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Annual Export and Trade Expansion Number

CANADIAN MACHINERY
AND MANUFACTURING NEWS

Vol. XXIV., No. 1 | Published by the MacLean Publishing Company, Limited, Toronto | July 1, 1920 | $3.00 a Year Subscription Price

READ AND PASS TO	check	See Page	READ AND PASS TO	check	See Page	READ AND PASS TO	check	See Page
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"A·W·P" HIGH SPEED STEEL TOOLS

For Quality and Service

ARMSTRONG WHITWORTH of CANADA Limited

Head Office :
298-300 St. James St.
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QUE.

Works :
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Branches at
126 Wellington St.W.,
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27 King William St.,
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McArthur Building,
WINNIPEG, MAN.

P & W

Pratt & Whitney Taps

"With the 'Con-eccentric' Land"

P & W Taps are **good** taps — easily the best where accuracy and high speed are essential. They cost more to buy, but less to use than others.

If you're doing work that calls for big production and for unusual precision give them a trial. You'll be back for more when you see them prove themselves.

The "con-eccentric" land—the special feature of Pratt & Whitney Taps permits sharpening on face of the cutting edge without affecting size. It lengthens life and assures accuracy hitherto thought impossible in a commercial tool.

Where You Can Buy Them—

New York, 326 Hudson St. **Boston,** 93-95 Oliver St. **Philadelphia,** 405 N. 21st St. **Cleveland,** 730 Superior Ave. **Detroit,** Kerr Machy. Bldg. **Chicago,** 571 W. Washington Blvd. **St. Louis,** 516 N. 3rd St. **Cincinnati,** 336 W. Fourth St. **Birmingham, Ala.,** 2015 First Ave. **St. Paul, Minn.,** Robinson, Cary & Sands Co. **New Orleans,** C. T. Patterson Co., Ltd. **San Francisco,** 16 to 18 Fremont St. **In Canada—** Pratt & Whitney Co. of Canada, Ltd., **Dundas, Montreal, Toronto, Winnipeg, Vancouver.**

PRATT & WHITNEY COMPANY OF CANADA, LIMITED

Works: DUNDAS, Ontario

MONTREAL
723 Drummond Bldg.

TORONTO
1002 C.P.R. Bldg.

WINNIPEG
1205 McArthur Bldg.

HALIFAX
91 Roy Building

WINDSOR
Davis Building.

VANCOUVER
B. C. Equipment Co.

The BERTRAM Page

MACHINE TOOLS

No. 8 Double Angle Shear
on plain base

Capacity—8" x 8" x 1¼" angles.

Motor drive—15 H.P. Motor.

The John Bertram & Sons Co., Limited
DUNDAS. ONTARIO.

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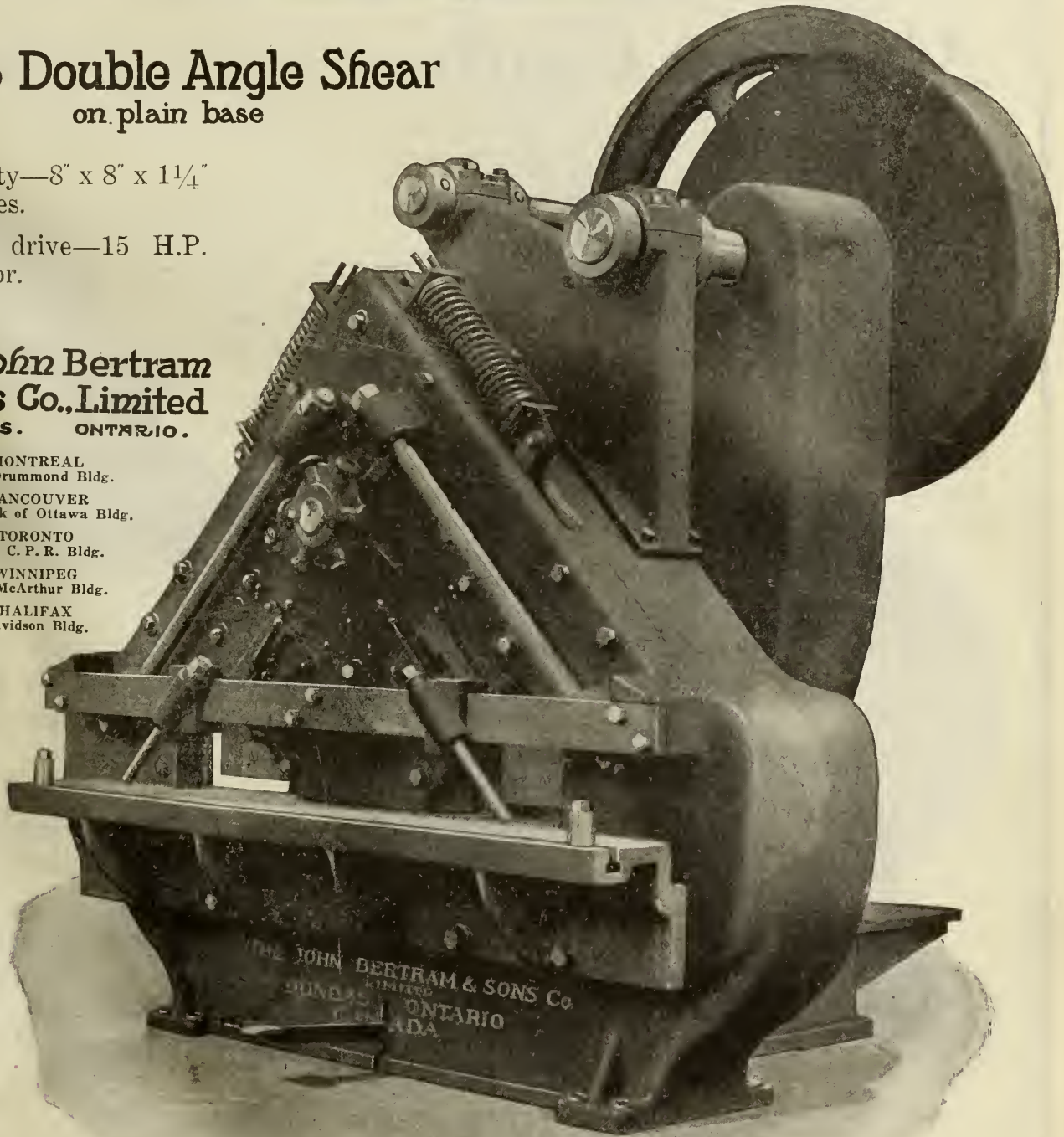
723 Drummond Bldg.

VANCOUVER
609 Bank of Ottawa Bldg.

TORONTO
1002 C. P. R. Bldg.

WINNIPEG
205 McArthur Bldg.

HALIFAX
Davidson Bldg.



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"WAUSI

REG. U.S. PAT. OFF.

Abrasive Cloth Grind

100% Efficient

"Wausite" wasteproof strips are put up in spools of 10 and 50 yards, in standard widths of ½ in., ¾ in., 1 in., 1½ in., 2 in., 2½ in. and in all grits.

Specially selected abrasive, durable fabric, and a high-grade bond give them wearing qualities which mean actual economy.

The durability and grinding qualities of "Wausite" abrasive have made them popular among prominent machinists and manufacturers all over the world.

They are indispensable on lathe work for an accurate, smooth finish, and in shops where highly polished surfaces are needed.

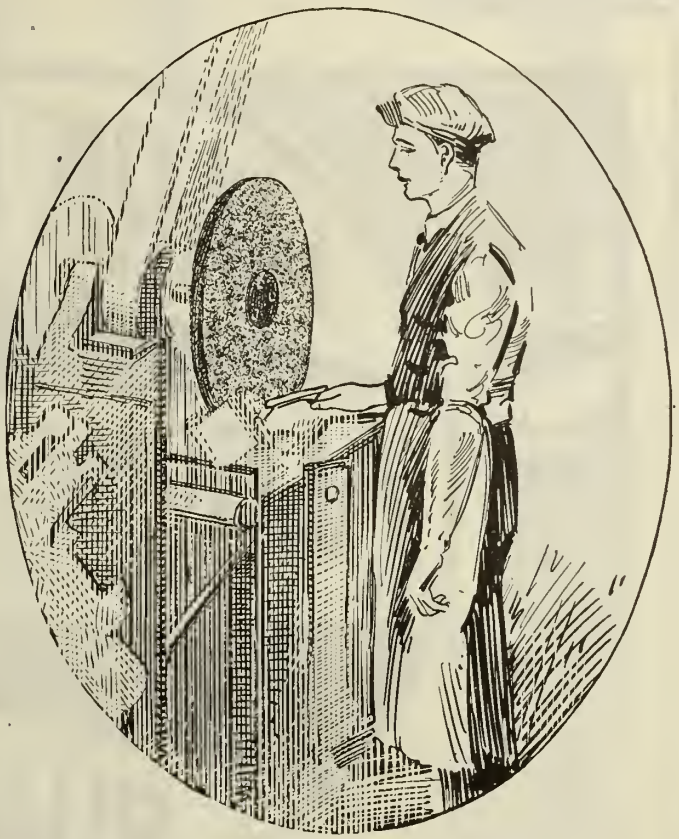
Our guarantee on every package assures you that the contents have been carefully inspected and counted and that we have used the highest grade of materials in the making.

We will be pleased to send you working samples and quote you prices on "WAUSITE." No obligation on your part whatsoever; just drop us a post card and say you saw our ad. in Canadian Machinery. We'll do the rest.

WAUSAU ABRASIVES COMPANY

TE"

ing Discs

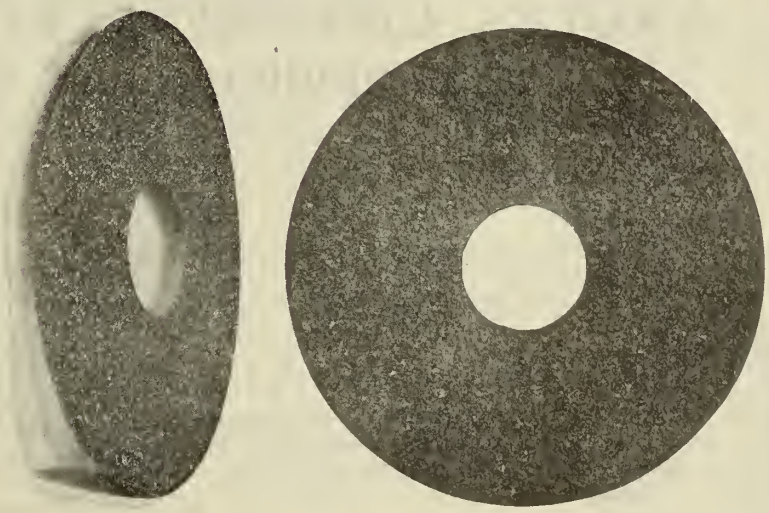


"Wausite" Grinding Discs are of the best possible quality and are made with the same painstaking care as the other "Wausite" products.

"Wausite" Grinding Discs have an enviable record for fast cutting, due to the durability of the surfaces and its secure bond to the heavy fabric.

"Wausite" Grinding Discs have a world-wide reputation for endurance. The standard of grinding efficiency which they have set is unparalleled.

We will be glad to send you working samples and quote you prices on "Wausite." This will cause no obligation on your part. A postcard mentioning our ad. is sufficient to give us the hint. We'll do the rest.



It comes to you in a sealed wrapper.

118 South Clinton Street, Chicago

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ANGLES, CHANNELS, BEAMS AND BARS
For Shipbuilding and other purposes

BLOOMS.
BILLETS.
SLABS.
STRUCTURAL STEEL.
MERCHANT BARS.
CONCRETE REINFORCING BARS.

IRON, BRASS AND BRONZE CASTINGS.
STEEL RAILS.
Open Hearth Quality.
(All sections from 12 lbs. to 100 lbs. per yard).

SPLICE BARS.
STEEL TIE PLATES.
PIG IRON;
BASIC, FOUNDRY—
MALLEABLE.
SULPHATE OF AMMONIA.

OPEN HEARTH ALLOY STEELS

Chrome-Vanadium Chromo-Nickel Nickel

All of these steels we supply in HOT ROLLED BARS. We also furnish in BLOOM, BILLET AND SLAB FORM.

SULPHURIC ACID ***NITRE CAKE***

OUR manufacturing facilities enable us to give you the very best in quality and prompt service. May we have your next order?

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SAULT STE. MARIE, ONT.
Sales Offices:
Montreal: 606 McGill Building
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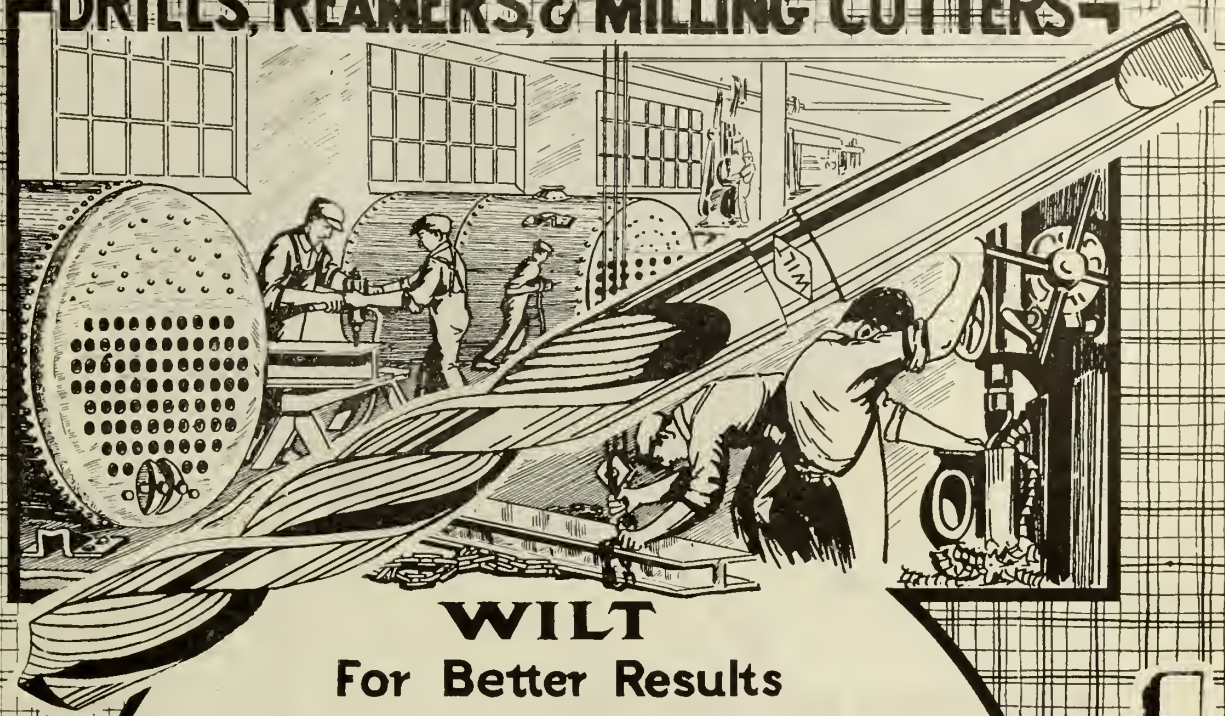
WILT

HIGH SPEED & CARBON TWIST
DRILLS, REAMERS, & MILLING CUTTERS



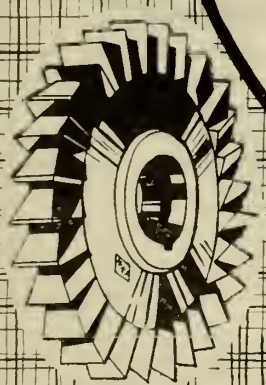
WILT
For Better Results

Made in Canada

Manufacturers who have switched from the use of ordinary tools to WILT TOOLS realize the benefit of the change. They are getting better results from their operations.

Wilt High Speed and Carbon Twist Drills, Reamers and Milling Cutters give longer service, do more work without regrinding and cost no more than ordinary tools.

For a steady volume of work that is satisfactory from the standpoint of both **quantity** and **quality** there are no better tools than the WILT line.



WILT TWIST DRILL COMPANY
OF CANADA LIMITED
WALKERVILLE · · ONTARIO

TRADE WILT MARK

"Where there's a WILT – There's the Way"

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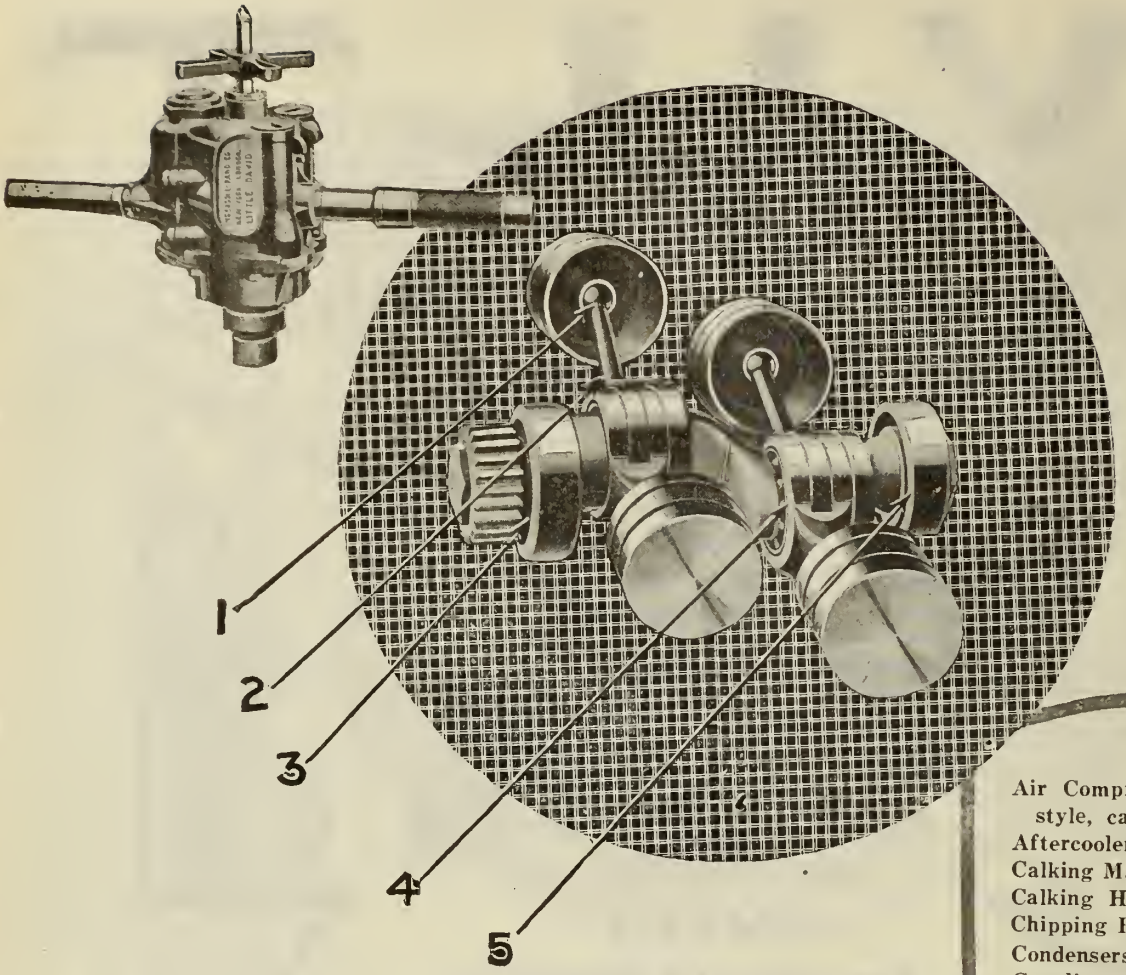


Five Vital Reasons Why LITTLE DAVID Drills Are Long on Service and Short on Repair Costs.

1. **Ball and socket joints between pistons and connecting rods—simple and strong.**
2. **Solid drop-forged connecting rods, no nuts to work loose, threads to strip, or cotter pins to shear.**
3. **Ball bearing takes up thrust and relieves outside frame from stresses and strains.**
4. **Roller bearings between connecting rods and crank pins reduce friction and make an easy running tool.**
5. **Ball bearing provides large bearing surface, reduces friction and minimizes wear.**

All four pistons and connecting rods are interchangeable. Valves are also interchangeable and being of the rotary type are geared direct without the use of straps or eccentrics. Due to their extreme simplicity individual parts have greater strength and stand up longer and when repairs do become necessary they can be made easily and quickly.

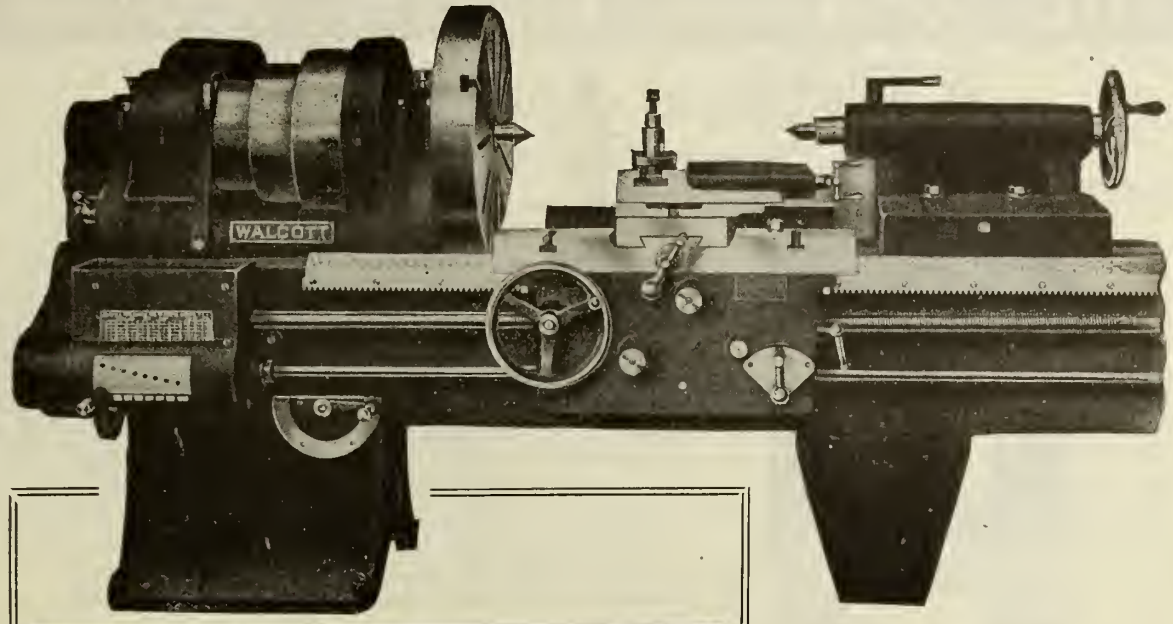
These are only a few of many exclusive features that make Little Davids most desirable, features that appeal particularly to the user and repair man. They are more durable and efficient, cheaper to maintain, and will stand a greater overload without stalling than any other drill on the market.

Air Compressors, any style, capacity or drive
Aftercoolers, Air
Calking Machines
Calking Hammers
Chipping Hammers
Condensers, Steam
Couplings, Hose
Drift Bolt Drivers
Drills, Pneumatic
Grinders, Pneumatic
Hoists, Air, Steam and Electric
Hose, Pneumatic
Pumps, Air Lift
Pumps, Hydraulic
Pumps, Vacuum
Receivers, Air
Reheaters, Air
Riveting Hammers
Saws, Pneumatic
Tie Tampers, Pneumatic
Woodborers, Pneumatic

Drills and other members of the Little David Family are described bulletin series 8000 ---copies of which are yours for the asking.

Canadian Ingersoll-Rand Company Limited

SYDNEY COBALT SHERBROOKE WINNIPEG MONTREAL NELSON TORONTO VANCOUVER



WALCOTT

SCATTERED round the circumference of the globe, it may be truly said that Walcott lathes never stop. On every continent, in almost every country, they are meeting the demand for a lathe that can handle all work within its capacity and survive all conditions of service.

Developed through an experience of nearly forty years, they are well qualified for their big achievements.

Have you a "Walcott" catalogue?

Walcott Lathe Company

125 Calhoun Street

JACKSON - - - - - MICHIGAN

WALCOTT AGENTS

Domestic.

Walcott Lathe Company, Branch Stores: 254 Jefferson Ave. E, Detroit, Mich.; 258 Washington St. W., Syracuse, N.Y.; 1316 Ontario St., Cleveland, Ohio; Hill, Clarke & Co., Chicago, Ill.; Peter A. Frasse & Co., New York City, N.Y.; W. E. Shipley Machy Co., Philadelphia, Pa.; The National Supply Co., Toledo, Ohio; Wm. E. Duff Co., York, Pa., and Jacksonville, Fla.; Perine Machinery Co., Seattle, Wash.; Brown-McDonald Machinery Co., St. Louis, Mo.; M. D. Larkin Supply Co., Dayton, Ohio; Smith-Booth-Usher Co., Los Angeles, Calif., and San Francisco, Calif.; Factory Mill Supply Co., Boston, Mass.; Hendrie & Bolthoff Mfg. Co., Denver, Colo.; Gordon & Finkbeiner, Portland, Ore.; Northern Machinery Co., Minneapolis, Minn.; Aumen Machinery Co., Baltimore, Md.; Peden Iron & Steel Co., Houston, Texas.

Foreign.

Fenwick Freres & Co., France, Switzerland, Belgium, Italy; William E. Duff Co., Tokyo, Japan; Willy Keunen & Co., Hertogenbosch, Holland and Bandoeng, Dutch East Indies; Fenwick & Co., Barcelona, Spain; Cuban-American Sales Co., Havana, Cuba; Universal Machinery Co., London, England.

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CANADIAN FAIRBANKS-MORSE CO.

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WINNIPEG	VANCOUVER
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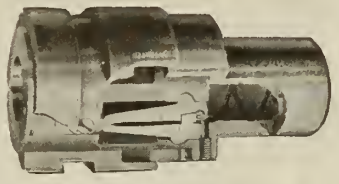
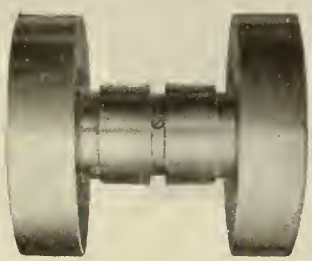
THE JOHNSON FRICTION CLUTCH

A Clutch of Known Quality Built to Your Own Requirements





That's what you get in the Johnson Clutch. A clutch that you can rely on — that has proven its merits—and still one that can be applied to your own requirements, just as well as if you built it yourself. If your drive comes within the rating of Johnson Clutches, we can develop the most satisfactory clutch to handle it.

Johnson Clutches are adaptable to high speed and low speed, to all conditions of service, from the most delicate to the most strenuous. They are exceptionally serviceable in machine installations. Our booklet, "Clutches as Applied to Machine Building" shows what they are accomplishing in this line.

Write for our Yellow catalog.

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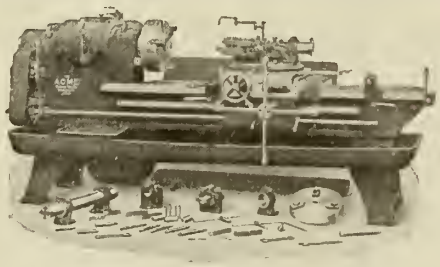
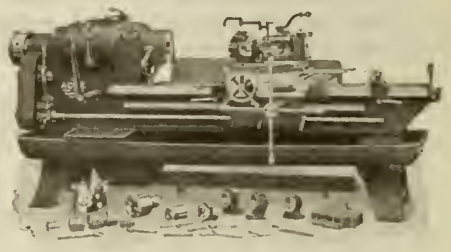
CANADIAN FAIRBANKS-MORSE CO., LIMITED, Montreal, Toronto, Winnipeg

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.



3¼" x 36" Flat Turret Lathe with Chucking Equipment.



3¼" x 36" Flat Turret Lathe with Bar Equipment.

Double Purpose Machine Tools

Do Both Bar and Chuck Work

Cincinnati Acme Flat Turret Lathes are adapted to both bar and chucking work. They are fast, accurate and economical. The head is cast solid with the bed. This gives constant, true alignment of the spindle with vees upon which the turret carriage travels. The only gears running are those doing the actual work, resulting in saved power.

Let us place the full facts before you—then decide for yourself if you can use this machine to advantage.

The Acme Machine Tool Company

Cincinnati, Ohio, U.S.A.

Canadian Agents: Rudel-Belnap Machinery Co., Montreal, Toronto

TRACKWORK

FOR STEAM AND ELECTRIC RAILWAYS

Manufacturers of Balkwill Articulated Manganese Steel Crossings

Complete layouts of built-up, rail-bound hard-centre or solid manganese steel construction.

TRACKWORK ACCESSORIES

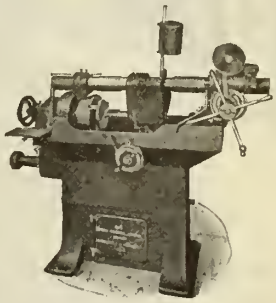
CANADIAN STEEL FOUNDRIES LIMITED

Transportation Building, Montreal

Bryant Hole Grinders

Speedy and Accurate Production

The Swinging Head Design Doubles Their Accuracy



Greater accuracy with less effort, due to the " 2 to 1" control, an inherent feature. Rapid reproduction of taper and formed holes due to the control plate method of grinding. Ease with which work can be gauged, afforded by swinging the grinding head back and out of the way by a simple turn of a handle.

Write to-day for particulars. The Bryant Production Book tells some interesting tales of actual production.

BRYANT CHUCKING GRINDER COMPANY

Springfield, Vermont, U.S.A.

Detroit Direct Representative: B. J. Riordan, 263 St. Paul Ave., Detroit. Chicago, Direct Representative, L. C. Gilchrist, 1262 Columbia Ave., Chicago. Motch & Merryweather Mchy. Co., Agents in Cleveland, Cincinnati and Pittsburgh. Henry Prentiss & Co., Agents in New York, Boston, Buffalo, Rochester, Syracuse, Scranton and Hartford. Berger and Carter Company, Agents in San Francisco and Los Angeles.

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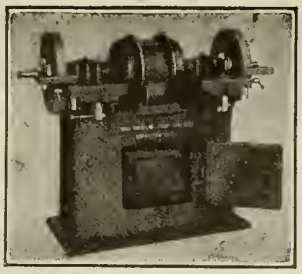
Light Type Floor Grinder

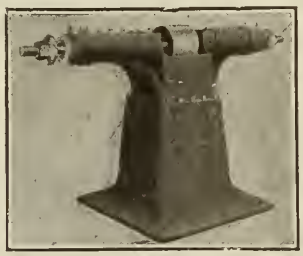


Motor-Driven Grinder

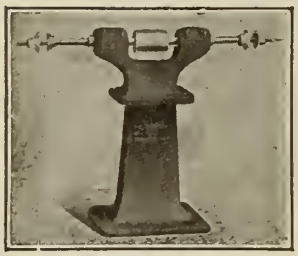
Heavy Type Polisher

Water Tool Grinder

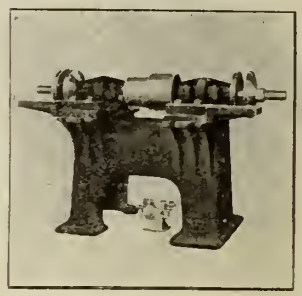
Swing Grinder



Plow Grinder

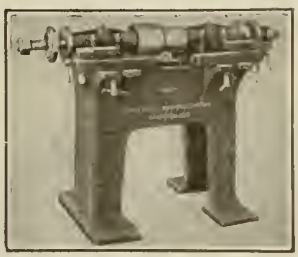


Buffing and Polishing Machine



Double End Grinder

Ford-Smith Grinders



Heavy Type Floor Grinder

Motor Driven Grinders.

Floor Grinders.

Bench Grinders.

Watertool Grinders.

Swing Grinders.

Disc Grinders.

Special Grinding Machinery.

Hack Saws.

Swivel Tables.

30" Double End Grinder

Shops taking up new lines of work, or speeding up present production, cutting down costs of manufacture, will do well to consider grinding processes. We have a wide experience which is at your service.

Write us. We can help solve your problems.

The Ford-Smith Machine Co., Limited

Hamilton, Ontario, Canada

Foreign Agents: W. E. Storey, 3 Arundel St., London, Eng. McLeod & Co., Calcutta, India. Gollin & Co., Melbourne, Australia. Atchier Demoor, Brussels, Belgium. British & Canadian Hydraulic Tube Co., Johannesburg, South Africa.

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

FORD-SMITH MILLERS

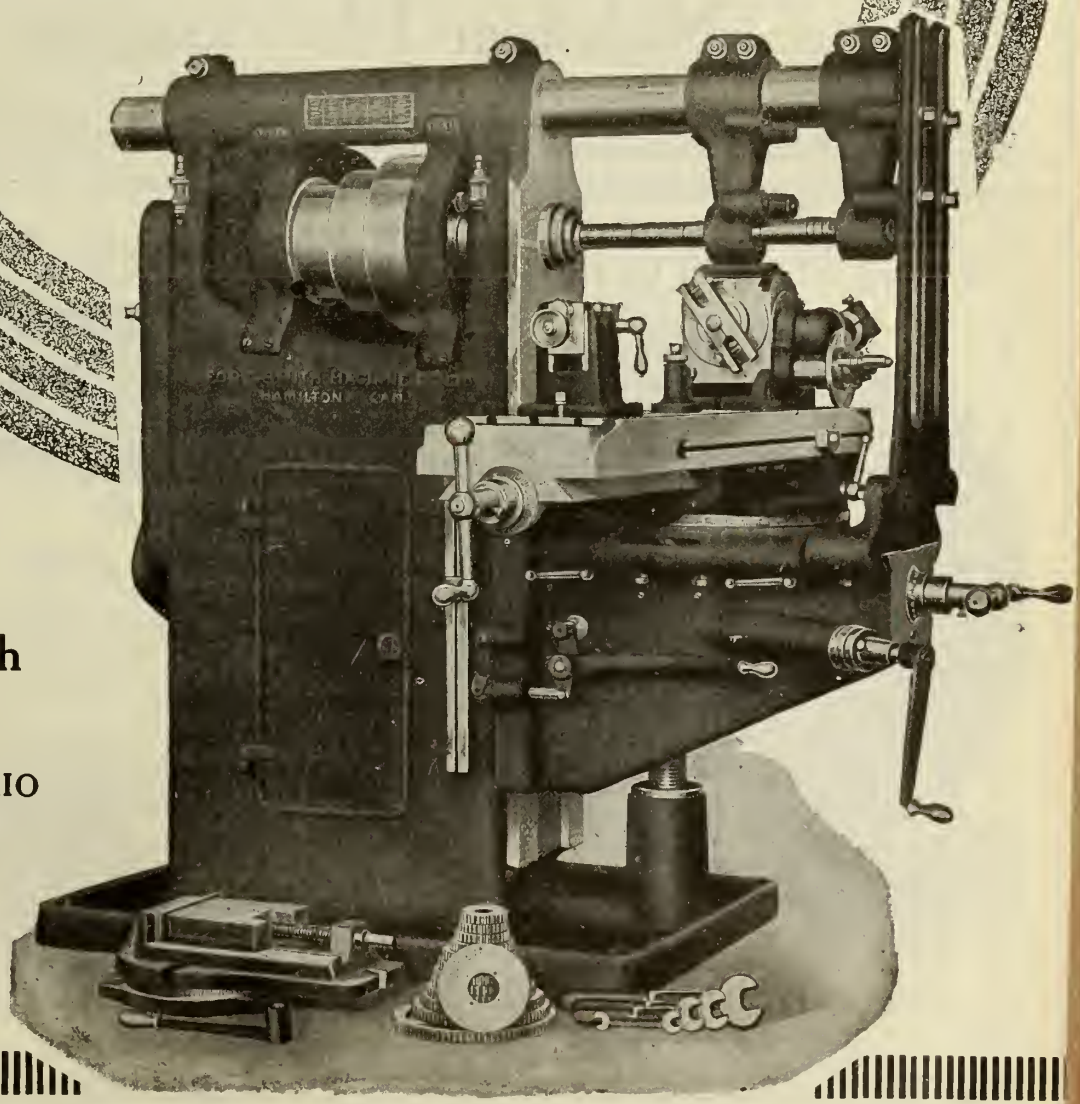
"The Distinctive Service Line"

We have followed out the very best practice in the design of these millers and the workmanship is only of the highest grade.

Extensive use throughout the country is proof of popularity.

Our plant is located in the centre of the industrial section and allows us excellent shipping facilities.

May we send our catalogue?



Manufactured by

The Ford-Smith Machine Co. Limited

HAMILTON, ONTARIO

Foreign Agents: W. E. Storey, 3 Arundel St., London, Eng.
Gollin & Co., Melbourne, Australia
Atchier Demoor, Brussels, Belgium
British & Canadian Hydraulic Tube Co., Johannesburg, So. Africa

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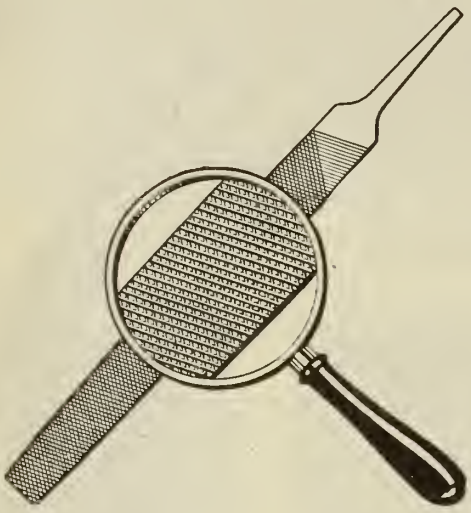


You Can Tell a File By Its Teeth

Are they properly shaped? Are they absolutely uniform and evenly set? Are they of steel sufficiently hardened for the strenuous work they must do?

File efficiency depends largely on these points.

In Famous Five Files, you will find teeth that meet all these requirements.

They do a clean job, and they give long service before wear is apparent. They have been the Standard for over fifty years. Specify them when ordering.

The Famous Five are:

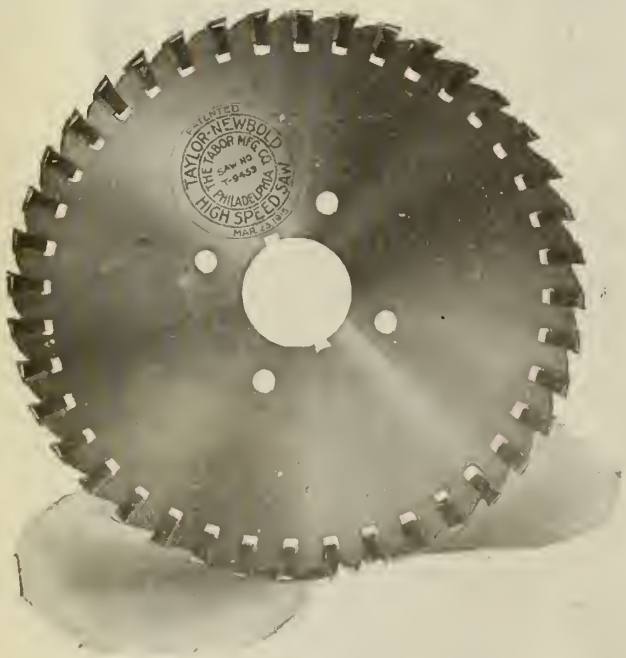
Kearney & Foot **American**
Great Western **Arcade**
Globe

Made in Canada by

Nicholson File Company

PORT HOPE - ONTARIO

THE IMPROVED
TAYLOR-NEWBOLD



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WRITE FOR BULLETIN T-S
Tabor Mfg. Co., Philadelphia, Pa., U.S.A.

PERRIN
FOR
RELIABILITY

Hydraulic Screw and Filter Presses

Made in Canada

Hydraulic Truck Tire Press

WILLIAM PERRIN LIMITED - TORONTO

"WACO"

THE HIGH SPEED STEEL

MARSHALL, SON & BUNNEY
39 Richmond Street East TORONTO, ONT.

SOLE CANADIAN AGENTS FOR
WM. ATKINS & CO., LIMITED
SHEFFIELD - - ENGLAND

ALL SIZES
IN STOCK

GENUINE EMERY

Sizes 180, 160, 140, 120, 110, 100, 90, 80, 70, 60, 54, 46, 40, 36, 30, 24, 20, 18, 16, 14, 12, 10, 9, 8, hole.

EMERY FLOUR AND WASHED FLOUR

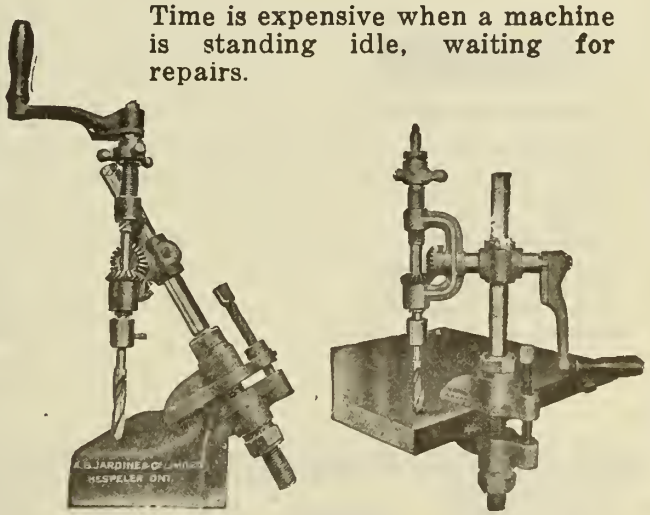
Emery, Glass, Flint, Garnet, Corundum, Carborundum — Paper and Cloth — In Sheets, Rolls, Discs, Bands, Strips and Tapes, &c

JOHN OAKEY & SONS
LIMITED
WELLINGTON MILLS
LONDON, S.E.1., ENGLAND

AGENTS:
F. Manley, 42 Silvester-Willson Building
Winnipeg, Man.
Sankey & Mason
839 Beatty St., Vancouver

Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.



On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, $26.50 net.
Sold by all Machinery and Supply Houses

A. B. JARDINE & CO., Limited
HESPELER, ONTARIO

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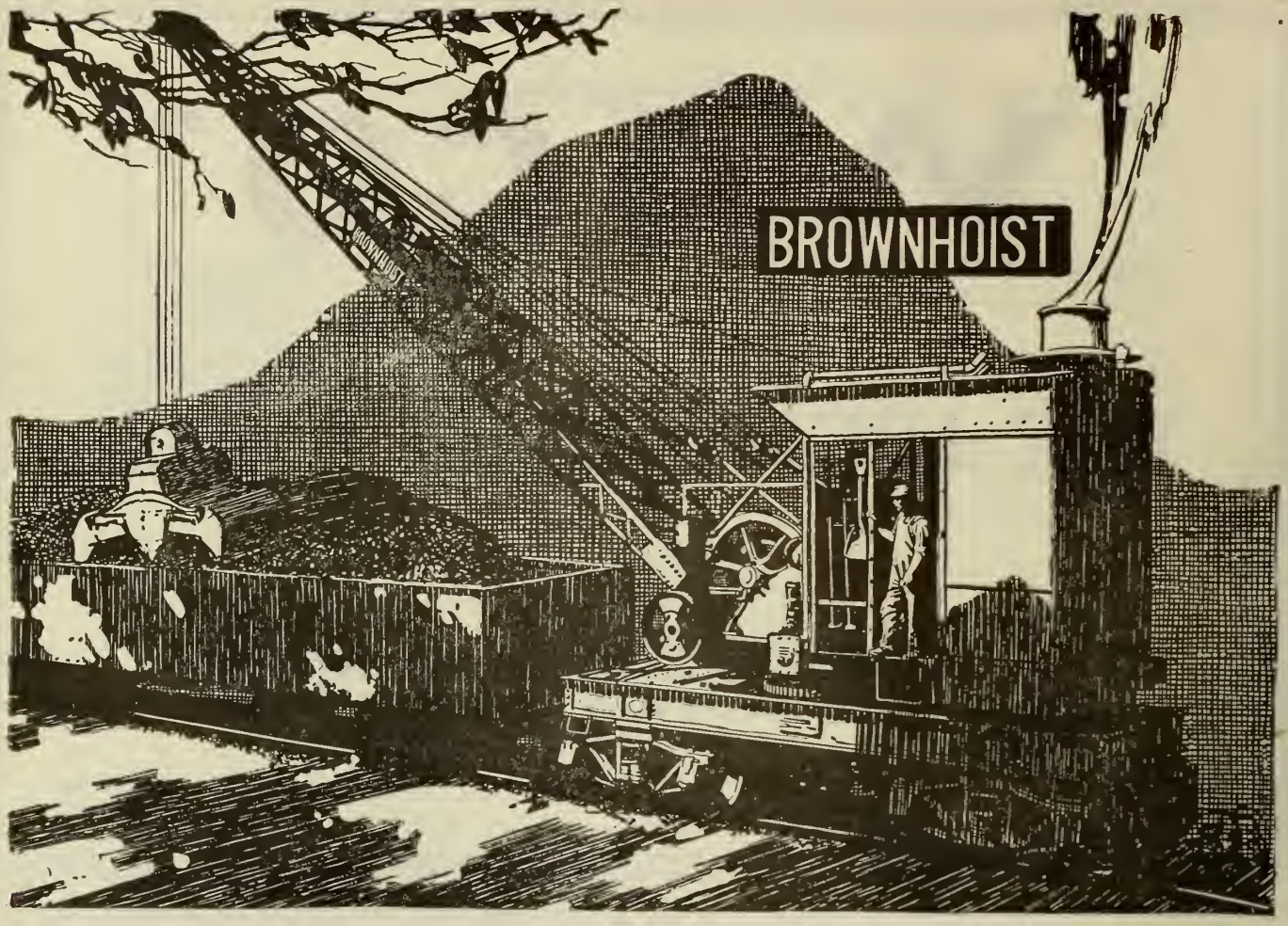


BROWNHOIST

Products Include :

Locomotive Cranes.
Grab Buckets.
Drag-line Buckets.
Electric Hoists.
Tramrails and Trolleys.
Overhead Tr. Cranes.
Pillar and Jib Cranes.
Heavy Dock Machinery.
Suspended Concrete Bins.

Write for Catalogs

Business needs more cars and you can help get them

Cars are very scarce now. And the car builders cannot produce enough to give us any material relief for some time yet. You play a certain part in the nation's business and whatever you may do to relieve the car situation will be of some help.

There is only one way in which this serious situation can be improved, and that is for all shippers and receivers of freight to use the cars more efficiently. See that your cars are unloaded as soon as received and then reloaded immediately, or if you have no outgoing freight that day, turn the car back to the road. And see that the loading and unloading are done as rapidly as possible.

A Brownhoist Locomotive Crane loads and unloads cars rapidly. If you can use a locomotive crane profitably, then buy it. We offer our services to determine whether it would be a paying proposition for you.

Write for Catalog K which shows how Brownhoist Cranes are used

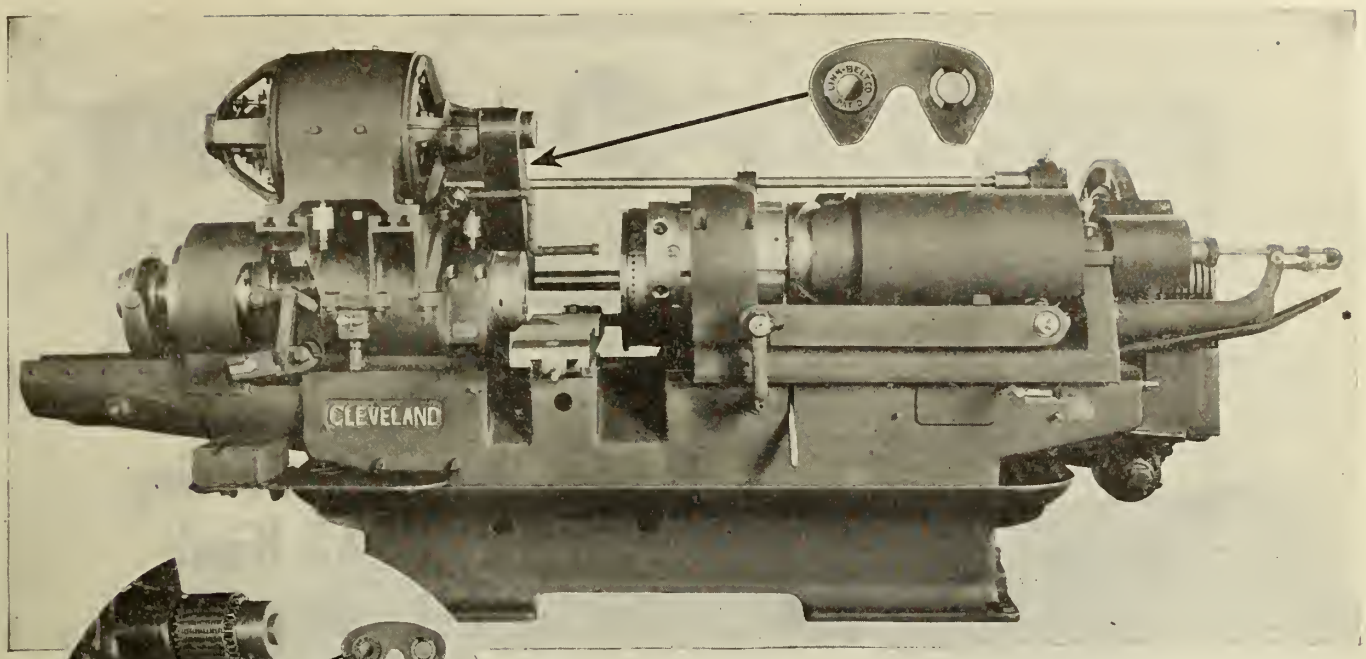
The Brown Hoisting Machinery Company

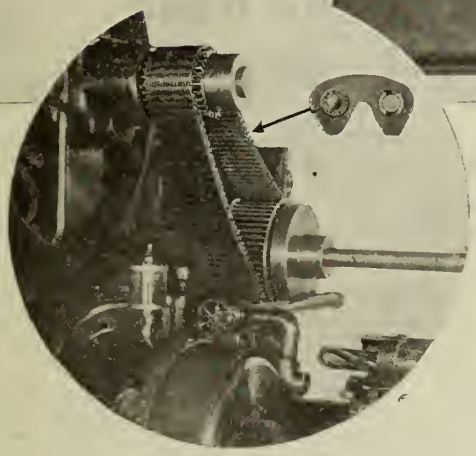
40 Years in Crane Business

Cleveland, Ohio, U. S. A.

Engineers and Manufacturers of Heavy Dock Machinery, Bridge Cranes, etc., as well as smaller Cranes and Hoists.

Branch Offices in New York, Pittsburgh, Chicago and San Francisco. European Representative: H. E. Hayes, 12 Rue de Phalsbourg, Paris.





Equip Your Machines with This Efficient Drive

DON'T continue to use noisy gear drives, or slipping flat-belt drives, on machines from which you expect maximum production. Use a drive that can't slip—the 98.2% Efficient Link-Belt Silent Chain Drive.

Link-Belt Silent Chain can be run on short centers, at relatively high speed, and in either direction. It is not affected by heat, cold or moisture, and by actual certified tests, under exactly similar conditions, in competition with leather belts and spur gearing, it delivered more power (98.2%) at less cost, to perform useful work.

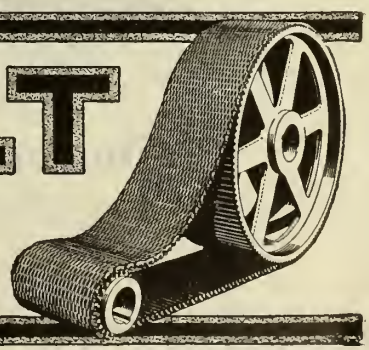
Link-Belt Silent Chain is the ideal drive for machine tools. By its use you can arrange your motor to suit your convenience. It saves floor space, insures quiet operation of machinery, has long life, reduces journal friction to a minimum, and possesses many other advantages which we shall be glad to point out to those interested.

Write for our book "The Ideal Drive for Machine Tools"

CANADIAN LINK BELT CO.
LIMITED
WELLINGTON & PETER STS.
TORONTO

578

LINK-BELT
SILENT CHAIN
FOR POWER TRANSMISSION



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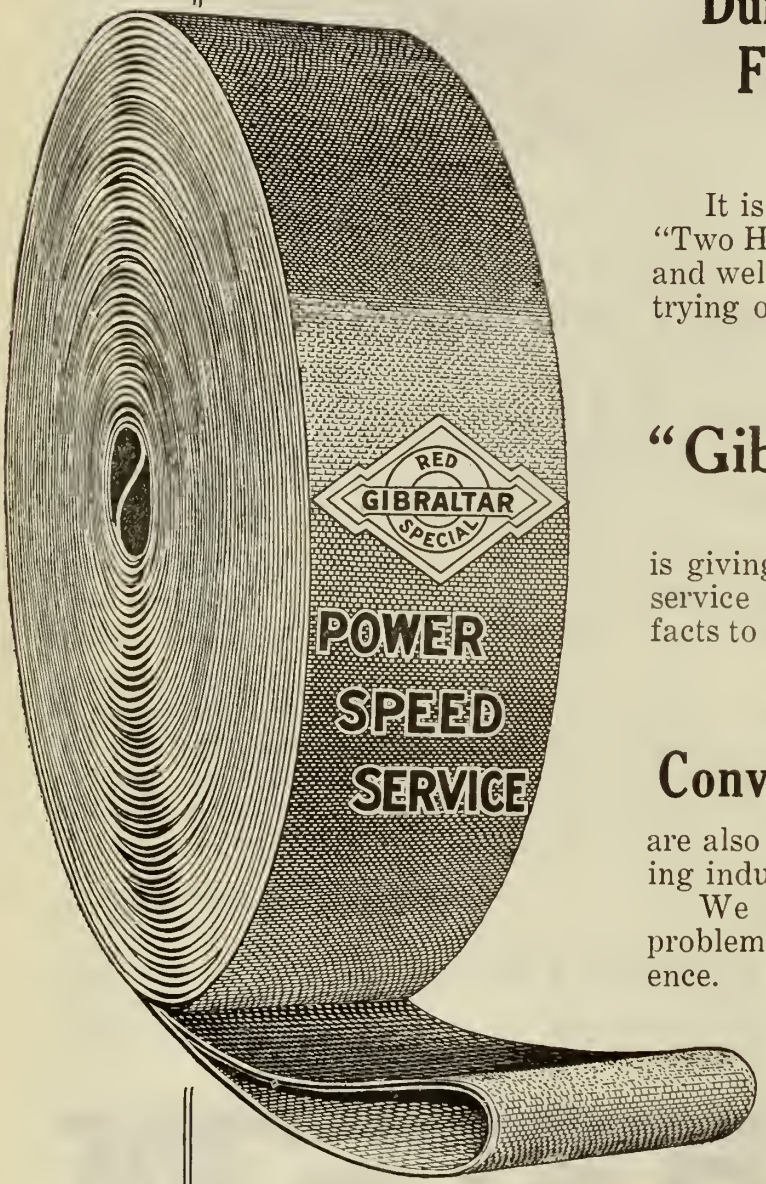
SEAL OF QUALITY
DUNLOP
RUBBER PRODUCTS



Dunlop Belting is Serving Faithfully in All Kinds of Industries

It is a matter of record that wherever the "Two Hands" products go they serve faithfully and well. In industries which are particularly trying on Belting

DUNLOP
"Gibraltar RedSpecial"
TRANSMISSION BELTING

is giving a higher percentage of satisfactory service than any other type. We have the facts to prove this statement.

DUNLOP
Conveyor and Elevator Belts

are also prominently employed in all flourishing industries.

We have a staff who specialize on Belt problems. You are welcome to their experience.

Also Makers of High-grade Hose and Packing

Dunlop Tire and Rubber Goods Co., Limited

Head Office and Factories: TORONTO

Branches in the Leading Cities

Speaking of Automatics-

"I believe P & Js are the best for handling Forgings, Castings and Sawed Bar Stock—"

Bulletin 41

The above words were spoken by the Foreman at the New Process Gear Corporation's Plant at Syracuse, N.Y. It is too bad space is limited as it is only possible to show a portion of their equipment and only a small variety of the class of work they are doing. Write to us and we will tell you some of the work these machines are doing. Better still, send your drawings or samples along and we will tell you how to produce.

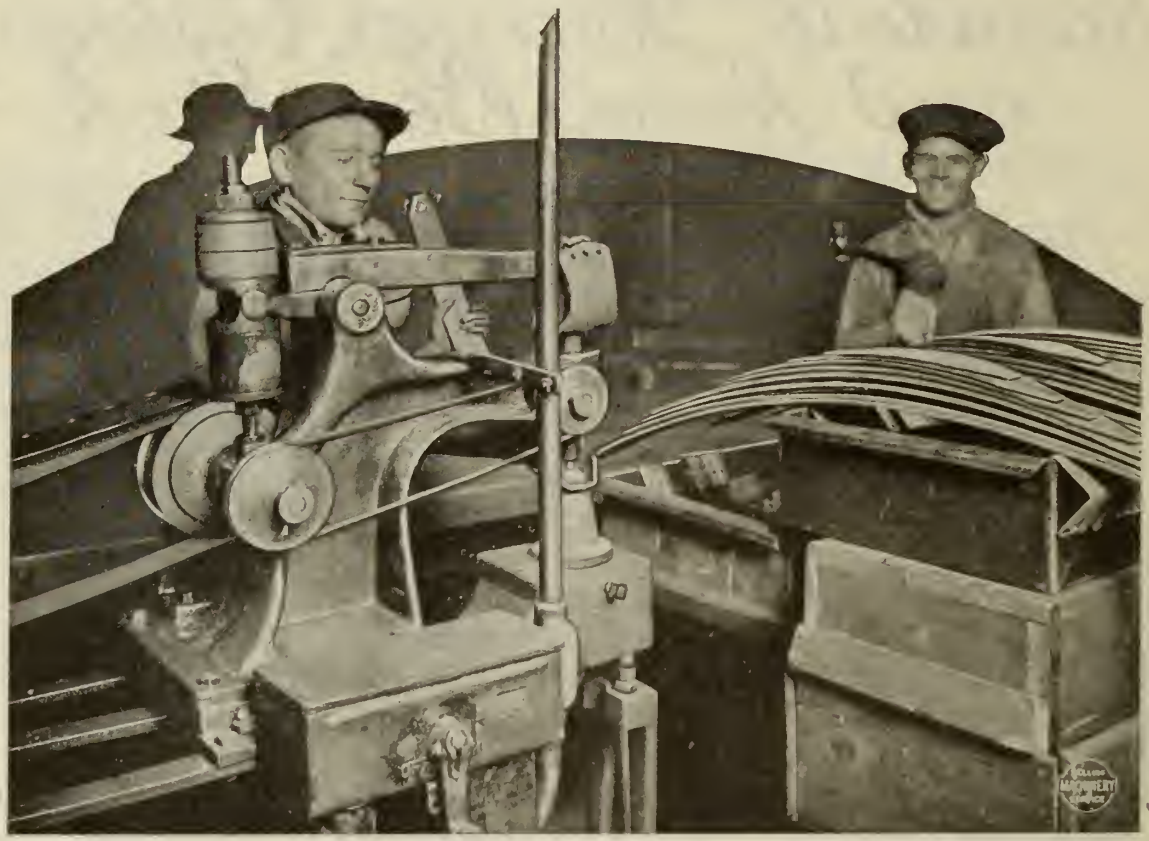
Canadian Offices: **POTTER & JOHNSTON MACHINE CO.**

ROELOFSON MACHINE & TOOL CO., LIMITED

11 Wellington Street East, Toronto, Canada

If interested tear out this page and place with letters to be answered.

High Speed Hammers
on Auto Springs

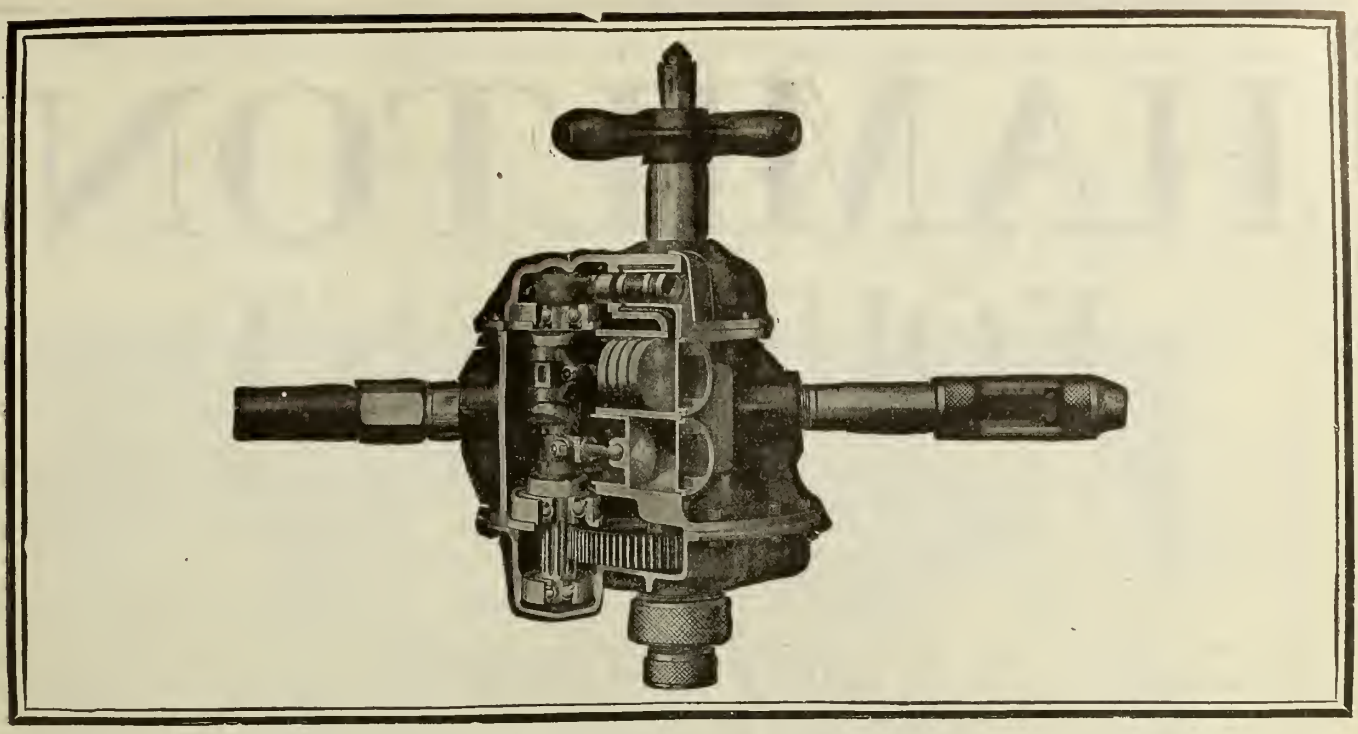


There Are Six of a Kind in This Cleveland Plant

This auto spring assembling scene is reproduced six times simultaneously in the plant of the Perfection Spring Company, Cleveland, Ohio. Six high-speed riveting hammers work in self-contained departments at the same job. The operation consists of riveting rebound clips into auto springs with 3/8" diameter steel rivets. Though the work is heavy, production is four springs per minute, as the actual riveting time is but eight seconds. We build high speed hammers in sizes to head rivets cold, from the smallest to 1½" in diameter. Can you afford to do without them?

You are invited to submit your riveting problems to us. Send sample with loose rivets or sketch showing dimensions, size and location of rivets, we will do the rest.

THE HIGH SPEED HAMMER CO., Inc.
ROCHESTER, NEW YORK, U.S.A.



Under Little Giant drill housings

Seeing is believing!

Seeing—

A toggle with renewable liner suggests a saving of 86% in toggle repair costs—

A 3-point ball-bearing crankshaft suspension suggests more work-units per dollar through frictionless operation at high economy of air consumption—

Balanced piston valves, with increased area and shorter ports, suggest faster drilling by quick air admission and exhaust—

Stub-tooth gears, sturdy and compact, suggest long service and full power delivered.

And seeing Little Giants in operation is *believing* that you should make them *your* standard air drill, and that your next requisition should specify Little Giants for prompt delivery from complete stocks now carried at the Company Branches listed below.

Sales Representatives

The Holden Company, Limited

354-356 St. James Street, Montreal, Canada

Sales and Service Branches: TORONTO, 342 Adelaide Street, West WINNIPEG, 150 Princess Street VANCOUVER, 81 Pender Street

Canadian Factory: Canadian Pneumatic Tool Company, Montreal

P-58-H

BOYER PNEUMATIC HAMMERS · · LITTLE GIANT PNEUMATIC AND ELECTRIC TOOLS
CHICAGO PNEUMATIC AIR COMPRESSORS · · VACUUM PUMPS · · PNEUMATIC HOISTS,
GIANT OIL AND GAS ENGINES ROCK DRILLS · · COAL DRILLS

GIANT ENGINES

Dependable Power at *Less Cost Per Hour*

If interested tear out this page and place with letters to be answered.

HAMILTON EQUIPMENT

Built in a plant that has been specializing in high-grade, dependable Saw Mill, Pulp Mill, and Hydraulic Turbine Machinery for over sixty-five years.

Quality and Service

Saw Mill Equipment

Boom Chains
Warping Anchors
Capstans for Warping
Log Jacks
Log Deck Equipment
Band Mills
Log Carriages
Set Works (steam and hand)
Edgers
Husk Frames
Live Rolls and Drives
Slashers
Trimmers
Cut-off Saws
Lath Mill Machinery
Shingle Mill Machinery
Filing Room Machinery
Resaws (circular)
Hogs
Drag Saws
Gang Circulars
Twin Circulars
Steam Feeds
Friction Feeds
Transmission Machinery
Haul-up and Transfer Chains
Refuse Burners
Conveyors
Engines (slide valve)
Boilers
Feed Water Heaters

Pulp Mill Equipment

Log Haul-Ups
Pulp Wood Slashers
Pulp Wood Conveyors
Barking Drums
Centrifugal Pump Screens (horizontal and vertical)
Beating Engines
Flat Screens
Pulp Grinders
Centrifugal Pumps
Triplex Stuff Pumps
Slusher Tanks
Chippers
Chip Crushers
Jordon Engines
Chip Screens (rotary and flat)
Digester Fittings
Push Fans
Agitator Drives
Refuse Burners
Transmission Machinery
Steel Plate Work

Hydraulic Power Plant Equipment

Water Wheels
Water Wheel Governors
Head Gate Hoists
Stop Log Winches
Trash Racks
Butterfly Valves
Power Transmissions
Hand Power Travelling Cranes
Steel Feeder Pipes
Surge Tanks

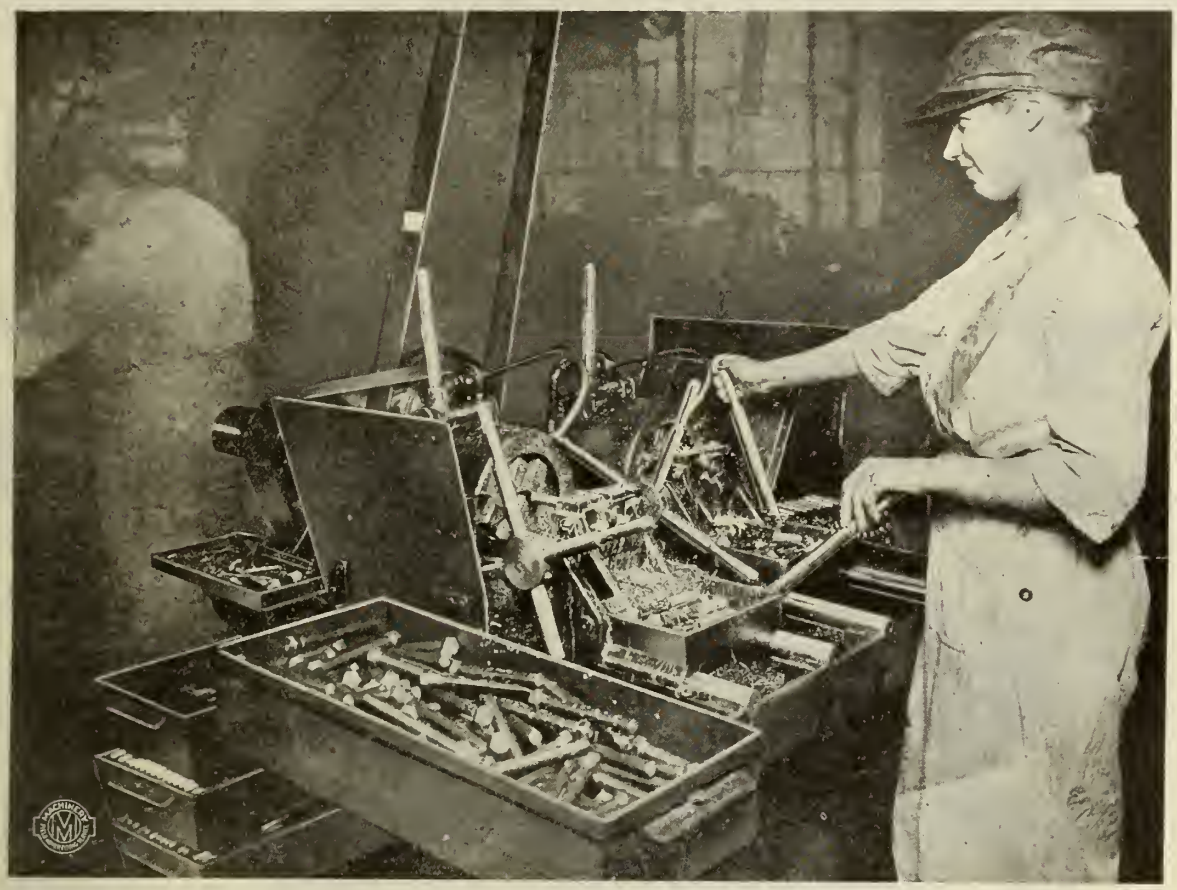
General Equipment

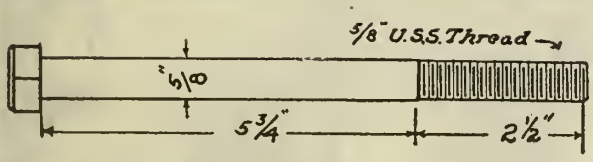
Gray Iron Castings
Brass Castings
Special Machines built to order
Patterns
Structural Steel Work
Transmission Machinery
Steel Plate Work
Tanks
Standpipes
Smoke Stacks
Boiler Breechings
Steel Pipe
Steel Bins and Hoppers

Send Us Your Specifications

WILLIAM HAMILTON COMPANY,
LIMITED
PETERBOROUGH, CANADA

GIRL OPERATORS DO WELL *with* LANDIS THREADING MACHINES





THE twenty-six Landis Threading Machines in this shop were bought some time "before the war." They've been "manned" by girl operators ever since they were set up. ¶ When the war came and the rush of work was so great that it almost disorganized many shops—The Ferry Cap and Set Screw Co., of Cleveland, found very little adjusting to do. They were well equipped with machines that produced the goods; machines so simple they could be operated by *any* intelligent worker.

¶ The machine in the picture is cutting 5/8 in. standard threads 2½ in. long on tough, low carbon steel king bolts for Chandler Cars—the production, 2000 per day, speaks for itself.

¶ We would like to have you know more about Landis Machines.

May we send you our Catalogue 24?

LANDIS MACHINE COMPANY, Inc.

Waynesboro, Pennsylvania, U.S.A.

If interested tear out this page and place with letters to be answered.

CANADA FOUNDRIES & FORGINGS LIMITED

PRODUCED AT

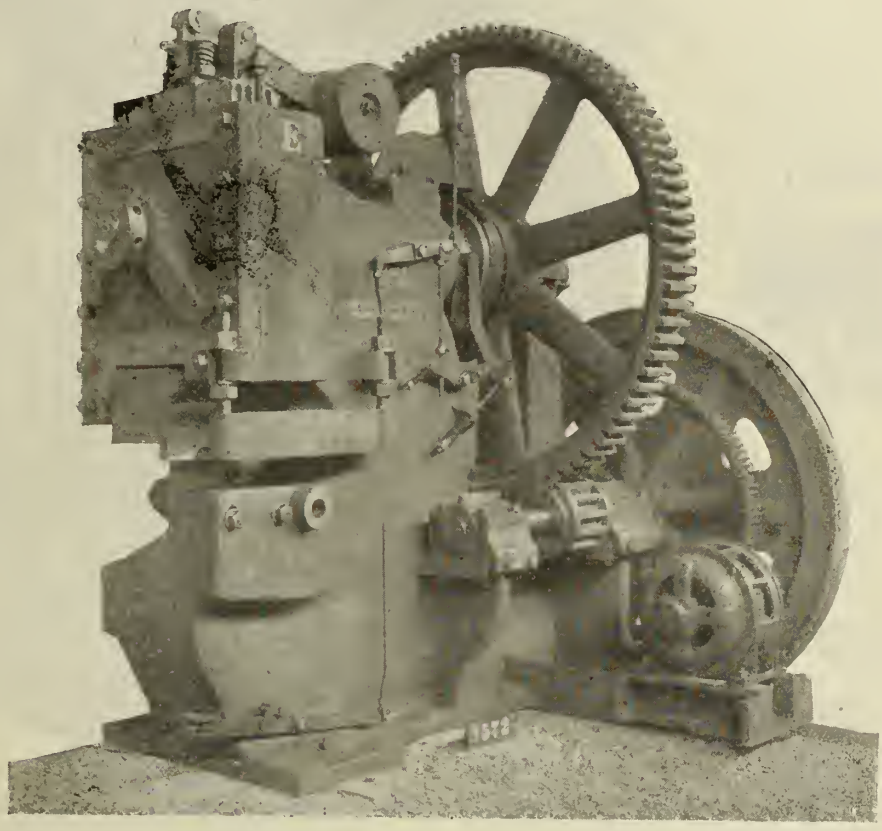
JAMES SMART PLANT

BROCKVILLE, CANADA

"The Quality Line"

PUNCHING and SHEARING MACHINERY

Machinery Equipment for Rolling Mills Bridge and Structural Works



Machinery Equipment for Steel Car Plants and Shipyards

No. E. OPEN THROAT BAR IRON SHEAR
Capacity 11" x 2¼" Flat, 4" Round, 3½" Square

All machines are built of same high-grade workmanship and material that have given the "L&A" product a recognized standard of quality for over 50 years.

May we send you our big catalogue.

The Long & Allstatter Co.

Established 1856

American Punch & Shear Works
HAMILTON, OHIO, U.S.A.

Incorporated 1878

Canadian Agents:
RUDEL-BELNAP MACHINERY CO., LIMITED
Toronto Montreal

If interested tear out this page and place with letters to be answered.

WALTHAM

CARBOWALT WHEELS

ALOWALT

CARBOWALT

For Grinding Brass and Bronze

THE efficient grinding of brass and bronze depends upon the proper combination of grits and binders in the wheel used for the work. In Waltham Carbowalt wheels this is so scientifically proportioned as to insure a good grinding surface at all times and make clogging the wheels practically impossible.

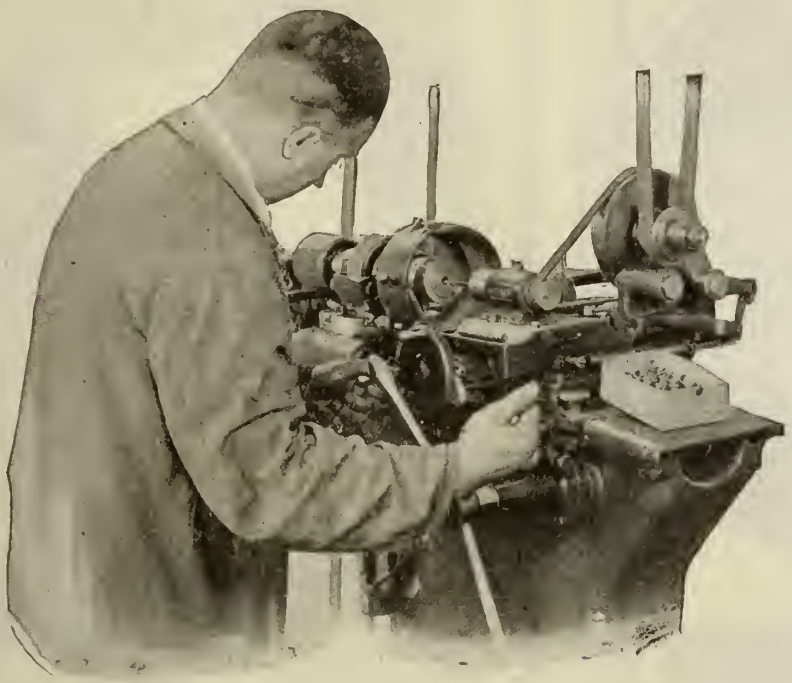
The photograph shows a Waltham 70-0 Carbowalt Grinding Wheel, attached to a Portable Electric Drill, putting the finishing touches on the underside of a cast brass grate.

Fine finish, good time and low grinding costs prove the wisdom of choosing the right wheel for the work. Waltham Wheels are made in special grades to suit all purposes—high grade wheels for fine work.

There is one that will fill your needs. Ask us.

WALTHAM GRINDING WHEEL COMPANY

WALTHAM MASS., U. S. A.



No. 1

The hole in the ball race as shown above was ¾ in. diameter by ½ in. long. It made an ideal job for the Heald Style No. 85, which handles work ¼ in. to 2 in. diameter by 2½ in. long.

Grinding Small Short Work

The above photograph shows the Heald No. 85 grinding a small chrome steel ball race. Notice the simplicity of the chucking operation. The ball race was placed in a draw-in collet, the lever thrown to the left, securely holding the work. Removing it was even simpler. The pilot wheel was turned to the right, drawing the wheel from the hole, the work head automatically stopped, water was shut off and by operating the collet lever to the right, the work was released, fairly jumping into the operator's hand.

Other features are a positive stop accurately governing the travel of the table, flexible wheel head idler, automatic wheel guard, water attachments, and simple single countershaft.

May we send you literature on this or our larger internal grinders.

THE HEALD MACHINE CO.

51 New Bond Street

Worcester, Mass.

Branches at

NEW YORK
DETROIT
PHILADELPHIA
CINCINNATI
CHICAGO
CLEVELAND

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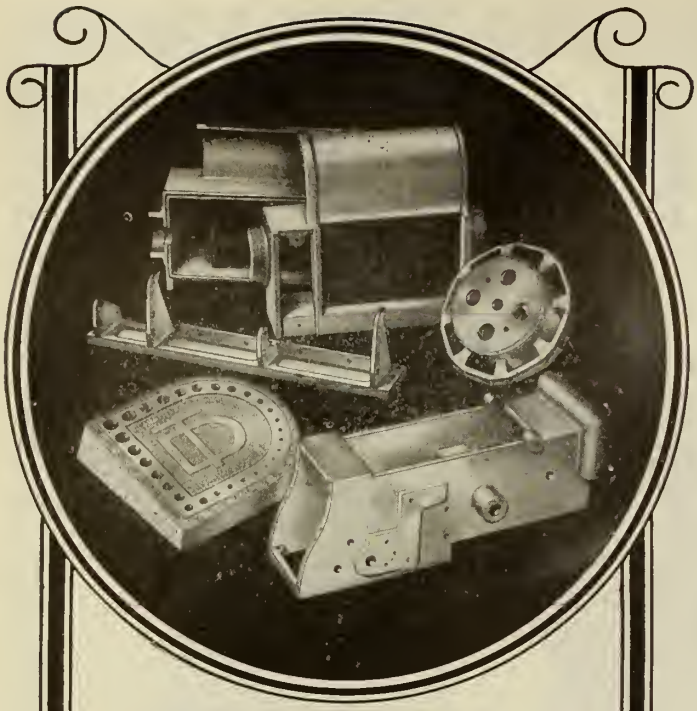


FRANKLIN DIE-CASTINGS

They Simplify Production and Reduce Costs

For nearly thirty years Franklin Die-Castings have aided the development of many fields of industry by reducing costs and simplifying production.

Wherever Franklin Die-Castings are adaptable they lower the cost of production through the saving of time, labor, equipment and material otherwise spent in machining.

Franklin Die-Casting methods often make it possible to produce a device in fewer parts. It is through such advantages, derived from the use of Franklin Die-Castings, that many products have been made commercially practical.

In 1892 we originated the die-casting industry. From our long experience, we can advise you whether the die-casting principle can be applied correctly and profitably to your special needs.

THE FRANKLIN DIE-CASTING CORPORATION
Gifford and Magnolia Streets SYRACUSE, N.Y

We cast in Aluminum, Tin, Lead and Zinc base alloys. Estimates made from samples, drawings or blueprints.
Send for Booklet

1/3 to 1/2 Reduction in Milling Cost

This will be the result of taking small milling jobs from your big millers and putting them up to

The U.S. MILLER

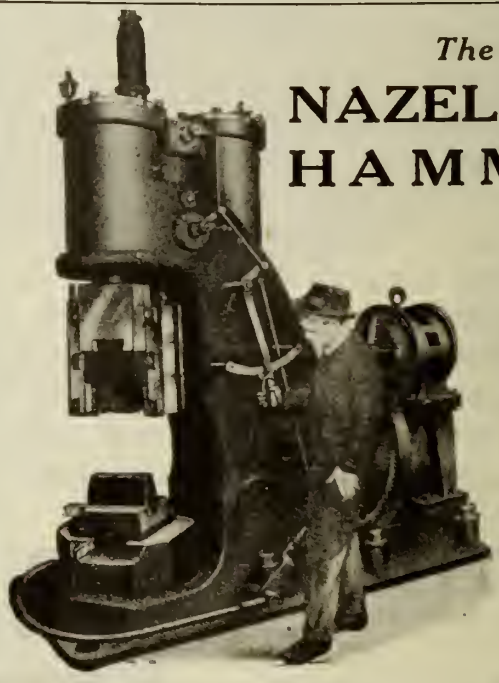
The Miller for Small Work

A small machine takes up less space, requires less power, is easier to operate and is more accurate. The Paramount Miller of its size. Drop us a line for full details.

United States Machine Tool Company
Cincinnati, Ohio, U.S.A.

The

NAZEL AIR HAMMER



NOTED FOR ITS BLOW AND CONTROL

A self-contained unit, HAMMER AND COMPRESSOR COMBINED, built in three types, six sizes arranged for BELT OR DIRECT MOTOR DRIVE, with capacities up to 7 inches square, for all manner of jobbing, manufacturing and certain classes of drop forgings.

Nazel Engineering & Machine Works
Dept. F., Philadelphia, Pa.

Built For *Service*

This BLOUNT Motor-driven Lathe is well adapted to all speed lathe uses. It is of late design, and has a number of features in which you will be interested. Provided with constant-speed motor. Lathe spindle made of hollow, high-carbon steel, ground to size and bored for Morse taper. Runs in self-oiling bronze bearings.

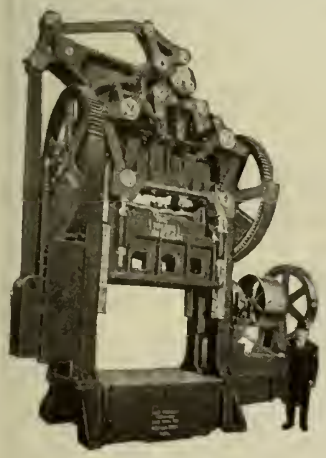
"We will accept Canadian funds at par"

J. G. Blount Co., Everett, Mass., U.S.A.

The "Toledo"

Toggle Drawing Presses

Tremendously superior to anything designed for deep drawn and stamped work.



The toggle mechanism is simple, practical, effective — obtaining a perfect rest of dwell of the blank holder during the entire drawing operation. Wasters are eliminated, smooth and noiseless running assured and the machine is at all times under complete control of operator. 80 sizes single and double crank.

The Toledo Machine & Tool Co.

TOLEDO, OHIO

Representatives:—Allied Machinery Co. of America, 19 Rue de Rocroy, Paris, France; Via XX Settembre 22, Turin, Italy; 16 Seidengasse, Zurich, Switzerland.

MYSTIC

CUTTING COMPOUND

Keeps the Cutting Edge

COOL

NO matter what the character of the work, or how exacting the conditions, Mystic Cutting Compound keeps the cutting edge *cool.* That is the important thing in any machine operation—*to prevent the cutting edge from heating.*

Mystic Cutting Compound, mixed with water, has the same cooling properties and cutting efficiency as lard oil, but is much more economical.

If you have been using ordinary cutting compounds, Mystic will make a big difference in your production-costs. It enables you to operate your machine at higher speeds, reduces tool expense and produces finer and more accurate work.

Mystic contains nothing to injure the hands of the operator, and does not rust, gum or separate.

A demonstration entails no obligation on your part.

CATARACT REFINING COMPANY

LIMITED

Toronto, Ontario

If interested, tear out this page and with letters to be answered.

OAKITE CLEANS

Canadian Plant Cleans 6¼ Million Bolts Every Month with Oakite

ONE of the large Canadian steel companies now uses Oakite materials for cleaning bolts because the work is performed faster and better.

The bolts that are threaded with cutting compound are cleaned and anti-rusted with Oakite materials in one operation.

The bolts that are threaded with oil are so cleaned with Oakite materials as to leave a light oil film for anti-rust protection.

Present output is 6,250,000 bolts monthly — and Oakite cleaning materials make good on every bolt.

This Advertisement is one of a series based on actual occurrences. T. W.

Perhaps your present cleaning methods are unnecessarily expensive—or consume too much time? For more than 10 years Oakite methods and materials have proven their ability to straighten out tangles in the cleaning room by improving the quality of the cleaning work.

OAKITE MANUFACTURED BY OAKLEY CHEMICAL CO. 44 THAMES STREET NEW YORK

MINISTRY OF G R MUNITIONS

The Disposal Board
Have
STOCKS
Lying in the United Kingdom and
AVAILABLE FOR EXPORT
of
ENGINEERING STORES

Ferrous and Non-Ferrous Metals
Plant and Machinery
Steam Engines and Boilers
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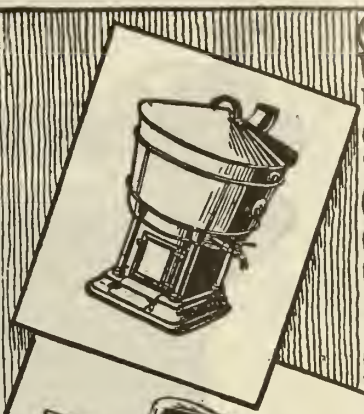
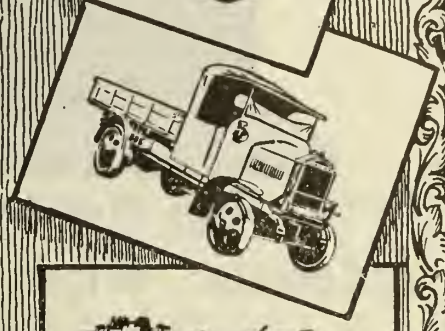
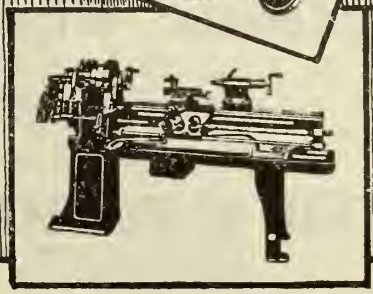
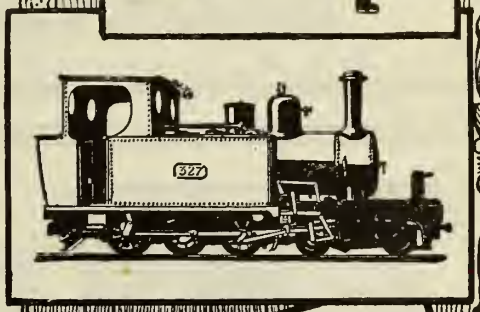
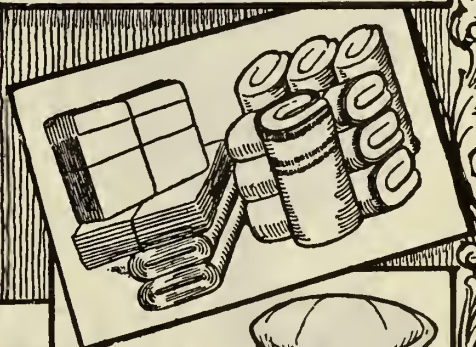
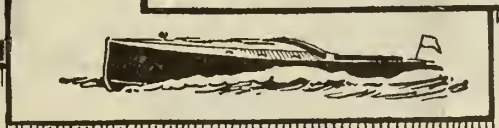
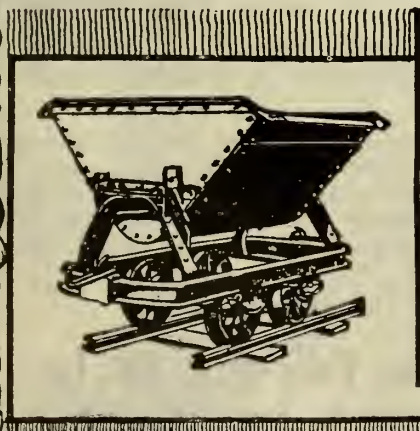
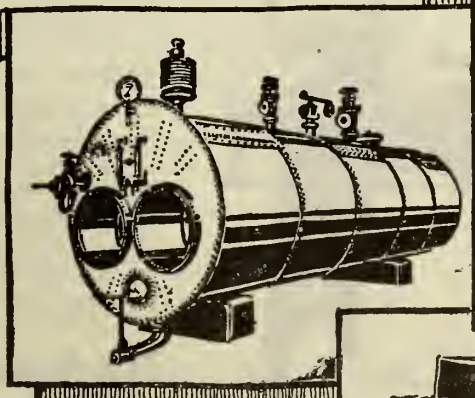
Electrical Instruments and Machinery
Medical Stores
Chemicals and Explosives
Motor Vehicles
Agricultural Machinery
Aircraft
Furniture
Textiles and Clothing
Motor Boats, etc., etc.
Boots and Leather Equipment, etc.

Buyers should instruct their representatives in the United Kingdom to communicate with D. B8 Canadian Export Department, Ministry of Munitions, Whitehall Place, London, S.W.

Cable Address:
"DISPEXPORT, MUNORGIZE, LONDON"

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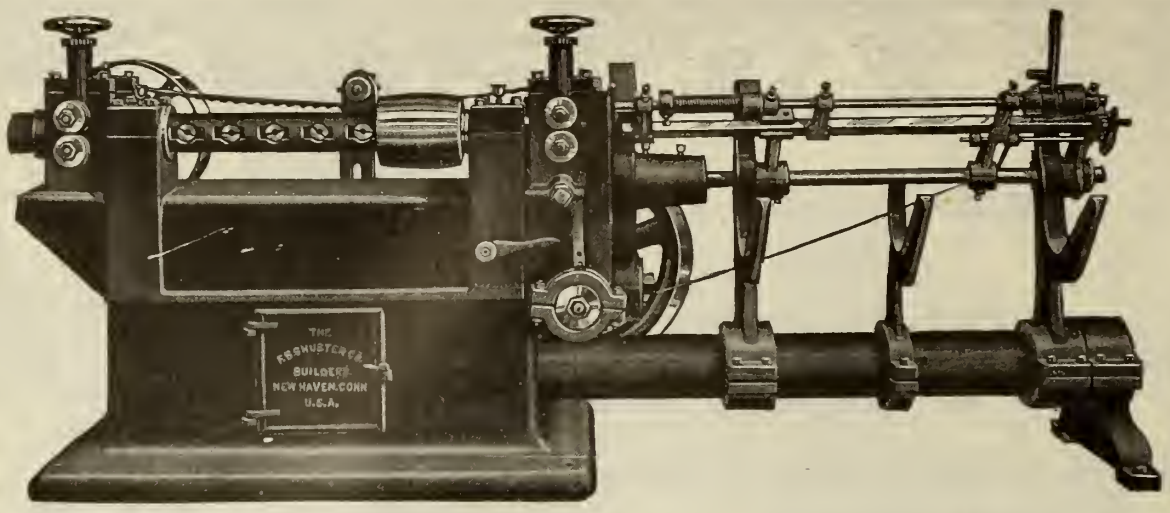


Perfect Wire Straightening Quickly and Profitably Done on Our

Automatic Wire Straightening and Cutting Machine

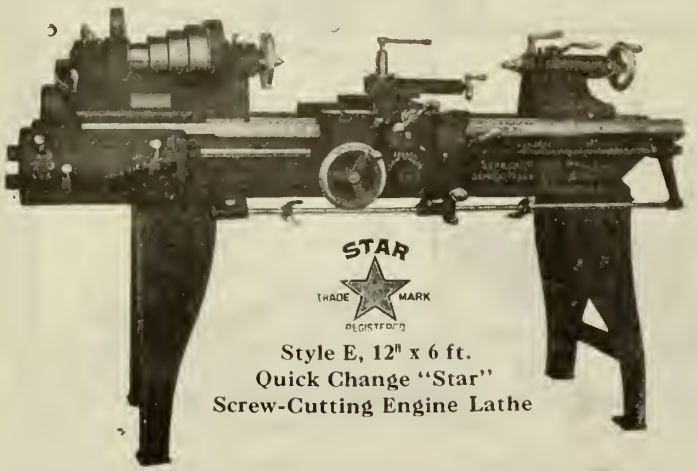
Just put your coil of wire on the reel, adjust the rolls and dies, and set the gauge for the length you want. The machine does the rest—thousands of feet per day, perfectly straight and cut to accurate lengths.

Catalogue tells more about them, and we will be glad to send you a copy.

THE F. B. SHUSTER CO., New Haven, Conn.

FORMERLY JOHN ADT & SON ESTABLISHED 1886

ALSO MAKERS OF STRAIGHTENERS FOR SQUARES, HEXAGONS, FLATS, ETC.



Style E, 12" x 6 ft.
Quick Change "Star"
Screw-Cutting Engine Lathe

The Micrometer Cross-Feed Stop Is a Valuable Asset

The Micrometer Cross-Feed Stop is a device which gives a positive stop as soon as the desired depth of a cut is reached.

This stop is invaluable for all kinds of inside and outside work. **It saves** time because it eliminates guessing at the depth of the cuts. **It saves** making several cuts to obtain a desired dimension. **It saves** stopping the lathe to caliper the work. And, **it insures uniformity in making duplicate parts.**

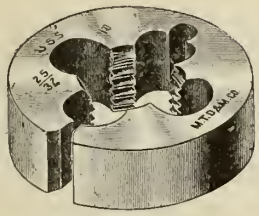
The depth of cut can not be varied by crowding the machine. The stop is positive and may be used in conjunction with tape-attachment.

Other features of "Star" Lathes will be found in the "Star" catalog. A copy will be sent you upon request.

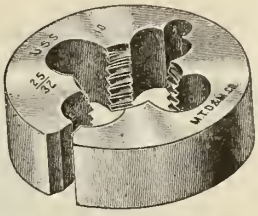
The Seneca Falls Mfg. Co., Inc.

366 W. Falls St., Seneca Falls, N.Y.

If it's Thread Cutting Production You Want



"MORSE" DIES



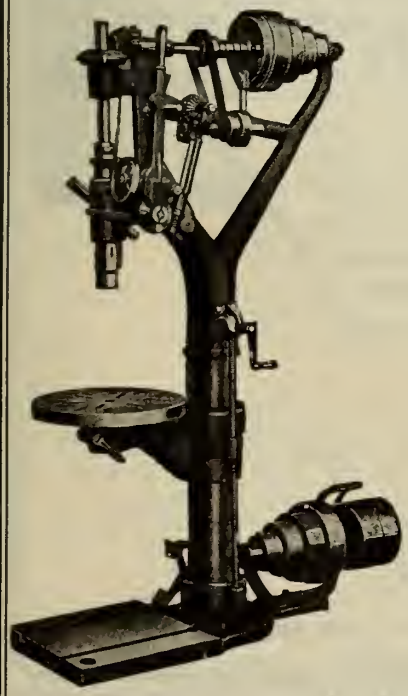
WILL GIVE IT

Carefully made of Tough Material, they stay right on the Job Cutting Clean and Accurately. They are furnished in either solid or adjustable types.

MORSE TWIST DRILL & MACHINE CO.

NEW BEDFORD, MASS., U. S. A.

Silver Drills



Simplicity, Convenience and Strength mark every feature

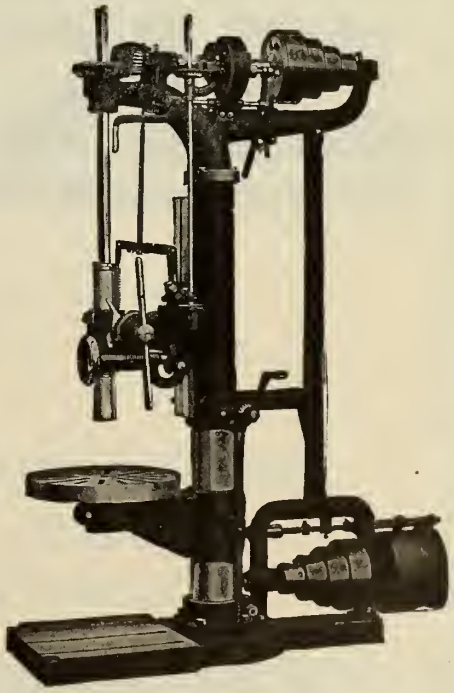
—and these factors are essential in a drill intended for economical work, for the speedy production of high grade parts where accuracy and finish are important. Silver Drills rigidly retain their accuracy under the heaviest and fastest work. The result is fewer rejects and broken tools.

—20-in. drills in four styles—plain lever feed, lever and wheel feed, power feed, automatic stop, back gearing. Singly, or in gangs of 2, 3 or 4.

—25-in. drills with eight spindle speeds and six positive geared feeds.

—Compact, Efficient, Economical.

New catalogue containing detailed information on request.



The Silver Mfg. Co.

290 Broadway, Salem, Ohio

Manufacturers also of the Silver Radials

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Canada's Chief Industrial Need

Canada's chief industrial need at present is not only increased production—but increased QUALITY in its increased production. It is vital not only in our domestic markets, but also in the world's markets overseas where need of goods has flung the gates open for a time but only QUALITY of goods can prop the gates open for all time.

To the manufacturer seeking to increase both the quality and quantity of production, S K F's foresight in organizing a scientific research for the study of bearing application and design is of value, we believe. For it enables the manufacturer to place his bearing problems in the hands of this technical staff with the assurance that a sincere attempt will be made to solve them.

This scientific, specialized engineering service is offered not only to those manufacturers who have already accepted the bearings produced by S K F as the highest type of anti-friction device, but to all others who recognize both the individual's and the nation's need of higher quality in our increased production.

CANADIAN SKF COMPANY, Limited
TORONTO AND MONTREAL

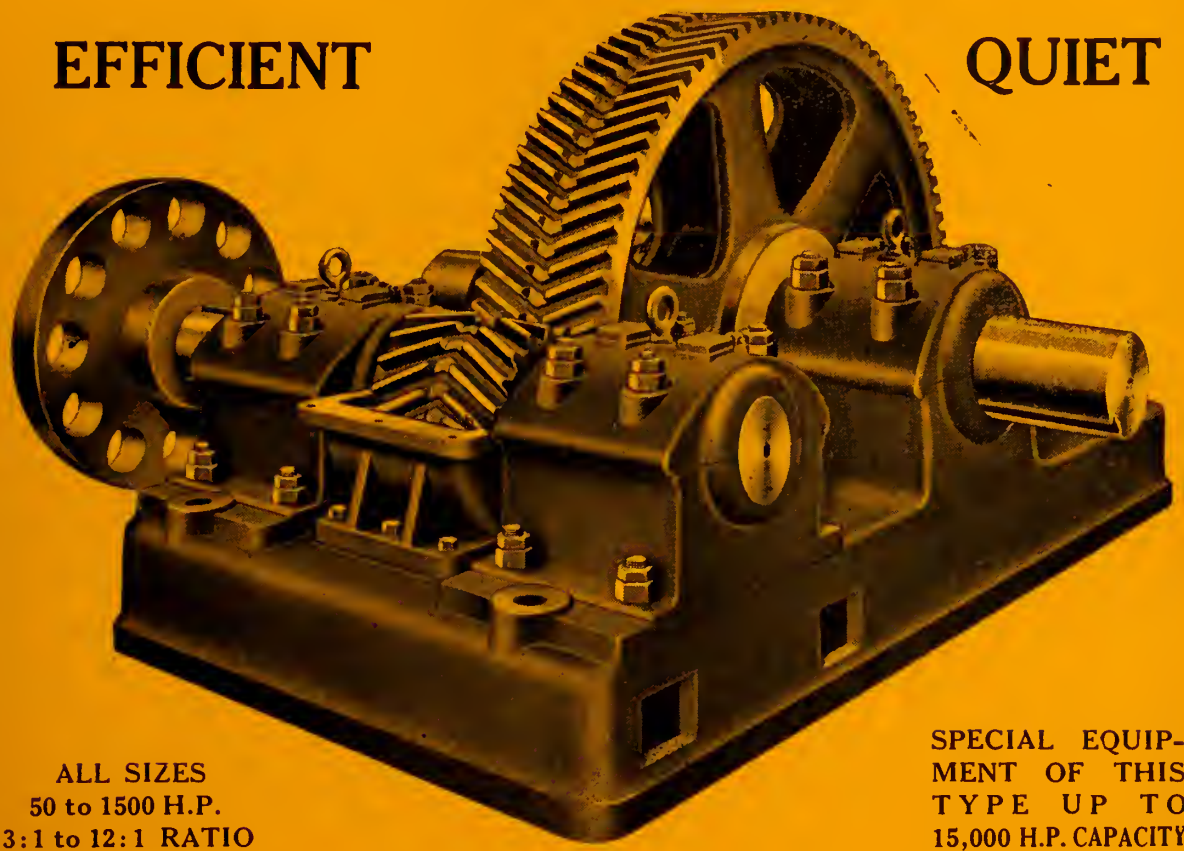
SKF INDUSTRIES

Hess-Bright Ball Bearings
S K F Ball Bearings
Atlas Steel Balls
Gronkvist Chucks
Transmission Hangers

The SKF Research Laboratories where friction problems are solved.

DOMINION
HERRINGBONE GEARS

EFFICIENT QUIET



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50 to 1500 H.P.
3:1 to 12:1 RATIO

SPECIAL EQUIPMENT OF THIS TYPE UP TO 15,000 H.P. CAPACITY

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SMALL DRIVES FOR RUBBER MILLS, RUBBER CALENDERS AND SUGAR MILLS, Etc.

Manufactured by

THE DOMINION STEEL PRODUCTS COMPANY, LIMITED
BRANTFORD CANADA

FAWCUS MACHINE COMPANY
PITTSBURGH, PA.

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ANNOUNCEMENT

JOHN H. HALL & SONS, LIMITED, largest manufacturers of pipe threading machinery in Canada, will hereafter be known as the HALL PLANT of the WILLIAMS TOOL CORPORATION OF CANADA, LIMITED.

¶ A merger has been made with the Williams Tool Corporation of Erie, Pa., largest manufacturers of pipe threading machinery in America.

¶ The amalgamation of the United States and Canadian Companies establishes the new Company as the largest exclusive manufacturers of pipe threading machinery in the world, with resources and facilities unequalled by any organization in the industry.

¶ All of the desirable features and patents of both the Canadian and American machines will now be embodied in the product of the Hall Plant, which, as in the past, will supply the needs of the trade in Canada and the British Dominions.

¶ With the enlarged resources and facilities which the amalgamation makes available, an adequate production is assured to keep machinery houses and agencies supplied in new machines, repair parts and dies. Dies will also be carried in stock at convenient distributing points to obviate delay in deliveries and cut down transportation charges.

¶ Several new and distinctive departments are being inaugurated which will be immense value both to the machinery house and the trade in general. An advertising campaign is being created to reach the manufacturer, the plumber and the steamfitter, and instructive and educational literature will be supplied for the use of the mechanic or man on the machine.

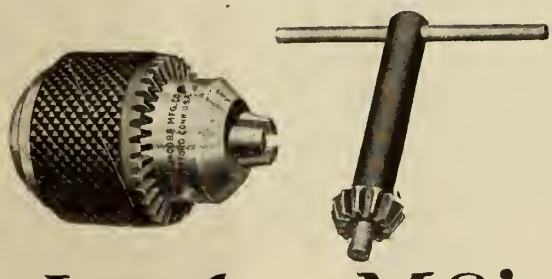
¶ All in all we propose rendering a complete service in the industry which will work for the mutual benefit of all concerned.

¶ All of the active members of John H. Hall & Sons, Limited, are continuing in various executive capacities with the new Corporation and thanks are extended, both individually and collectively, to their many friends and patrons for business courtesies and support in the past, and with the earnest hope that these same pleasant relations will be continued in the future.

¶ Announcements of further developments and plans will be made from time to time through the usual channels. Information will be supplied those particularly interested upon request.

Jacobs Chucks

The use of a product in ever widening circles is incontrovertible evidence in favor of the quality of both product and service. The increasing demand for Jacobs Chucks is a case in point.



The Jacobs Mfg. Co.

Hartford ~ Connecticut.

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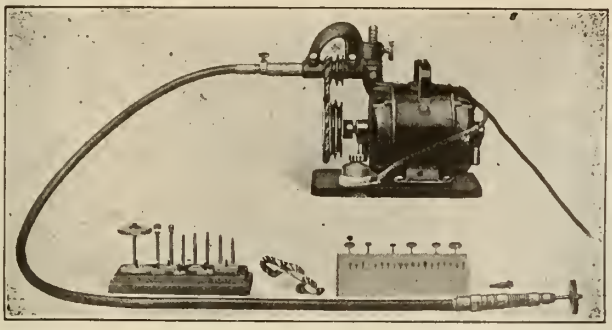
HASKINS



Type MH-4

DIE SINKING EQUIPMENTS

This equipment is especially designed for use in Die Sinking and Tool Work, and is being successfully used in many of the up-to-date plants engaged in this class of work.

The complete set of points and mandrels, as well as the special handpiece, allowing close and accurate work, make it the most complete and efficient equipment obtainable for this work.

Complete information on this and other HASKINS Labor Saving Machines may be obtained without obligation on your part, by writing to-day to:

R. G. HASKINS COMPANY

Manufacturers and Distributors of Portable Machinery

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Representatives for Eastern Canada:
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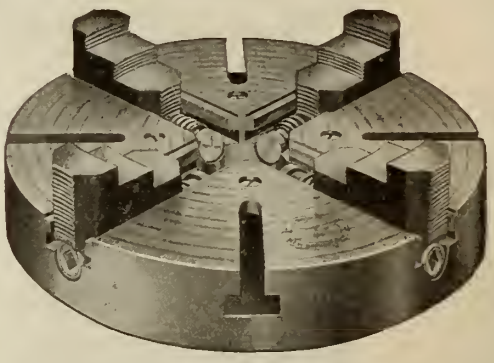
ALL STEEL

INDEPENDENT CHUCKS

are not an experiment—they have come to stay. They are a necessity with the modern machinery and high-speed steel cutting tools.



THE UNION STEEL BODY CHUCKS

are well designed and have all the elements of strength and durability for which they are designed. We make other types in steel also, including the Geared Scroll Chucks and the Geared Scroll Combination—all designed for heavy work and hard usage.

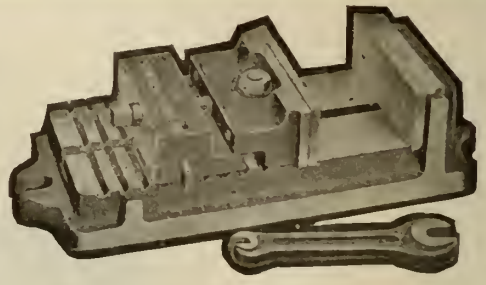
UNION MANUFACTURING COMPANY

New Britain, Conn.

New York Office: 26 Cortlandt Street

Makers of a complete line of chucks

SKINNER DRILL PRESS VISES



Designed for holding either straight or taper work this vise is portable, convenient and durable.

It is truly THE HANDY TOOL.

It may be bolted to a drill, planer, miller or shaper by the ears at both ends, clamped as desired by the flange or used at right angles.

THE SKINNER CHUCK COMPANY

NEW BRITAIN, CONN.

New York Office: 94 Reade St.
San Francisco Office: Rialto Bldg.
London Office: 139 Queen Victoria St., London, E. C. 4.

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Die-Cast parts come to you in clean and accurate shape, ready to assemble. Think of the time and labor saved. Send us samples or blue prints of your work for estimates. Quick service—we are the largest makers of Die-Castings in Canada.

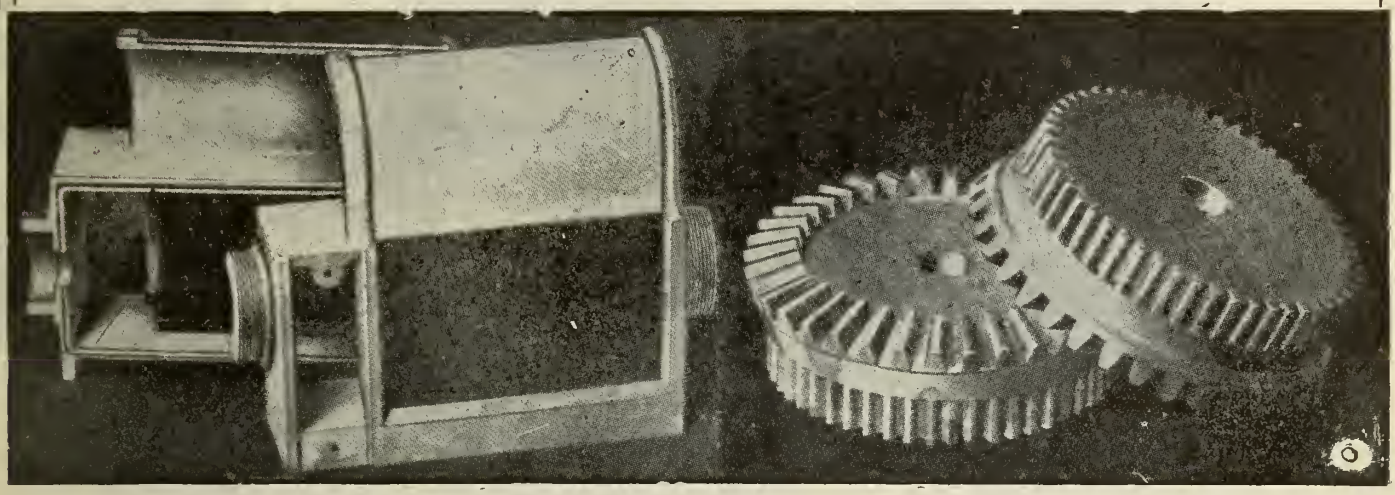
The Fisher Motor Co., Limited

Orillia, Ontario

Die-Casting Chat No. 14

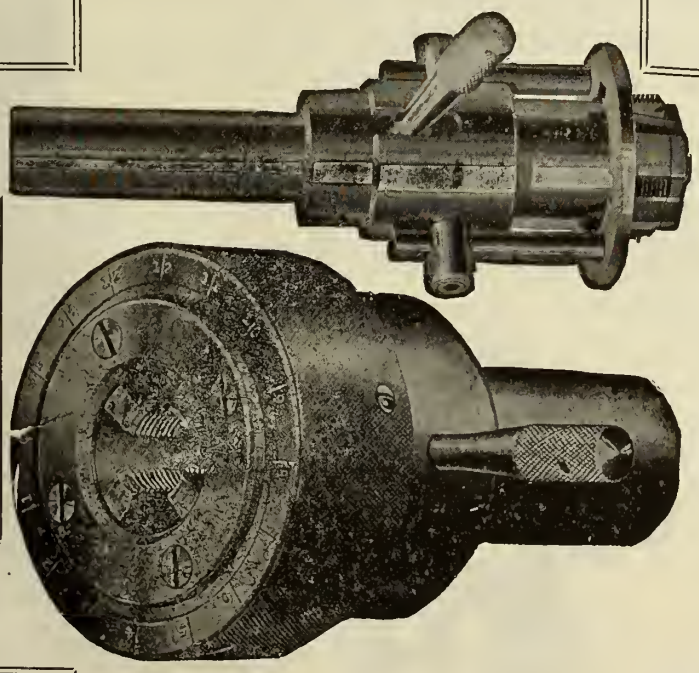
One feature about die-casting that should always be remembered is their accuracy. This feature is always assured as the construction of the die and the principle of die-casting guarantees this point.

Complicated shapes such as shown lend themselves very readily to the die-casting process. Cores are always the same, and gear teeth always correct as to pitch, depth, etc.



MAXIMUM Production

MINIMUM Cost



Murchey Taps and Dies last longer, do better and quicker work than ordinary tools.

Every tool that comes out of the Murchey shop is the very best that years of experience can make.

Murchey Tools will cut your tapping and threading costs and will boost production 50 per cent.

Send for a Murchey Tap and Die on approval and give it a trial. You will then secure actual proof of its value to you.

MURCHEY

Machine and Tool Company

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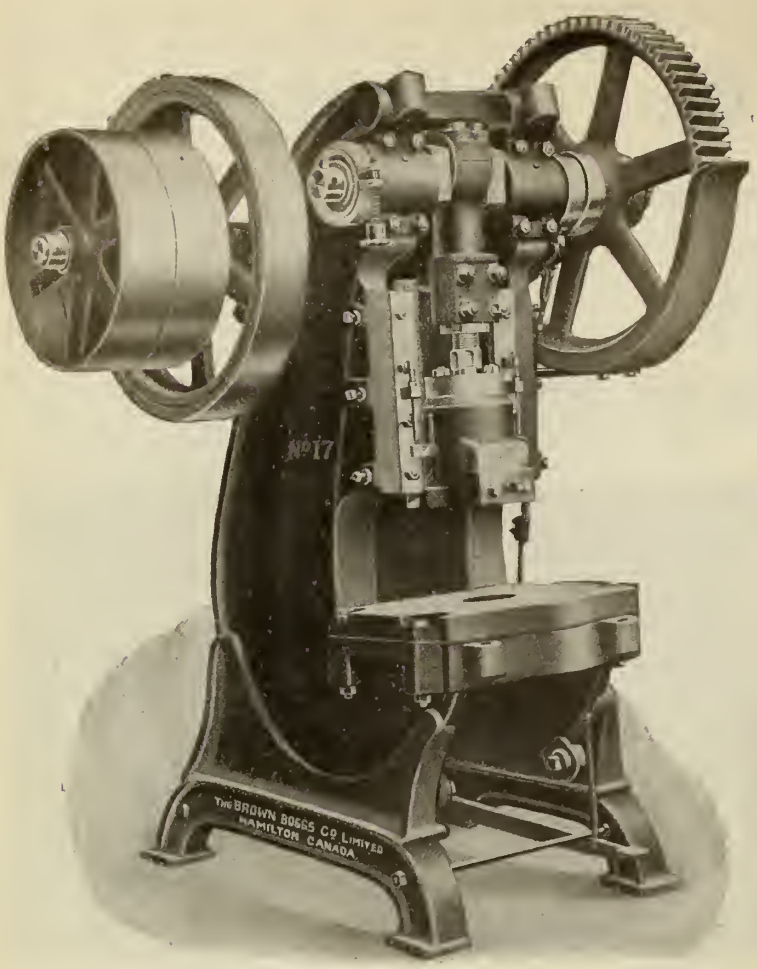
Bro Sheet

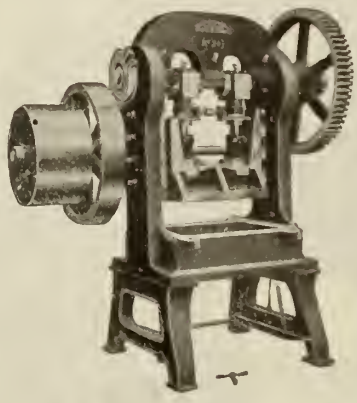


No. 17—Geared Inclinable Press.

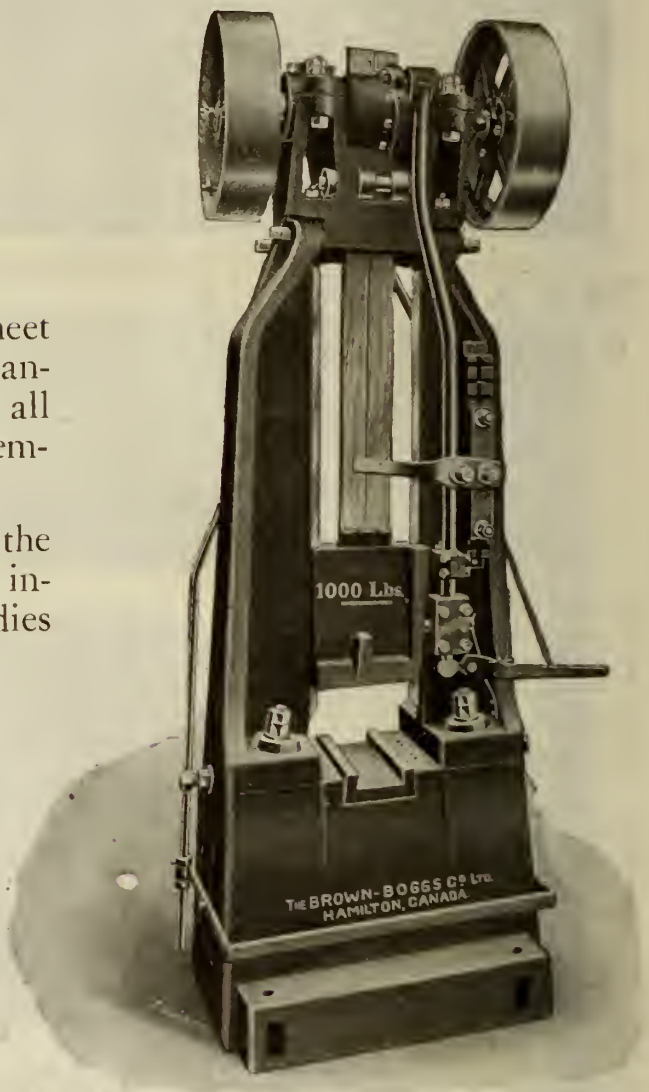
The "B-B" line comprises tinsmiths' tools and sheet metal working machines of every description; canners' and evaporators' machinery, shears of all kinds, power presses for punching, forming, embossing, blanking, etc.

We have recently added several new features to the design of our Inclinable Power Presses which increase their efficiency and add to the life of the dies used in them.

No. 126—Deep Throat Power Punch.



No. 20½—Power Press.



1,000 lb. Board Lift Drop Hammer.

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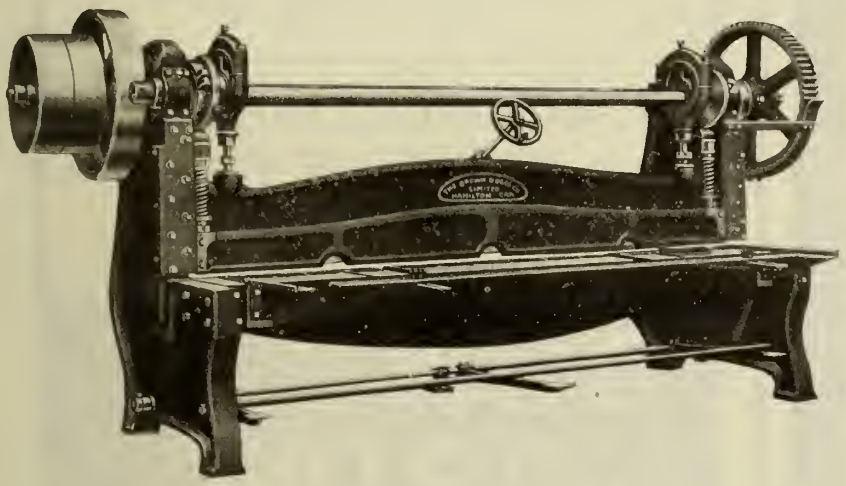
Metal Workers' Tools



No. 956—Square Shear.

No. 36—Ring and Circular Shear.

No. 404—Shear.

"B-B" Quality and Service pave the way to economical production. Years of manufacture and exhaustive experiment have resulted in many improvements of the various designs of "B-B" products. Every article is manufactured with great care by thoroughly competent workmen and finally undergoes a most rigid factory test.

These are the reasons why Brown-Boggs goods are reliable!

Export trade given prompt and efficient service.

The Brown-Boggs Co., Ltd.

Hamilton -:- Canada

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For bold heavy lines
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Plain Ends, per doz...$1.50
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American Lead Pencil Co.
238 Fifth Avenue, New York
Factory: Hoboken, U.S.A.
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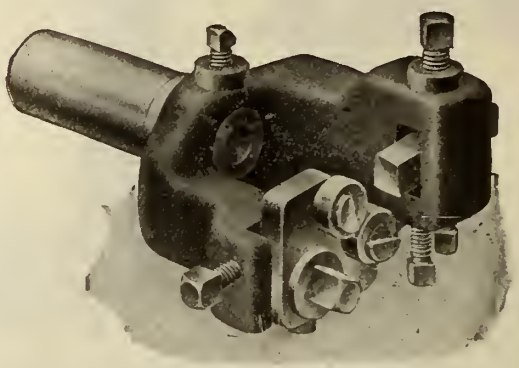
The largest selling **Quality** pencil in the world.

TURRET-LATHE
TOOLS & HOLDERS



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J. ACKWORTHIE LTD.
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ACCURACY ASSURED

You can always depend upon Dunbar Springs being accurate. Before proceeding with any order the first few springs are carefully tested and checked up for this very purpose.

Seventy-two years' experience making flat and spiral springs of every description enables us to furnish you with springs of the highest quality, that can be depended upon under all conditions.

Send blue prints for estimates.

The Dunbar Brothers Co.
BRISTOL, CONN.

HOLD TITE NUT LOCK

See How Easily Applied

Knowing the size Bolt—use same size Nut Lock. Place over Bolt—as shown above.

Screw another Nut onto Nut Lock and Depress it — as shown above.

Remove Second Nut and Nut Lock will Look — as shown above.

The Hold Tite Nut Lock cannot come loose when it is compressed into the thread of the Bolt. Compressing will not destroy the thread.

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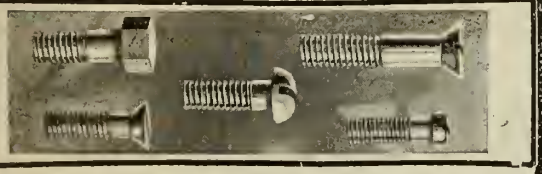
Wood Screw Making Machinery

SEND FOR CATALOGUE
Series B6



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Cable address: "Cook,"
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Asa S. Cook Co.
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MESTA MACHINE COMPANY
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Pumps for Pulp and Paper Mills, Pumping Engines for Municipal purposes, Centrifugal Pumps. Secure the advice of our engineering staff; no obligation incurred.

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The engineer who is menaced with a "Sea of Troubles" due to poor babbitts can unlock the door to satisfaction by using the Canada Metal line, which includes a babbitt metal for every purpose.

Special attention is drawn to "Harris Heavy Pressure." Here you have the key to good all-round babbitt service. It is known as "The Babbitt Metal Without a Fault," and answers perfectly for general machinery purposes in almost every case. Remains cool at any speed. Has easy flow, malleability, toughness, durability and anti-friction qualities.

Harris "Heavy Pressure," has on the upper side a profile of Mr. W. G. Harris, Esq., president and founder of the Canada Metal Company, who is recognized as Canada's greatest authority on White Metal Alloys. His experience and genius are reflected in all Canada Metal products.

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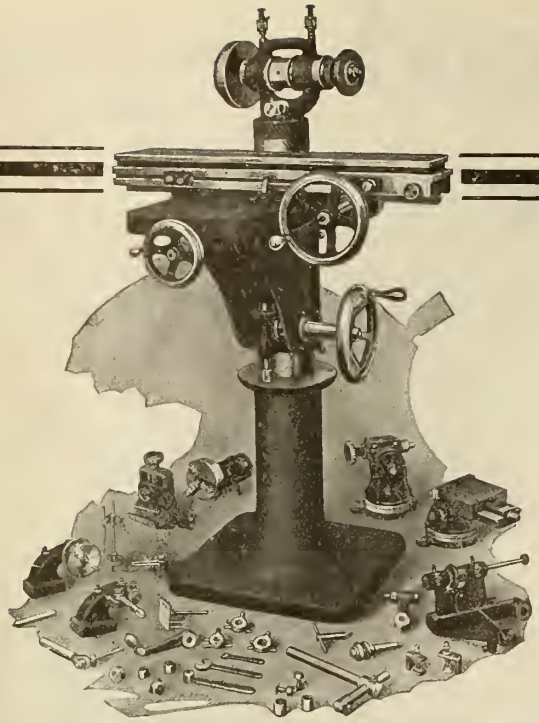
We have large stocks of
LEAD PIPE, SHEET LEAD, SOLDER AND ALL
INGOT METALS
and can make prompt shipment from all our factories

The Canada Metal Company, Limited
TORONTO, CANADA

HAMILTON WINNIPEG MONTREAL VANCOUVER



21 Different Set-Ups With a Greenfield

Universal Grinder

There is practically no job within the capacity of the machine that cannot be ground on the Greenfield. It is adapted for twenty-one set-ups—grinds straight, taper and rose reamers; flutes of taps, tapered arbors, flat keys, gauges, flat bar work, slitting saws, small internal work, countersinks and counterbores; spur, bevel, spiral, formed and end milling cutters; angular, small end gears, convex and inserted tooth cutters.

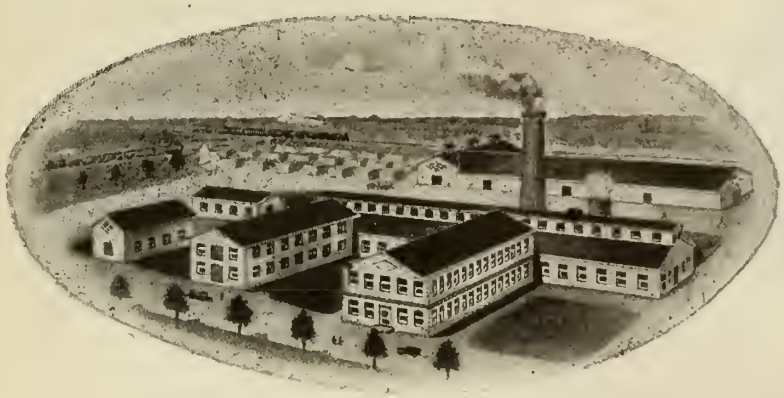
That is not all; combined with its unusual adaptability the Greenfield is of strong durable construction; has improved bronze taper bearings for spindle which eliminates vibration; is without complicated parts; accurate to the last degree and is economical. May we send you a complete description?

The new Greenfield head is made from a solid casting and embodies a rigid arch construction. There's room for a Greenfield in your shop and you can't afford to be without it.

Greenfield Machine Co.

GREENFIELD MASS. U. S. A.

"BERNARD"
TRANSMISSION APPLIANCES



have achieved an enviable reputation in the Industrial World. Their performance under every conceivable working test has proved their dependability, and they are the most economical because of their durability.
We stand back of our products and will give dealers every assistance.

Put them to the test.

The A. Bernard Industrial Co.

Manufacturers of High-Grade Power Transmission Appliances

Offices and Works: FORTIERVILLE, Que., Canada

Thor

ELECTRIC DRILLS

Universal motor for direct or alternating current, 110-220 volts. (Licensed under Buche Universal Motor Patent.)

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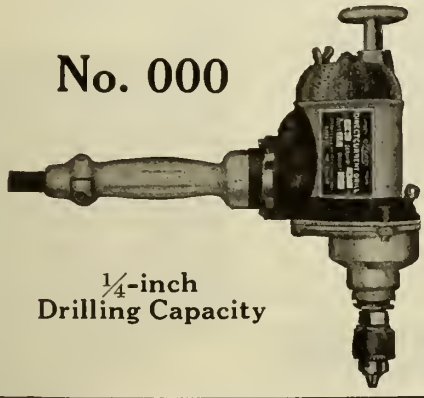

¼-inch Drilling Capacity

No. 00

5/16-inch Drilling Capacity

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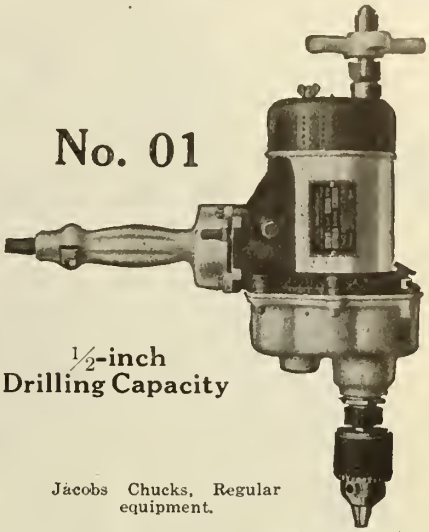


½-inch Drilling Capacity

Jacobs Chucks, Regular equipment.

Points of Superiority:

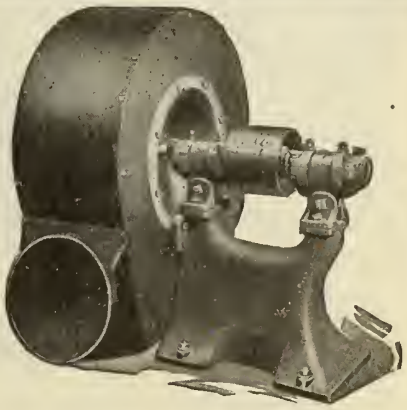
Light weight—The internal gear driver permits the use of smaller gears and gear case—3 teeth in contact instead of one.
Small and compact—Due to the distributed pole motor construction and small gear and gear case.
Most Powerful—The method of winding the field and armature, and the use of ball and roller bearings result in greater power.
Extreme Durability — Interlocking commutator bars; fully tapped and insulated coils; large brushes; and perfect automatic brush holders insure long life.
Highest Efficiency — Results from the unique motor construction and elimination of all friction.
Safety — The Thor switch breaks both sides of the line, leaving no current in the drill when idle. It would be impossible to make a switch insuring greater safety.

These features are used in Thor Electric Tools exclusively, and will not be found in any other make. Their compact construction, neat design and high grade finish is unsurpassed.

INDEPENDENT PNEUMATIC TOOL COMPANY
334 St. James St., MONTREAL

TORONTO, 32 Front Street West WINNIPEG, 123 Bannatyne Ave. East
VANCOUVER, 1142 Homer Street

"CANADIAN" MILL EXHAUSTERS



Handle Any Material

The Canadian Standard Mill Exhauster will handle and kind of material efficiently—sawdust, shavings, cotton lint, or stringy material, gases, fumes, smoke, etc.

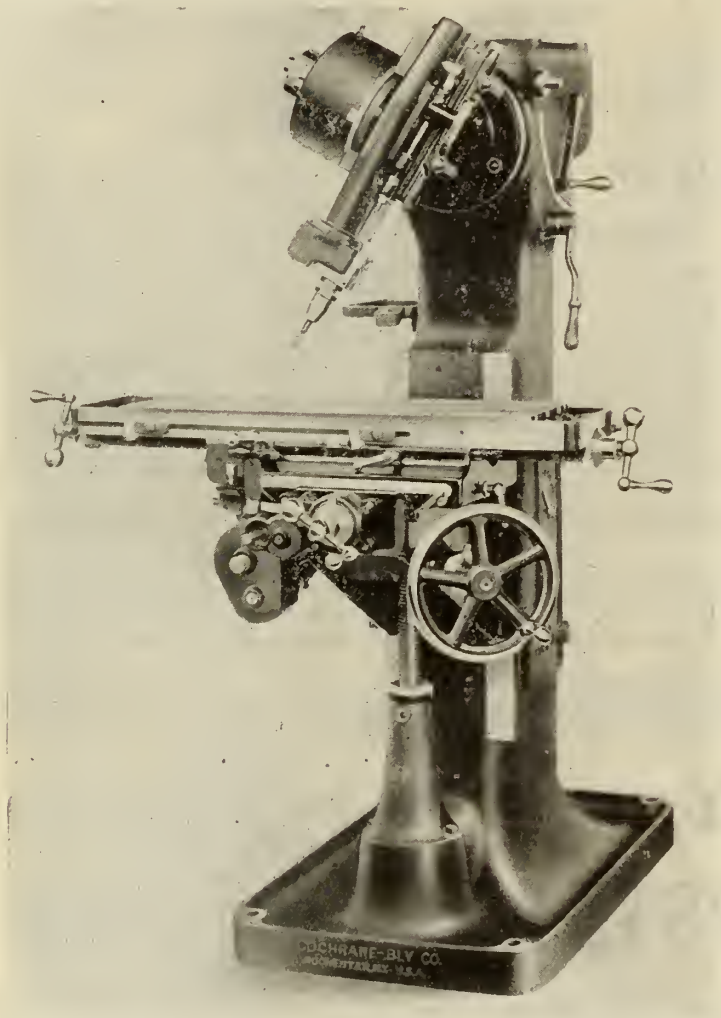
They are adjustable to any angle of discharge instantly—have universal type of wheel and carefully constructed self-aligning oil-ring bearings.

Catalog 410-77—gives technical data and prices. Write for a copy.

Canadian Blower & Forge Co., Ltd.
KITCHENER, ONT.

If interested, tear out this page and keep with letters to be answered.

Cochrane-Bly No. 14 Universal Vertical Shaper

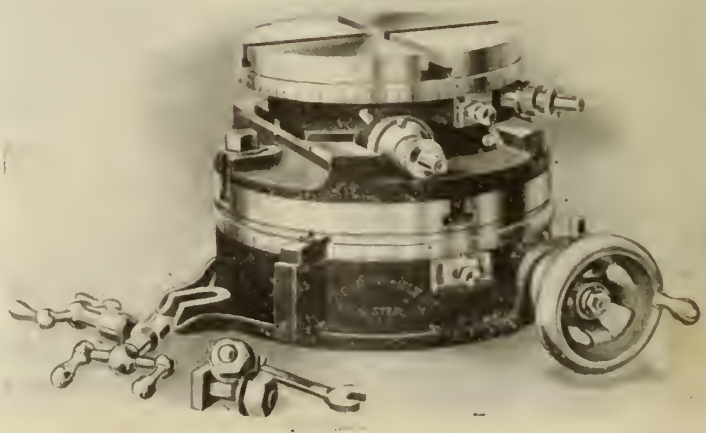


THE Universal Adjustment of the Shaper Head adapts this machine to a wide range of operations on Dies, Molds, Fixtures, Metal Patterns, Cutting Key Ways, Slotting and Planing, at any angle from the Vertical to Horizontal positions.

Stroke adjustable, 0 to 6". Positive automatic relief of tool on return stroke. Tool Head swivel, 360 degrees on Ram. Tables fitted to receive standard B. & S. Vernier and Scales.

The Circular Tables with either Hand or Power Feed and Dividing Attachment make it possible to work out any geometrical form and from any number of centers at one setting of the work.

Catalog on Request



Cochrane-Bly Co.
Rochester, N. Y.

Be Sure of the QUALITY of Your Belting

Quality in the belting you use determines to a great extent the output of your plant. The better the belting the better the output.

J. C. McLaren's products represent a **quality** in belting that is unsurpassed.

They are flexible, gripping, tough—they will carry all the power that any belting can possibly carry, yet wear long and always give good service.

The cost records of scores of plants bear witness to the fact of J. C. McLaren's belting economy and efficiency.

Sixty-four years of successful experience!
Put your belting problems in our hands.

J. C. McLaren Belting Co., Ltd.

Branches at TORONTO, WINNIPEG, CALGARY

Head Office : Park Ave. Extension, Montreal, P.Q.

If interested tear out this page and place with letters to be answered

Announcing

the issuance of a new catalog of prime interest to all users of milling and gear cutters and small tools. Herein you will find listed styles and sizes of end mills (special and plain) T-slot cutters. Key cutters, thread mills, gear slots—in fact your needs in the small tool line of this class are sure to be covered. Get your copy and note its completeness.

If your special requirement doesn't appear, Bilton can produce it—and in true Bilton Quality.

Just sign your name and address on a card and post it to

The Bilton Machine Tool Company
Housatonic Ave., Bridgeport, Conn.

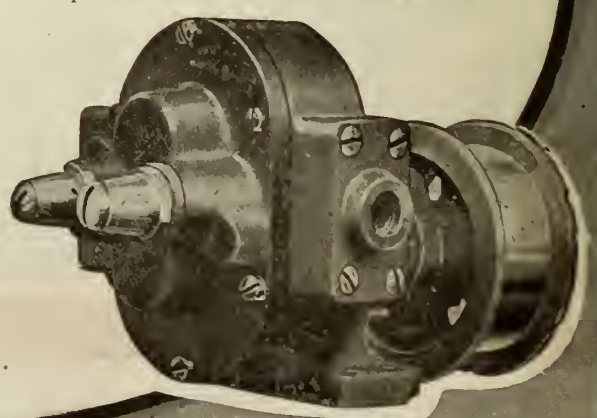
TRAHERN PUMPS

For a Continuous Coolant

Trahern Rotary Geared Pumps solve the coolant problem. They run smoothly, shoot copious, non-pulsating streams of coolant while running at low speed, and will operate if necessary against one hundred pounds pressure. Will pump either water, oil or compound. Liquid leaves discharge opening in a forceful stream which easily reaches deepest cuts and bores.

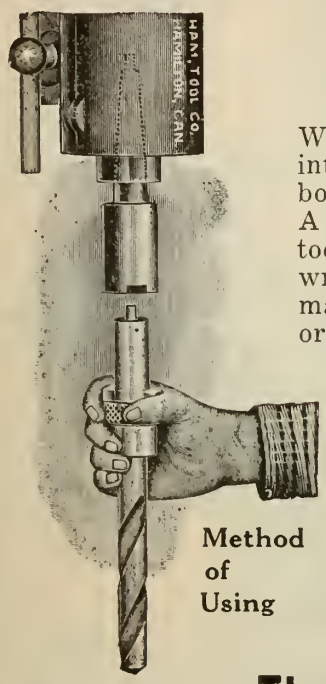
Tell us what your requirements are and let us send a sample pump for trial in your own plant.

You are the judge; may we hear from you?



TRAHERN PUMP DIV.
Geo. D. Roper Corp.
ROCKFORD, ILLINOIS
U. S. A.

THE BEAVER CHUCK AND COLLET



Method of Using

New Time-Saving Tool

With the Beaver Chuck and Collet you can interchange your Drills, Reamers, counterbores, etc., without stopping the machine. A self-contained device releases Collet and tool instantly, requiring neither hammer, wrench, nor key to operate. The change is made easily with one hand—nothing to catch or shock the operator.

The Beaver Chuck and Collet is simple in construction and positive in operation. Made of high grade tool steel throughout. It practically converts a Single Spindle Machine into a multiple Spindle Machine with as many tools as you may have operations in any piece of work.

Consider the time you can save with the Beaver Chuck and Collet! Write for full particulars.

The Hamilton Tool Co., Limited, Hamilton, Ont.

FORD TRIBLOC
"PAT. '09"
The Ford Loop Hand Chain Guide is a patented feature of the FORD TRIBLOC.
It permits operation of the hoist from any angle.
PAT.09

RELIABLE—

The FORD TRIBLOC is *reliable.* It is built in capacities from one-quarter to twenty tons. It requires little attention. It stands up outdoors or in, through rough handling. Planetary steel gears in a dust-proof housing, drop-forged steel hooks, and high test steel chain prevent accident.

The FORD Loop Hand Chain Guide is a patented feature of the FORD TRIBLOC. It is an endless malleable iron loop, having fixed guiding strips which lie adjacent to the flanges at the lower half of the hand wheel. No matter from what angle the hoist may be operated, this Loop Hand Chain guide prevents all "gagging" or over-riding of the hand wheel flange.

The FORD CATALOG tells the story and gives yau facts. It will be sent you just as soon as we receive your name and address. A postal will do.

2170-D

FORD CHAIN BLOCK CO.
2ND & DIAMOND STREETS PHILADELPHIA, PA.

OVER-SEAS REPRESENTATIVE
ALMACOA ALLIED MACHINERY COMPANY OF AMERICA ALMACOA
51 CHAMBERS ST. NEW YORK, U.S.A.

PARIS BRUSSELS TURIN BARCELONA RIO DE JANEIRO

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Meeting A Demand—

Not Making a Market for Larger-Capacity Automatics

The latest ACMES, in sizes 3 in. and 4 in., are offered not as an experiment—but to meet the logical demand—a demand created by a quarter century's success in building ACME 4-SPINDLE AUTOMATIC SCREW MACHINES in smaller capacities.

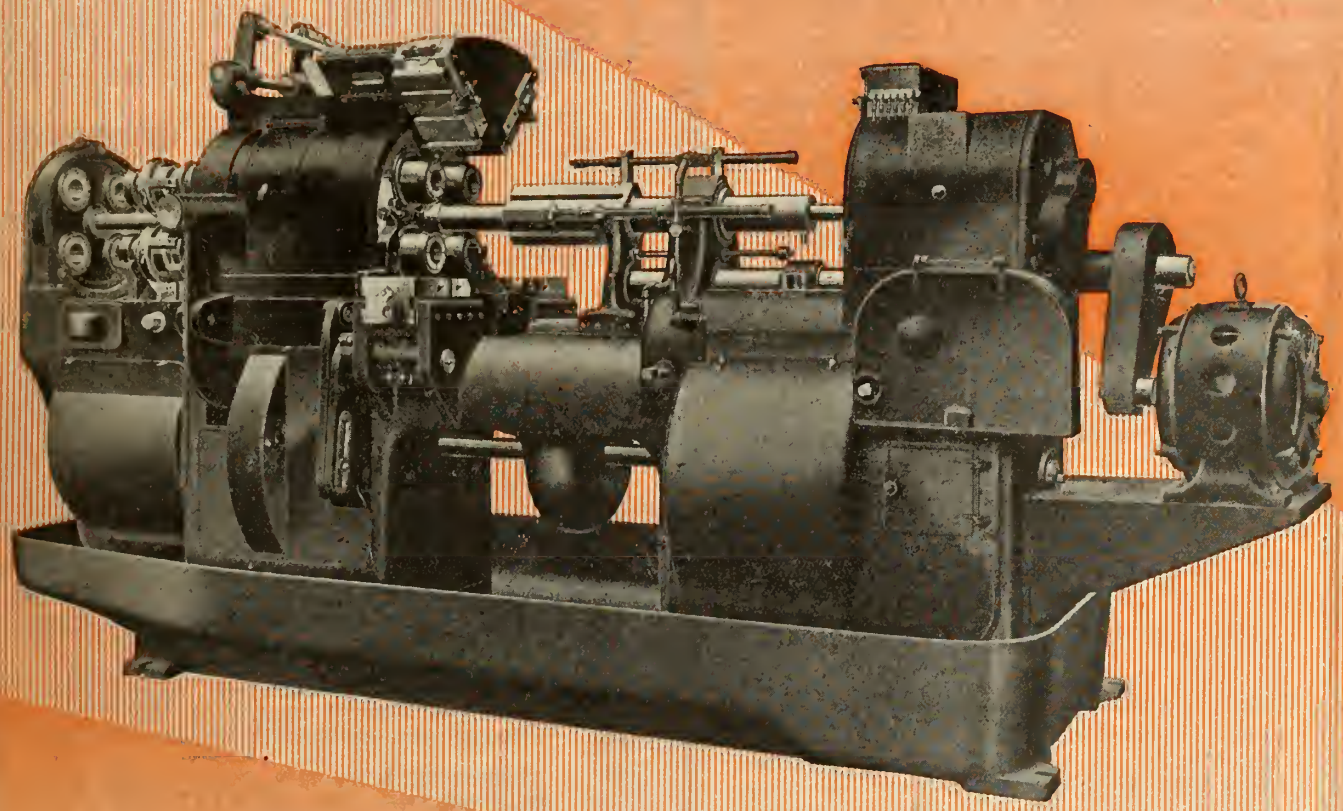
The new sizes embody all the essentials of the smaller Acme Automatics, together with many improved features of construction necessary for such large duplicate part work.

A complete description will be sent you on request.

Maximum Capacity—**4** in.

4" ACME

MULTIPLE SPINDLE AUTOMATIC



THE NATIONAL ACME CO.

New England Plant
Windsor, Vt.

Cleveland, Ohio

Canadian Screw Plant
Montreal, P.Q.

BRANCH OFFICES: NEW YORK BOSTON CHICAGO DETROIT BUFFALO

Warehouses: New York and Chicago

Representatives in Principal Foreign Countries

Makers of Gridley Single and Multiple-Spindle Automatics at Windsor, Vermont; and Acme Automatics, Threading Dies, Collapsing Taps and Screw Machine Products at Cleveland, Ohio

SCREW MACHINE PRODUCTS - MONTREAL, P.Q.

Your Money's Worth

Never again will the Canadian Nation and People be the same careless improvident spenders of "ante bellum" days. "EFFICIENCY" and "GET YOUR MONEY'S WORTH" will be the popular motto and the successful machine shop manager must be able to see the advantage of making one pound of High Speed Tool Steel do the same work as ten pounds in forged tools; in other words he must and will

USE ARMSTRONG TOOL HOLDERS

No heavy "stub-ends" to throw away. No time lost with men at the grinder while lathes stand idle. No stock of heavy sizes of steel to carry, and the blacksmith as a tool-dresser is eliminated entirely.

Armstrong Tools are great favorites with the men— a good thing to consider from a production standpoint.

Our Catalogue is of handy pocket size and will be mailed to you upon request

ARMSTRONG BROS. TOOL CO.
"THE TOOL HOLDER PEOPLE"
N. FRANCISCO AVE. CHICAGO, U.S.A.

ELK BRAND FIRE BRICK

Each Brand Has Some Particular Qualification

No one brand is best for all purposes but each is best on the kind of work for which it is intended. Certain places produce certain conditions. A particular brand has the qualifications necessary to meet these. We have the particular brand required for your work. Write us fully and we will tell you which it is.

Large stocks of various shapes carried in warehouse in Hamilton.

Our Brands
"Elkco"
"Elkco Special"
"Elk Steel"
"St. Marys"
"Keystone"
"M. D. Elk"
"Rotex"
"Elk Ladle"
"Elk Dust"
"Keystone Dust"
"Rotex Dust"

Elk Fire Brick Company
of Canada, Limited

Sun Life Building, HAMILTON, ONTARIO

"CUSHMAN" CHUCKS 1862

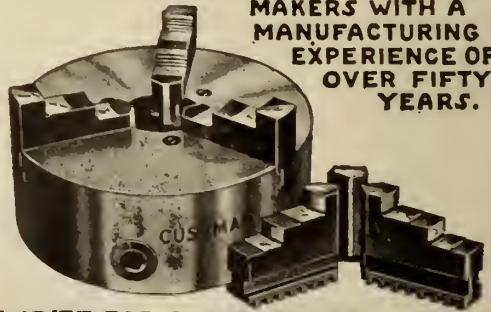
CUSHMAN GEARED SCROLL CHUCKS

PERFECT IN EVERY DETAIL

THE CHUCK THAT WILL CENTER YOUR WORK WITHIN .002 OF AN INCH.

THE APPLICATION OF THE WRENCH ON ANY ONE PINION WILL TIGHTEN OR LOOSEN ALL JAWS WITH EQUAL PRECISION.

GUARANTEED BY THE REPUTATION OF ONE OF THE WORLD'S BEST KNOWN MAKERS WITH A MANUFACTURING EXPERIENCE OF OVER FIFTY YEARS.



WRITE FOR OUR CATALOG.

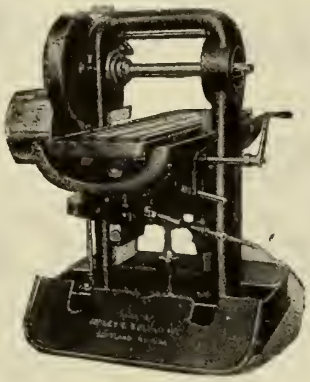
THE CUSHMAN CHUCK CO. HARTFORD, CONN., U.S.A.

If interested, tear out this page and keep with letters to be answered.

BRIGGS MILLERS

Production Tools

Machine tools to-day are judged by their ability to do efficient work, save time, labor and expense. These have ever been the measures by which Briggs Millers have been designed and constructed. That our engineers have succeeded in meeting these requirements is evidenced by the increasing popularity of Briggs Millers.



No matter what the nature of the work or how severe the service the Briggs Miller will stand up to it. Its unusual rigidity, great strength and ability to take wide deep cuts when running at a high rate of speed, has established a wide reputation that is unexcelled. We would like to show how "B r i g g s" adaptability and convenience can increase output and lower costs for you. A letter will bring full details by return mail.

Gooley & Edlund, Inc.

CORTLAND, N.Y.

Canadian Representatives:
Garlock-Walker Machinery Company, Ltd., Toronto
Williams & Wilson, Ltd., Montreal

Some Day You Will Use These

When you want a steel stamp that gives longer service, makes cleaner, clearer, deeper impressions—a steel stamp on which the characters are clear and distinct and made to stand severe strain—then, you will buy Matthews Steel Stamps.

Our catalog tells a lot about these serviceable stamps. Write now for it!

JAS. H. MATTHEWS & CO.

1723 Forbes Field, Pittsburgh, Pa., U.S.A.

Diamond-F
1 Discs, Speedometer Gears Clutch Linings, Inner Rings
2 Truck Insulation
3 Wire Manifolds etc.
5 Gears, Washers, Gaskets
4 Bobbins, Roving Cans, Trucks, Mill Boxes, & Baskets etc.
6 Bushings, Switch Handles Insulations etc.
7 Waste Baskets etc.
8 Trunk Fibre, Cases etc.
FIBRE

Diamond-F

Diamond Fibre is a super-material that combines great strength with light weight (lighter than aluminum). It is dense, tough and hard; high in dielectric, compression, shearing and tensile strength—does not splinter, split, crack or break.

Diamond Fibre is absolutely free from grit and all foreign matter and therefore takes extreme machining with but little wear on edge tools. It can be sawed, bored, drilled, stamped, turned, tapped, threaded, milled, punched, bent or worked into almost any conceivable form.

Superior to metal, rubber, porcelain, wood and leather for a great variety of purposes. Made in sheets, rods, tubes and special parts machined to your specifications.

Prices, samples and complete information upon request.

Dept. C

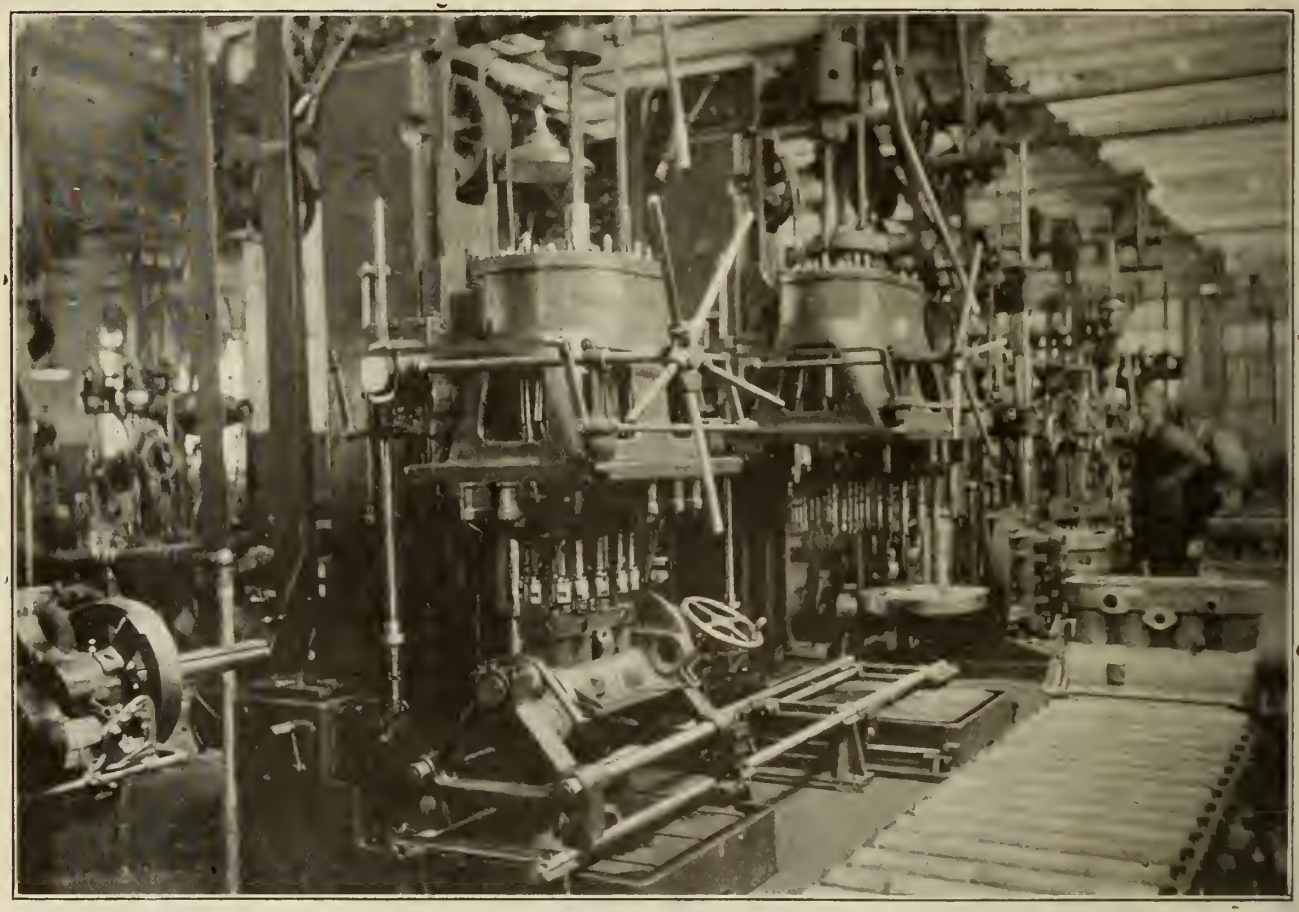
Diamond State Fibre Company of Canada, Ltd.

455 King Street West
Toronto - Canada

Multi-Drillers NATCO Multi-Tappers

The "Hole" Story in One Word

In the Plant of
The Willys-Overland Company
TORONTO, CANADA



The National Automatic Tool

NATCO Foreign Agents: Burton, Griffiths & Co., British Isles
Allied Machinery Co. of America, Italy, Spain, Portugal, Switzerland

Multi-Drillers NATCO Multi-Tappers

The "Hole" Story in One Word

NATCO service is already too well known to require comment. But let us refer to the photograph on the opposite page.

This photograph was taken in the plant of the Willys-Overland Company and depicts two NATCO Machines.

In this case the operation is that of tapping 38 holes in cylinder blocks of Overland motors. One machine taps 14 holes in top of cylinder, when the work is revolved 180°, is rolled along the rails to the second machine and 24 holes are tapped in the top.

The NATCO is the only Multi-Driller on which you can drill large and small holes, perform different operations such as drilling, tapping, reaming, spot facing, counter-boring, etc., simultaneously and still have each size and type of tool running at its correct working speed.

NATCOS are built in eleven standard sizes with a wide range of drilling area and of spindle capacity. We specialize in Multiple Drilling Machinery and would be glad to have you put your drilling problems up to us.

We also design and build jigs and fixtures to be used in connection with NATCO Multi-Drillers.

o., Richmond, Indiana, U.S.A

NATCO Foreign Agents: Isbecque & Co., Belgium
Aux Forges de Vulcain, France Chr. A. Herstad, Norway, Sweden, Denmark

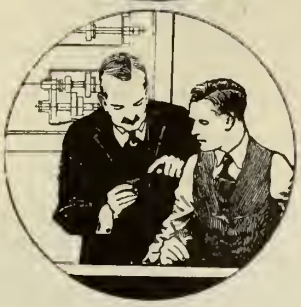
If interested tear out this page and place with letters to be answered

New Method Saves Valuable Hours

To Duplicate Blueprints

Tracing them in the drafting room takes hours — sometimes days — of a highly paid man's time, always with a chance of errors.

The PHOTOSTAT accomplishes the same result in a few minutes at a cost of a few cents and without errors.



To Make Drawings of Small Machine Parts

in the drafting room, costs many dollars and takes hours or days of time.

A PHOTOSTAT copy of a small machine part accomplishes the same result and is made in a few minutes at a cost of a few cents.

To Make Advertising Layouts

By hand for six or a dozen publications requires hours of work by an expensive man.

The PHOTOSTAT quickly duplicates the original layout at the required size and as many times as desired at a cost of a few cents apiece.

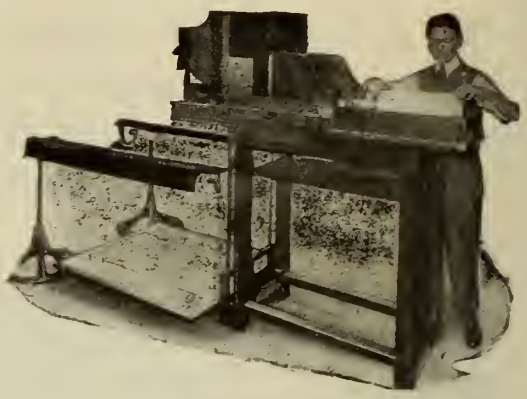
To Copy Catalog Pages

letters, reports, charts, etc., take hours of a stenographer's time. The results cannot be exact duplicates and there are frequent errors.

The PHOTOSTAT produces an exact duplicate, without errors, in a few minutes, at a cost of a few cents.

The PHOTOSTAT

(Trade Mark Registered)



is the Up to Date Method for Doing All This Work

Photographic Copying Machine

Cuts Hours to Minutes
Cuts Dollars to Cents
Makes No Mistakes

"The machine pays for itself in 8 or 9 months, because of its man power savings."

Manufactured by the Eastman Kodak Company Exclusively for

COMMERCIAL CAMERA COMPANY

ROCHESTER, N.Y.

CHICAGO NEW YORK CITY PHILADELPHIA PROVIDENCE
SAN FRANCISCO WASHINGTON

AGENCIES:

Alfred Herbert, Ltd., Coventry, England
Societe Anonyme Alfred Herbert, Paris, France
Societe Anonyme Belge Alfred Herbert, Brussels, Belgium
Graham Bros., Stockholm, Sweden
Societa Anonima Italiana Alfred Herbert, Milano, Italy

THE COWAN TRANSVEYOR SYSTEM — IT REVOLUTIONIZED FACTORY TRANSPORTATION

THEY SAY

Paragraphed pointers from successful users of the lift truck system for erection, movement, storage and shipment.

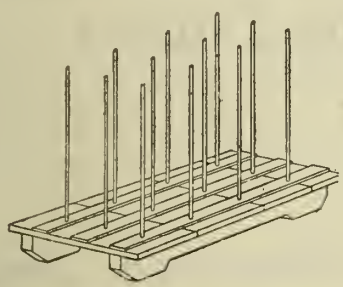
THE DUTCH SURRENDER

Even Holland has it! A safe maker says that they move 1800-lb. safes from plant to paint department—300 ft. It used to take three men two hours. Now one man and a Transveyor make the trip in three minutes. In the tiled-floor painting department a 16-year old boy moves the load.

They declare emphatically that the Cowan Transveyor has great economical advantages—so great that they "hesitate to express in figures" the total saving that they derive from it.

RINGING THE PEGS

When a factory manager says that the Cowan Transveyor System is not adapted to his business, it is usually an indication that he hasn't absorbed the IDEA. At one time small gears, pulleys, rings or phonograph records were not piled high on Transveyor skids because they would not stick on. But now many firms solve the problem by adding upright iron rods to the platforms.



"BACKS UP WORKMEN"

You can get the real facts about trucking from the man who furnishes the motive power. An old workman out in Ohio told a Cowan salesman that the Transveyor had saved more kidneys than old Doctor Doan.

EGGS OR PIANOS

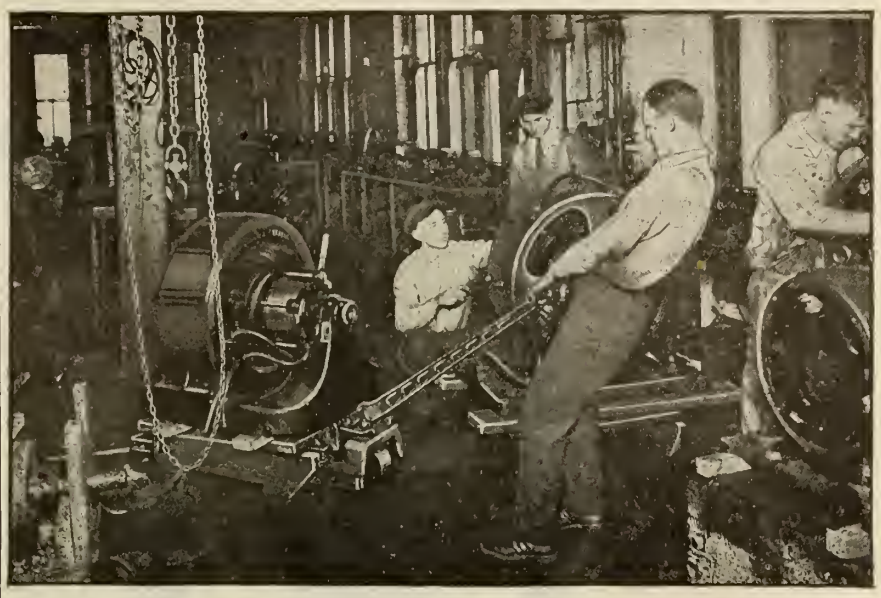
The hydraulic Transveyor release check—without leather packings—lowers a heavy load at a safe and uniform speed—no shock or jar. Window glass, eggs, pianos—all are saved from sudden drop by the hydraulic device.

PEDALING

Notice that the Transveyor release pedal is at the side of the head—down out of the way. Pedals projecting in front of frame head are sure to be damaged sooner or later. This is simply one of the many points that goes to make up the carefully designed and perfectly constructed Transveyor. It's the cheapest in the end, because it doesn't end in the repair shop.

FRUITS OF PERFECTION

It is a California fruit company that in addition to finding the Transveyor entirely suited to their work, assert, "The Transveyors are very free from mechanical defects and accordingly give close to 100% service all of the time."



Machine Erection and Repair on Transveyor Platforms

FROM start to finish the economical machine builder uses TRANSVEYOR platforms as a foundation for all operations.

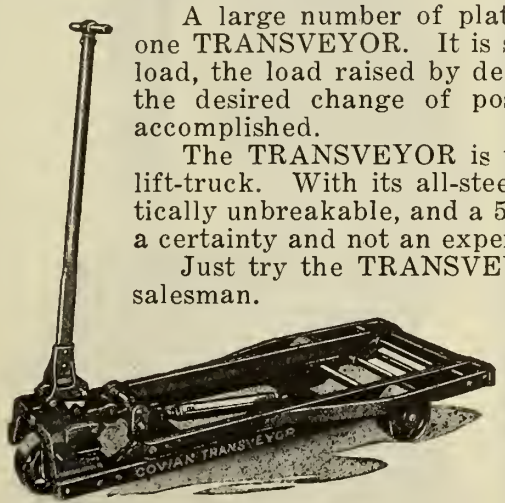
THE COWAN TRANSVEYOR

TRADE MARK REG. U. S. PAT. OFFICE

A large number of platforms can be served by one TRANSVEYOR. It is simply backed under the load, the load raised by depressing the handle, and the desired change of position or location easily accomplished.

The TRANSVEYOR is the pioneer and premier lift-truck. With its all-steel construction it is practically unbreakable, and a 5-year guarantee makes it a certainty and not an experiment.

Just try the TRANSVEYOR. It is its own best salesman.



Cowan Truck Co.

118 Glenholme Ave.

TORONTO, ONT.

COWAN TRUCK CO., 118 Glenholme Ave., Toronto, Ont.

I am interested in reducing the cost and increasing the efficiency of hand trucking. Send a copy of

"HOW TO APPLY THE TRANSVEYOR TO YOUR BUSINESS."

NAME_____

ADDRESS_____

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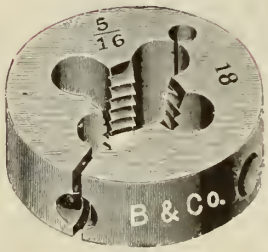
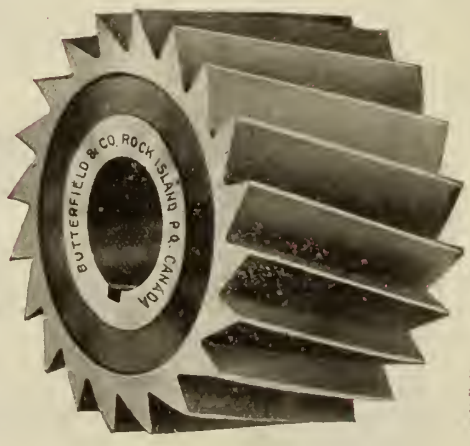
BUTTER

Taps, Dies, Drills, Reamers and Milling Cutters



Butterfield Tools are in widespread use---they are dependable in quality

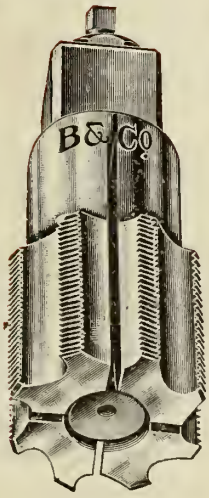


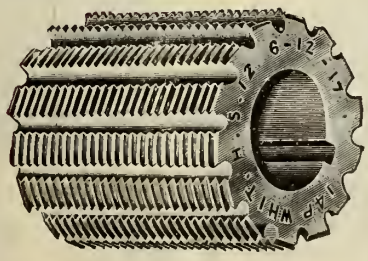
Butterfield &
Union Twist
Rock Island

Foreign Representatives: Great Britain, Geo. H. Alexand
83-84 Coleshill St., London, England; France, Italy, Belgi
and Switzerland, Fenwick, Freres, 8 Rue de Rocroy, Par
Sweden, Norway and Denmark, Ab. Sigfr. Anderson & C
Malmo; Spain, Casamitjana Hermanos, Barcelona; Jap

FIELD

BUTTERFIELD Tools are in use in practically every important industrial centre throughout the world — Great Britain, France, Italy, Belgium, Switzerland, Sweden, Norway, Denmark, Greece, Holland, Japan, Australia, South America, in addition to Canada and United States. *Butterfield* Tools are in widespread demand by virtue of their consistent quality; this quality is assured by elaborate factory tests. Whether the tools be for home use or export, the quality is always maintained. Orders promptly shipped.





Company, Division

Drill Company

Quebec

Abe Kobei & Co., Yokohama; Greece, Stephen C. Stephanon, 11 Lycourgan St., Athens; Netherlands, Wynmalen & Hausman, Rotterdam; Australia, H. R. Richardson, 82 Pitt St., Vickery's Chambers, Sydney: South America, Charles Dreyfus, B. Mitre, 785, Buenos Aires, R.A.

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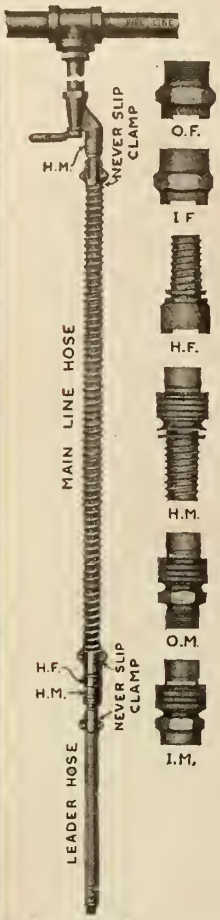

CLEVELAND HOSE SPECIALTIES

Bowes Automatic Air Hose Couplings

Standard Equipment Everywhere

STYLE O.F. is an Outside Thread Female Pipe End. Made in sizes ⅜-inch to 1½-inch.
STYLE I.F. is an inside Thread Female Pipe End. Made in sizes ¼-inch to 1½-inch.
STYLE H.F. is a Female Hose End with spiral shank to insert into the hose and has groove for the Never Slip Hose Clamp. Made in sizes ¼-in. to 1½-in.
STYLE H.M. is a Male Hose End with spiral shank to insert into the hose and has groove for the Never Slip Hose Clamp. Made in sizes ¼-in. to 1½-in.
STYLE O.M. is an Inside Thread Male Pipe End Made in sizes ¼-in. to 1½-in.
STYLE I.M. is an Inside Thread Male Pipe End. Made in sizes ⅜-in. to 1½-in.
The Male and Female Ends of Bowes Couplings interchange in sizes ¼-in. to ¾-in. Sizes 1-in. and 1¼-in. interchange. The 1½-in. ends interchange only with themselves.

BOWES COUPLINGS

Are instantly connected or disconnected.
They are absolutely air-tight under all pressures.
They quickly pay for themselves by stopping costly leaks.
They interchange in sizes most commonly used.
They have no loose parts to be mislaid or lost.
They are made of brass and will not rust.
The U-shaped Gasket interchanges in couplings ¼-inch to ¾-in.

The Cleco Never Slip Hose Clamp

Made in same sizes as Bowes Couplings

The adjoining cut of Cleco Never Slip Hose Clamp shows the "Flanges" which engage the groove provided in all hose ends of Bowes Couplings. The "Model Hose Line" illustrated shows correct styles of couplings and valve to use and proper way to attach the clamps.

CLECO GROOVED HOSE NIPPLE

Grooved Nipples when attached to hose with the wire clamp cannot "blow-out," as one-half of the Wire Clamp lies in Nipple Groove, and the other half on the hose, uniting nipple and hose permanently.

WIRE CLAMP TOOL

To apply Wire Clamps to Grooved Hose Nipples you need the Wire Clamp Tool illustrated, a small hand-operated tool at moderate cost which we carry in stock for immediate delivery. In Stock: Riveting and Chipping Hammers, Four-piston Air Drills, Corner Drills, Emery Grinders, Sand Rammers, Holder Ons, etc.

Use Annealed Wire No. 14

Write for Bulletin 38 illustrating Cleco Hose Fittings, Couplings, Valves, etc.

IMPORTANT:—The Small Leaks in your "AIR LINE" mean serious loss in DOLLARS. Have you any idea of the amount of "Air" wasted in small leaks at your connections? Air Leakage through 1-16 in. opening equals 5.32 cu. ft. per minute at 80 lbs. It will pay you to install Bowes Couplings and stop costly leaks.

Write for Bulletin 34A, 41 and 43.

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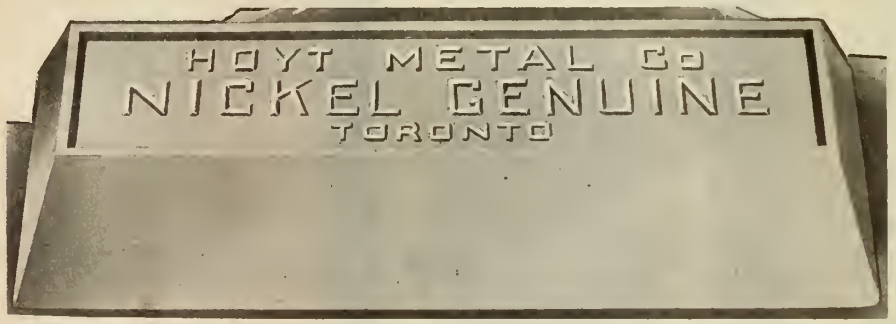
A. R. WILLIAMS MACHINERY CO., TORONTO, 337 Craig St., W., MONTREAL. WILLIAMS & WILSON, MONTREAL



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2

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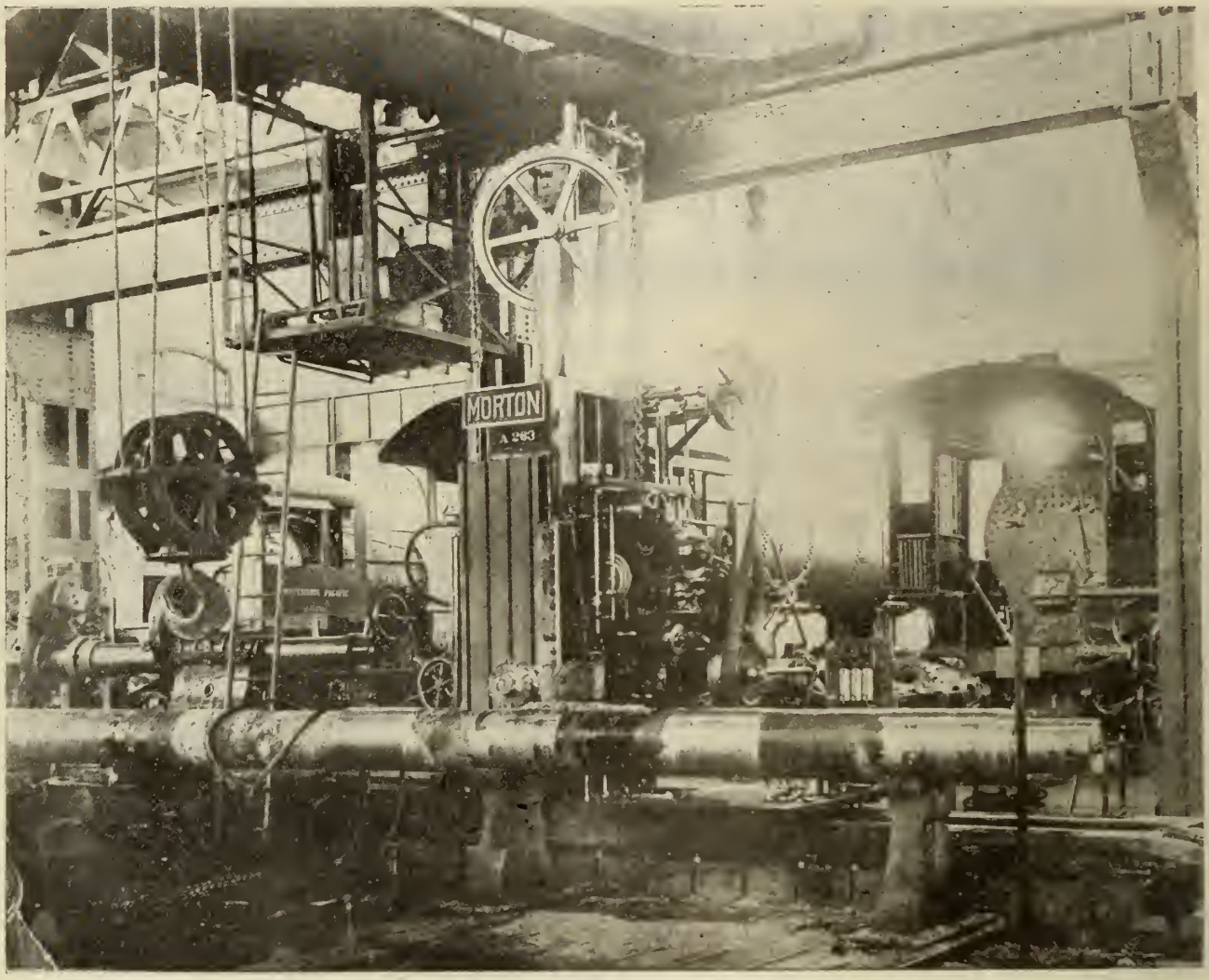

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It's adaptability is practically unlimited: intricate and difficult work, especially on large castings, being accomplished with ease.

The floor space required by a Morton Travelling Head Planer is but one-half that necessary for the ordinary housed planer.

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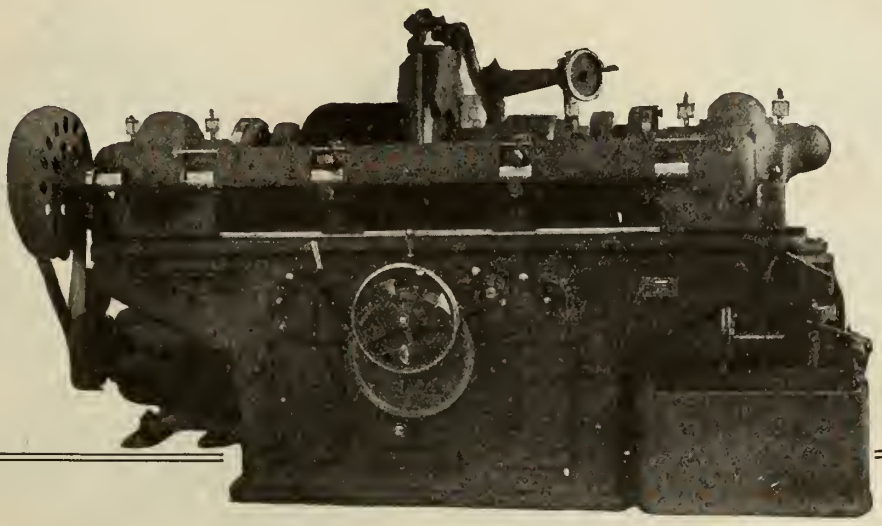

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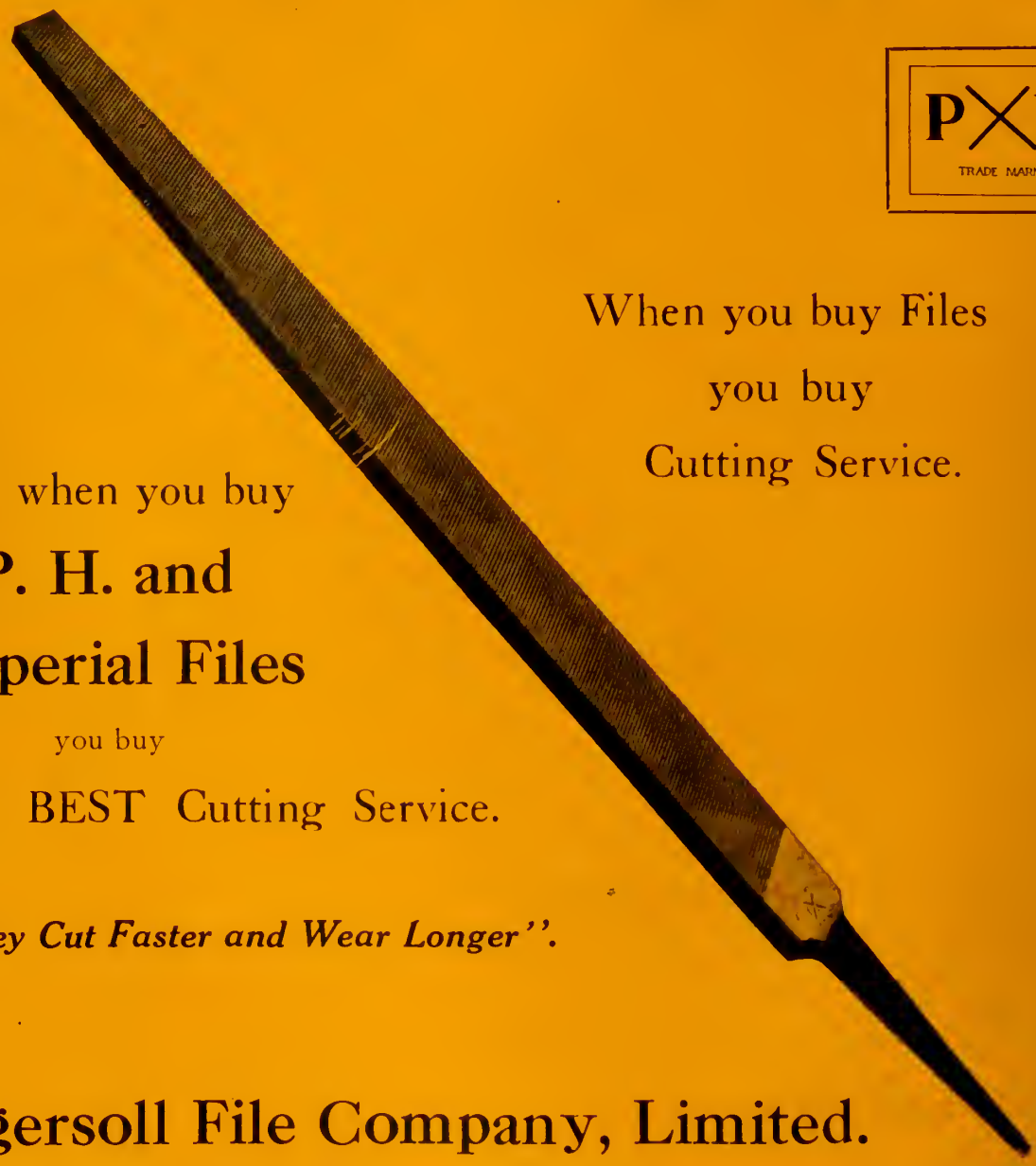

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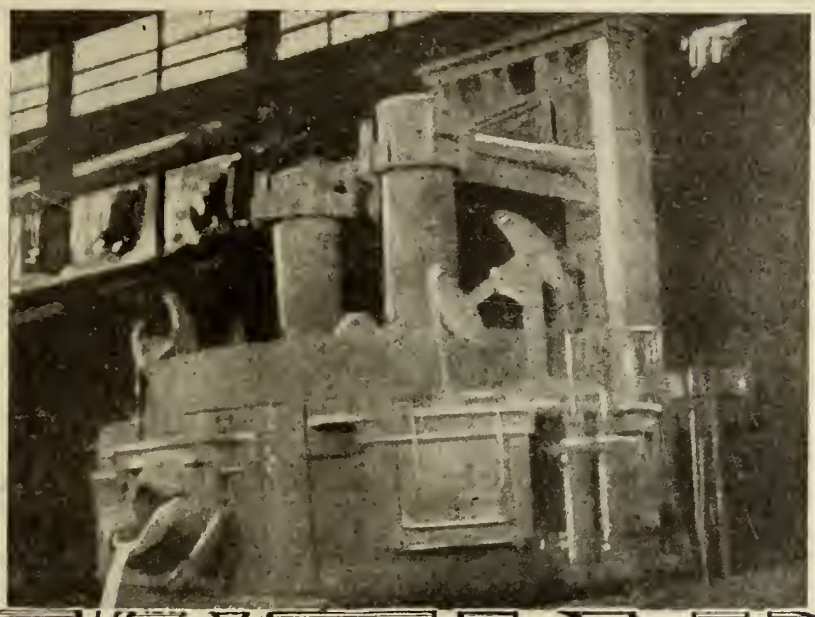

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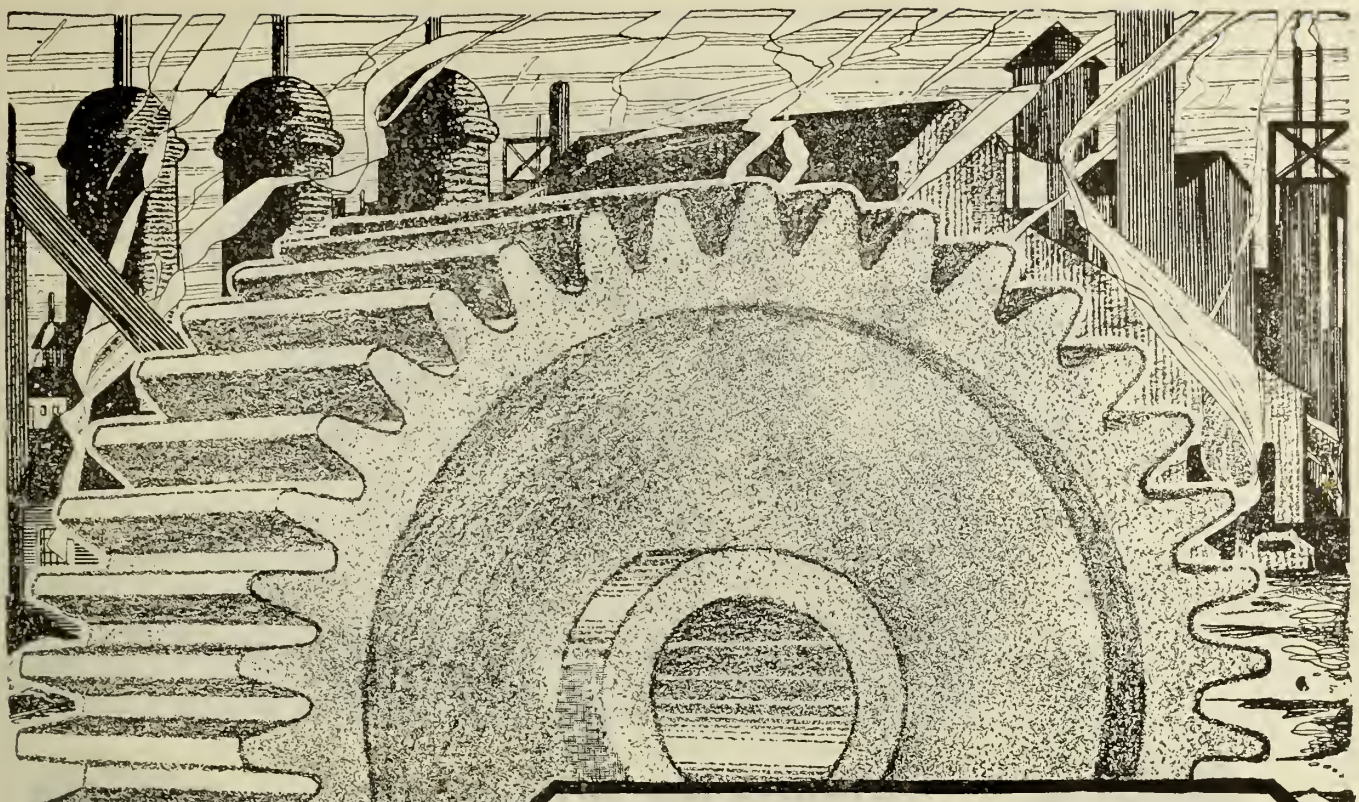

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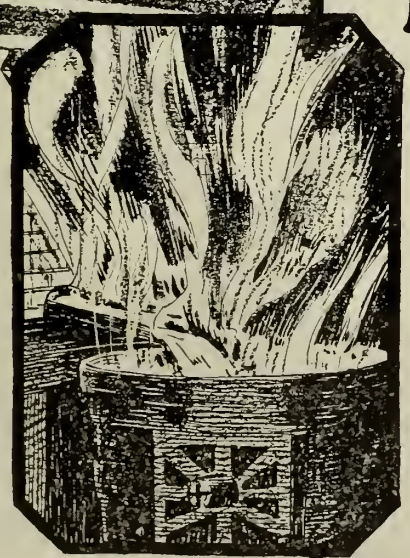

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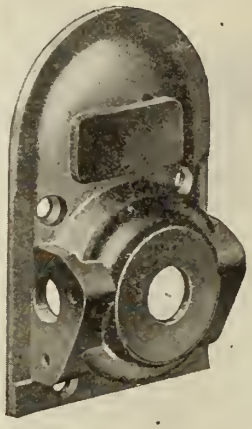
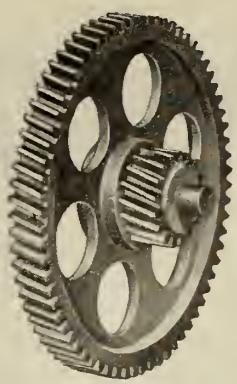
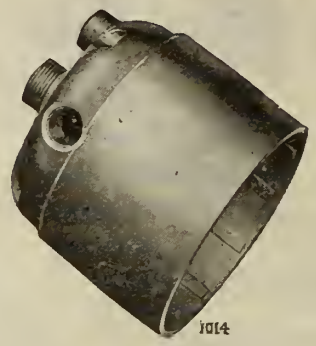
Doehler Service







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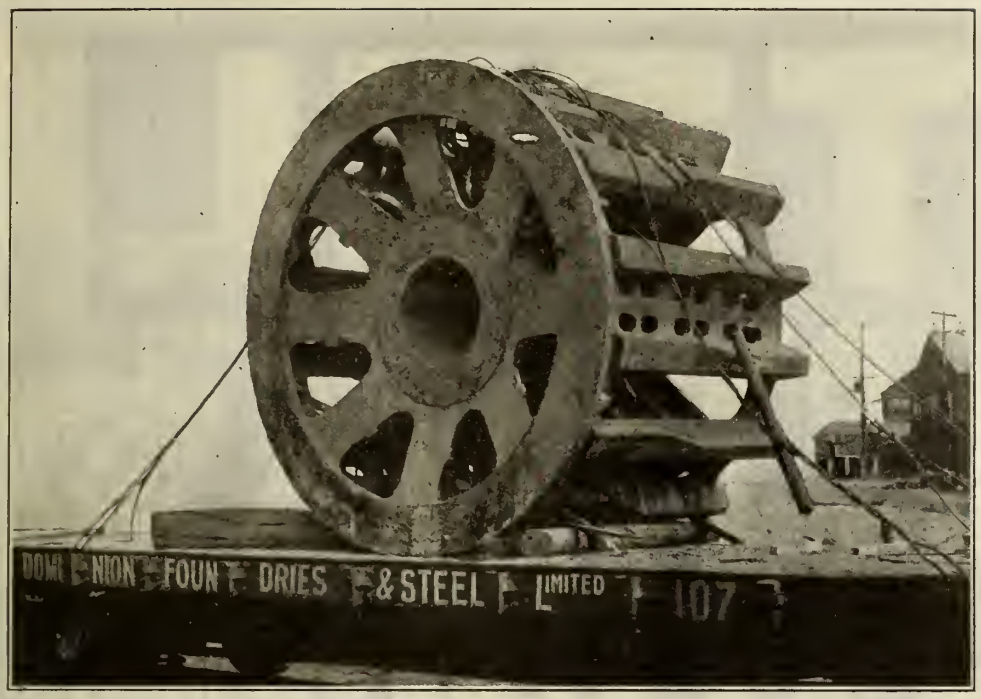

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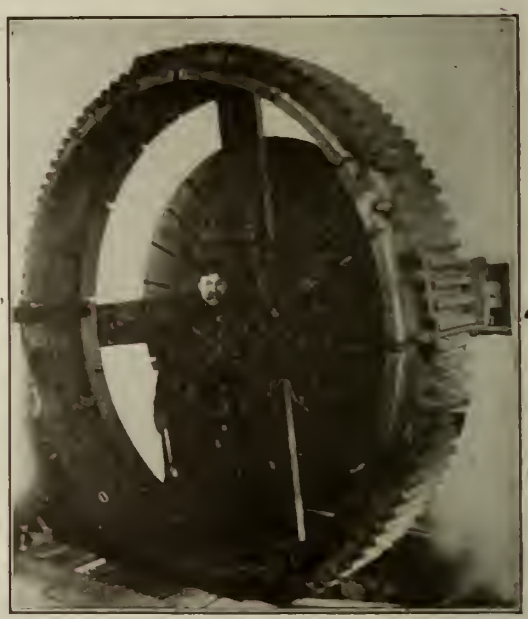

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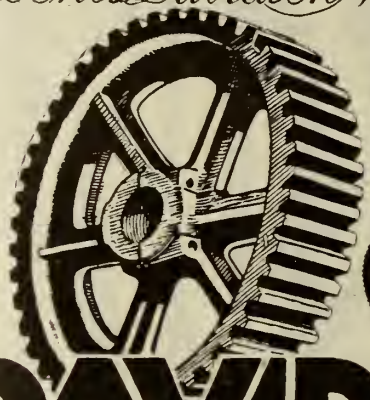

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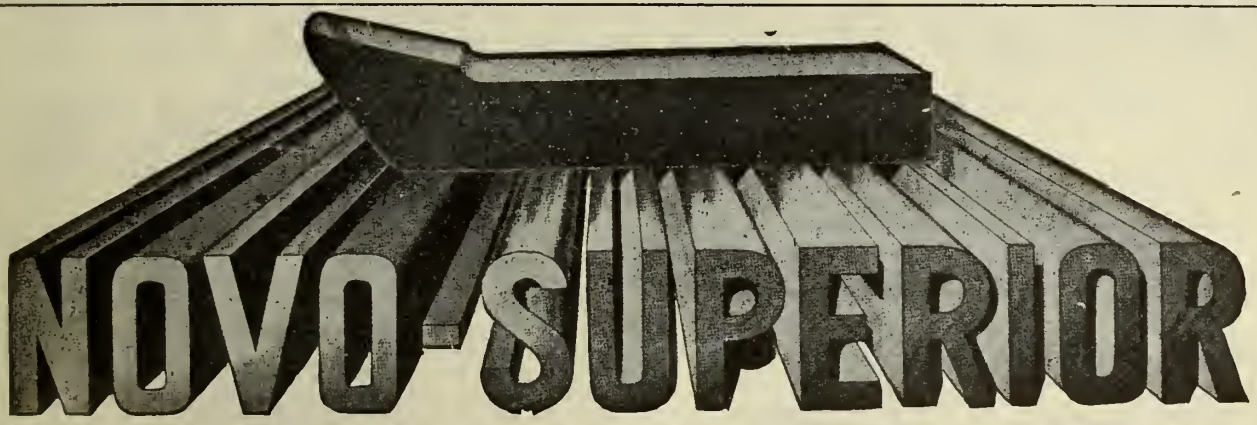

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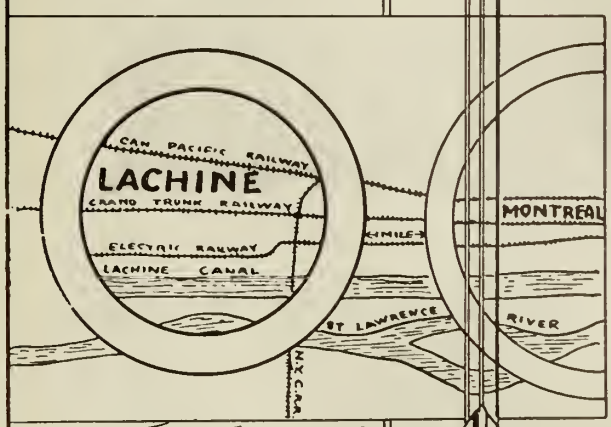
There are a number of excellent industrial sites available that possess both water and rail facilities. Ask about them. The most detailed information given cheerfully on request.



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For more detailed information write

Mr. E. Leduc

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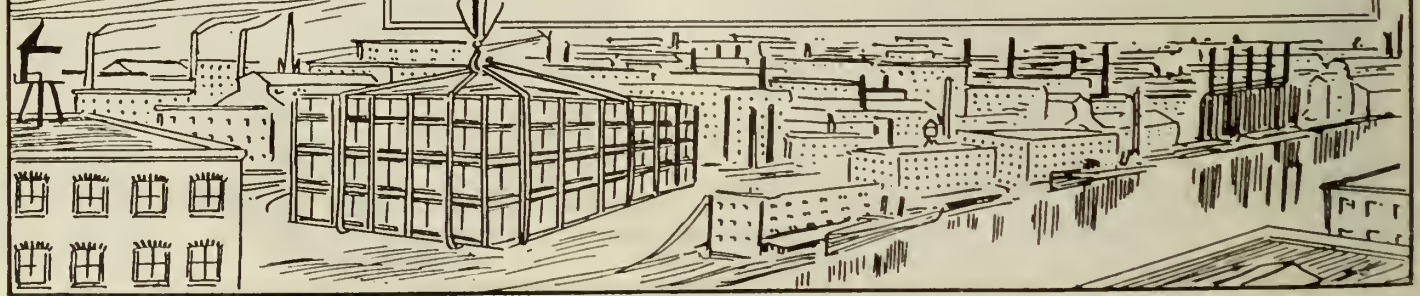

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They cost you less than other grinding wheels because they give service equal to the best imported wheels—and you are not required to pay **duty** or **exchange rates.**

Dominion Quality

We know you have no use for wheels that will not stand up and do high-class work even though they may cost you less to buy. You want **quality** wheels at any cost. When you buy Dominion Wheels you get what you want. In making Dominion Wheels we use abrasives of correct grade and grain from our own furnaces—there is the secret of their success. Why not put them to the test?

Use Dominion "Excelite" wheels for general use and precision work — use "Carbolox" for grey iron,, chilled castings, brass, bronze, etc.

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Equal to the Best

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For Truing Grinding Wheels

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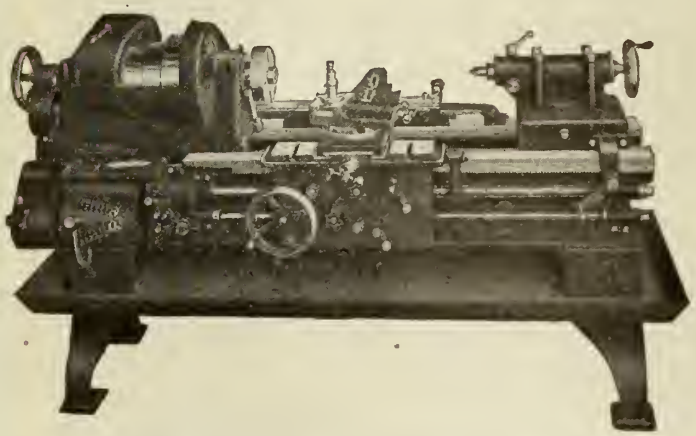
Will Put the Same Degree of Efficiency Into *Your* Shops as They Have in Many Others



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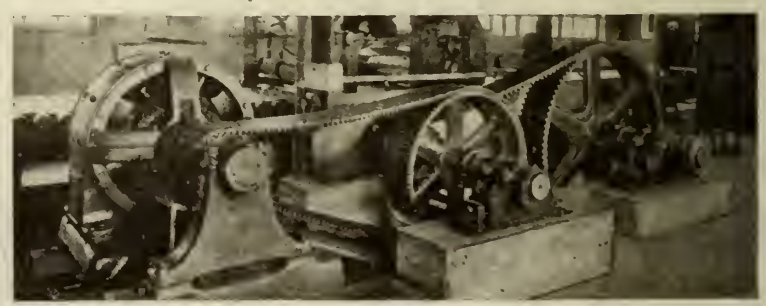
High Speed Silent Chains

Why?

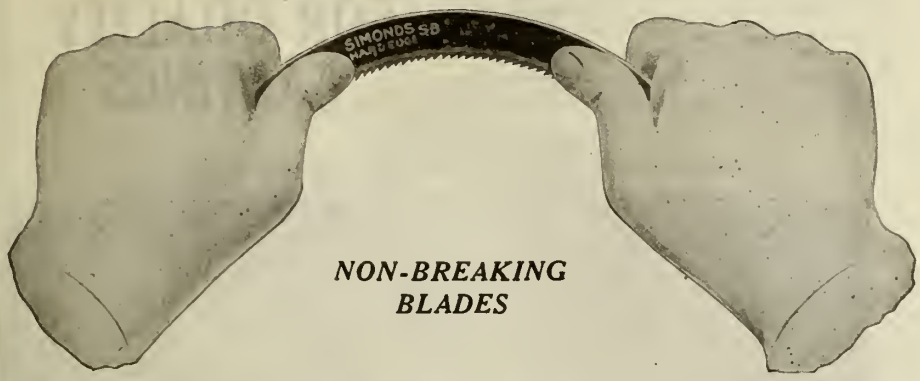
Morse Chain possesses the exclusive
Rocker Joint
Frictionless—Requires no Oilbath.

Jones & Glassco (Reg'd.)
Canadian Agents
Montreal - - Toronto



80 H.P. Morse Drive to Rolls, reverses direction every 45 seconds

SIMONDS HACK SAWS

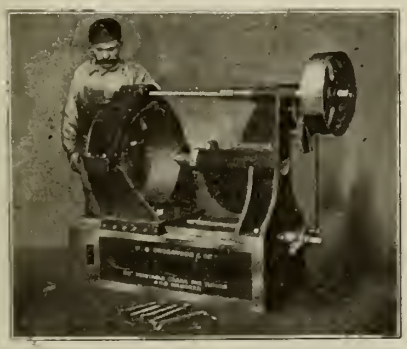


NON-BREAKING BLADES

CUT CUTTING COST

For Machine or Hand Use
Any Size or Length

Simonds Canada Saw Co.
LIMITED
MONTREAL
St. John Vancouver



Underwood Portable Crank Pin Turning Machine

Designed for Accuracy and Adaptability.

This machine is for truing up crank pins on side crank engines; independent of whether the crank is disc or bell shaped. It can be properly set up to give original alignment to the pin, the work is always in full view of the operator. The finish true and smooth.

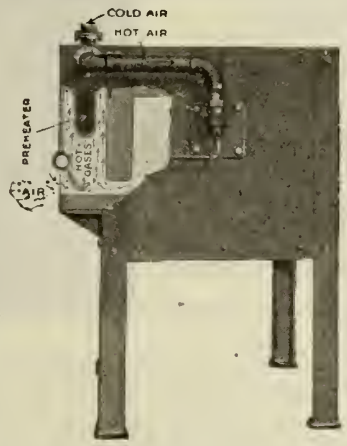
Our catalog describes fully the complete Underwood line, Send for a copy

H. B. UNDERWOOD CORP.

1025 Hamilton St., Philadelphia, Pa.

Overcome the Summer "Slump"

When it's too hot to work—**production drops and overhead rises.** Men will not put forth their best efforts when suffering from oppressive heat.



(Patented)
Section showing deflection of hot gases, with induced air **toward** the furnace, and the preheating of air for combustion.

A forging is the result of a working combination of machine, furnace and man. The man is the weak link in the operation; when he's idle, expensive equipment is idle.

The fatigue of furnace operators is due largely to gases and heat. In the

ROCKWELL ECONOMIZER FORGE

the novel construction of shield deflects the hot gases and—

See illustration, write for Bulletin 34-T, and learn of the many other advantages that make this forge an ***all-year-round economizer.***

Let Us Handle Your Heating Problems
"FURNACE AND FUEL TO SUIT THE WORK"

Canadian Representative:
R. J. McLEAN,
604 Southam Bldg., Montreal, P.Q.

W. S. ROCKWELL CO. INDUSTRIAL FURNACES ESTABLISHED 1888 50 CHURCH ST. NEW YORK

Do Your Furnaces Waste Oil?

OILGAS Industrial Furnaces

Will save 50% of the fuel used by ordinary furnaces of the same capacity.
Continuous forge furnaces, and furnaces for heating, melting, reheating, heat treating, annealing, hardening, sherardizing, and welding. Any industrial process requiring heat.
The only distinct advance in furnace practice since Siemens' time.
Are you interested in a description of these furnaces? Bulletin 54 is yours for the asking.

General Combustion Company of Canada, Limited

619-623 New Birks Bldg., Montreal

If interested tear out this page and place with letters to be answered.

VOLTA
Electric Furnace

For economy, it is essential that the furnace be so designed and equipped as to reduce to a minimum the refining time and delay between heats.
Volta Furnaces are the result of 10 years' experience **and nothing is spared to make them efficient.**
We are capable of advising you on your steel casting proposition.

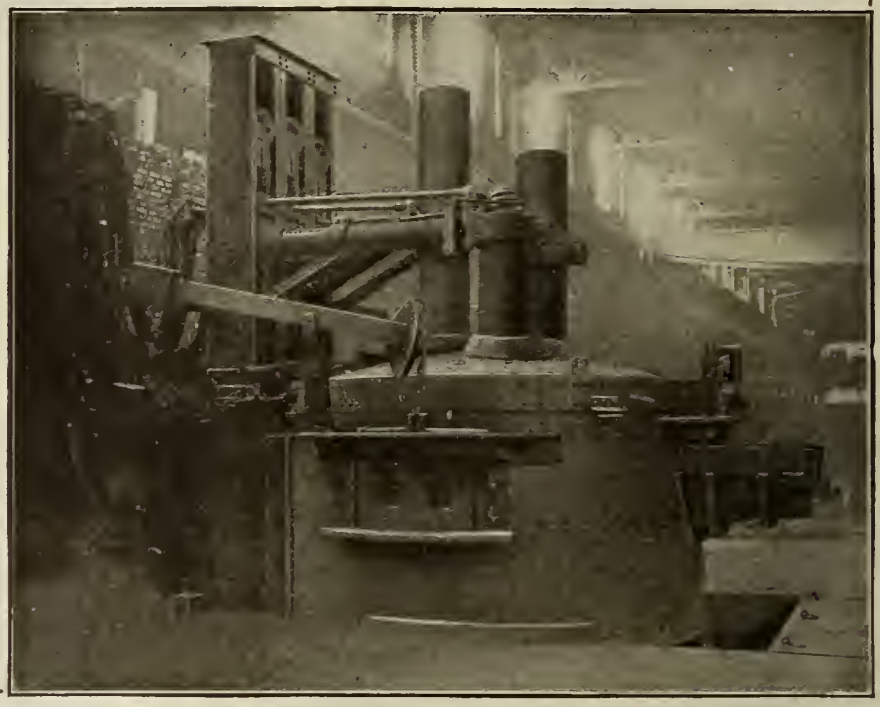
Volta Manufacturing Co., Limited

WELLAND - ONTARIO

BESIDES being cheaper, electric steel castings have other advantages over ordinary steel castings. The product has a particularly homogeneous structure, a fine grain, superior physical properties, and a chemical composition which can be perfectly controlled.

FOR QUALITY CASTINGS

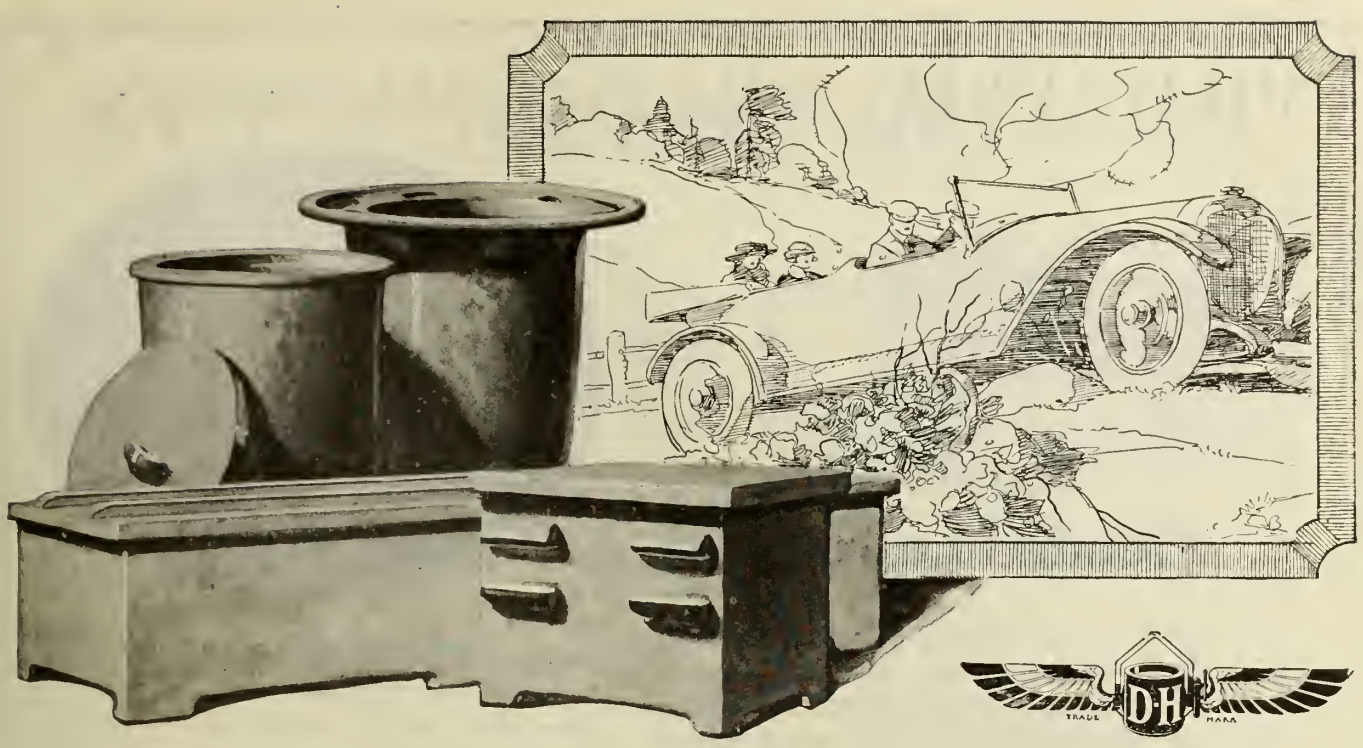
Illustration shows 6-ton VOLTA Furnace in running position.



HOSKINS ELECTRIC FURNACES

SIMPLE
EFFICIENT
ACCURATE
ECONOMICAL

Hiram Walker & Sons Metal Products Limited
Walkerville, Ontario



Cost per Heat and Cost per Mile

GEARS or any other case-hardened parts in a pleasure car have a direct bearing on cost per mile. Manufacturers who use Cast Nichrome Heat Treating Containers have the advantage of lower costs per heat, as well as a uniformly dependable quality in the heat-treated product that adds considerably to prestige.

Cast Nichrome Containers give thousands of hours of service at 1800° F—without warping, cracking, scaling, etc. The Nichrome guarantee assures your economy.

A Type for Every Purpose

Manufactured under HENDERSON Patents by

CANADIAN DRIVER-HARRIS Co., Ltd.

WESTERN OFFICE AND DEPOT CHICAGO 28 So JEFFERSON ST

WALKERVILLE, ONT. CANADA

AMERICAN OFFICE AND WORKS HARRISON, N J

BRITISH WORKS MANCHESTER ENGLAND

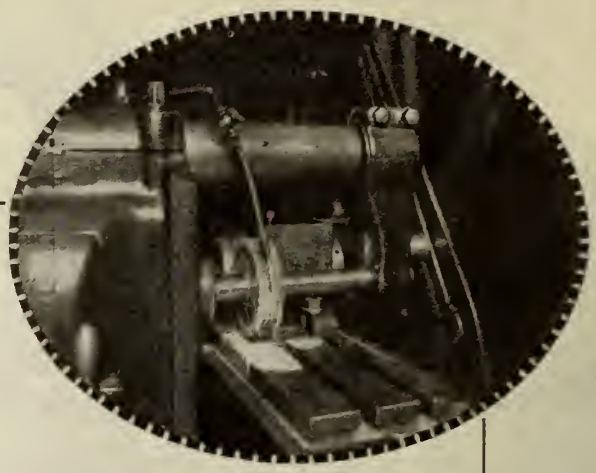
Heat Treating Containers of

Cast Nichrome

ENDURE IN HIGH TEMPERATURE

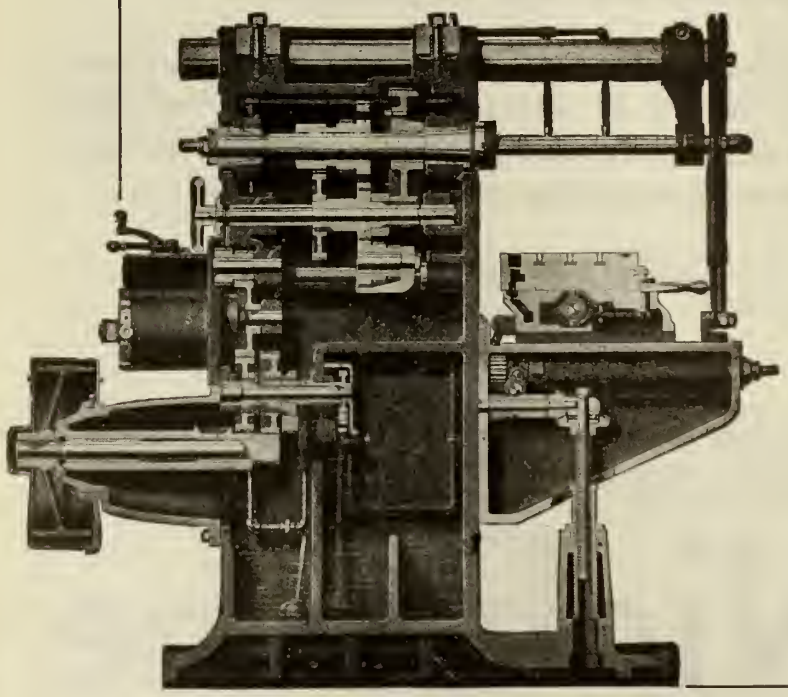
If interested, tear out this page and with letters to be answered.

MILWAUKEE MILLING MACHINES



Automatic Flooded Lubrication

ONE of the most important features of Milwaukee Milling Machines is the AUTOMATIC FLOODED LUBRICATION SYSTEM, which pumps six quarts of lubricant per minute through the bearings and over the hardened steel gearing in the column, feed box and pulley bracket. This system is highly efficient and it takes the responsibility of lubricating these parts of the machine off the operator, entirely, as the reservoir containing the lubricant has to be filled only two or three times a year. The pump for supplying lubricant operates whenever the driving pulley or motor revolves.



The CUTTER LUBRICATING SYSTEM, which is also very important, supplies the cutter lubricant or cooling compound pumped from the base of the machine to the cutters, through adjustable nozzles. The lubricant or cooling compound is returned from the table by a patented telescopic tubing arrangement instead of a flexible hose. The pump, piping, etc., are included in the price of the machine and are an integral part of the design. The pump for lubricating the cutters is so arranged that it operates only when the spindle revolves, or cutter lubricant may be shut off entirely.

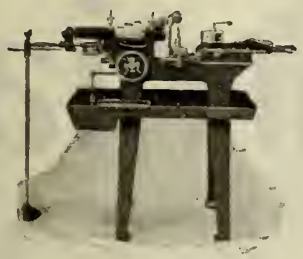
High speed operations may be performed continuously on Milwaukee Milling Machines with minimum supervision of lubrication.

For complete details, write for our catalogue.

KEARNEY & TRECKER CO. MILWAUKEE, WIS.

Canadian Representatives: Williams & Wilson, Ltd., Montreal; F. F. Barber Mchy. Co., Toronto; A. R. Williams Mchy. Co., Vancouver & Winnipeg.

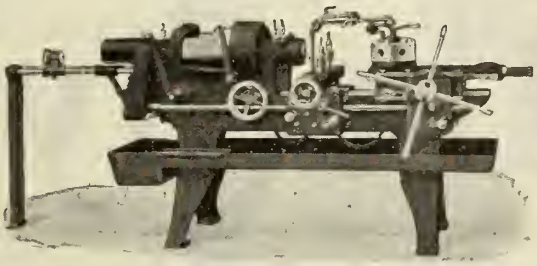
FOSTER TOOLING METHODS



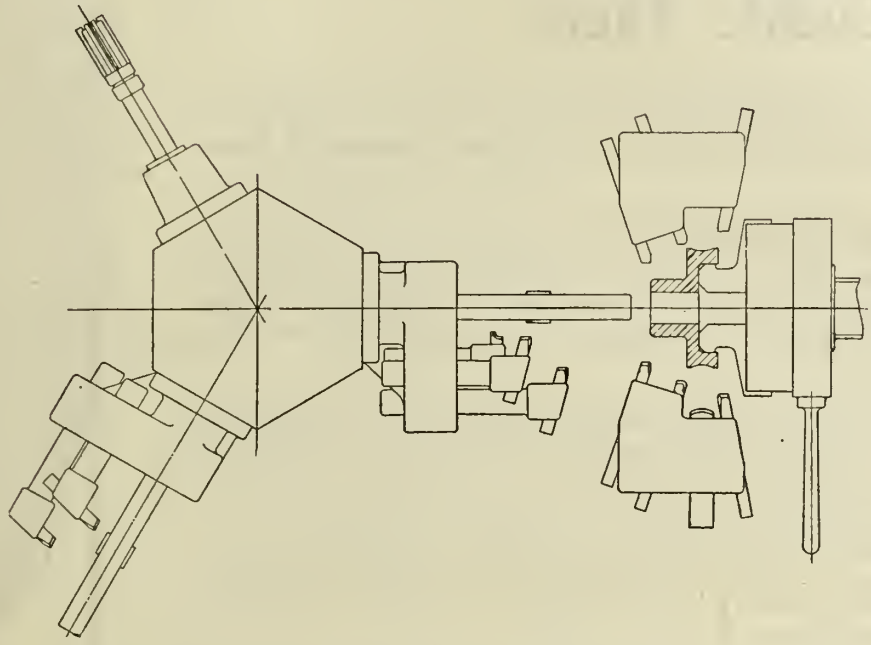
No. 0 Plain H. Screw Machine

THREE SIZES:

No. 0 P.H. SCR. MCH.
No. 1 P.H. SCR. MCH.
No. 3 P.H. SCR. MCH.
No. 3 F.H. SCR. MCH.
No. 5 F.H. SCR. MCH.
No. 7 F.H. SCR. MCH.



No. 7 Friction Head Screw Machine



BOOST YOUR PRODUCTION

The above shows a worm gear blank being machined on a FOSTER No. 5 SCREW MACHINE.

A Barker Wrenchless Chuck grips the work. Only five operations are necessary. The multiple tooling makes this possible. The floor to floor time is cut to a minimum.

Let us get together.

Write for the Pamphlet "Foster Production."

FOSTER MACHINE CO., ELKHART, IND.

If interested tear out this page and place with letters to be answered.

The City of Sarnia

Why You (Mr. Manufacturer) Should Locate There

ALL you require to do is to look at the map to realize that Sarnia is the **Ideal Industrial location.**

Its lake shipping advantages; its excellent railway connections; its proximity to the big manufacturing states of Michigan, Ohio, and other states of the middle west, give to the manufacturer unparalleled advantages for the assembling of raw materials and successfully meeting competition.

Sarnia's location makes it a central distributing point for the trade of the entire Dominion. It is particularly suitable as a Canadian Location for the branch plants of American firms on account of the convenience in receiving shipments of raw materials and unfinished parts.

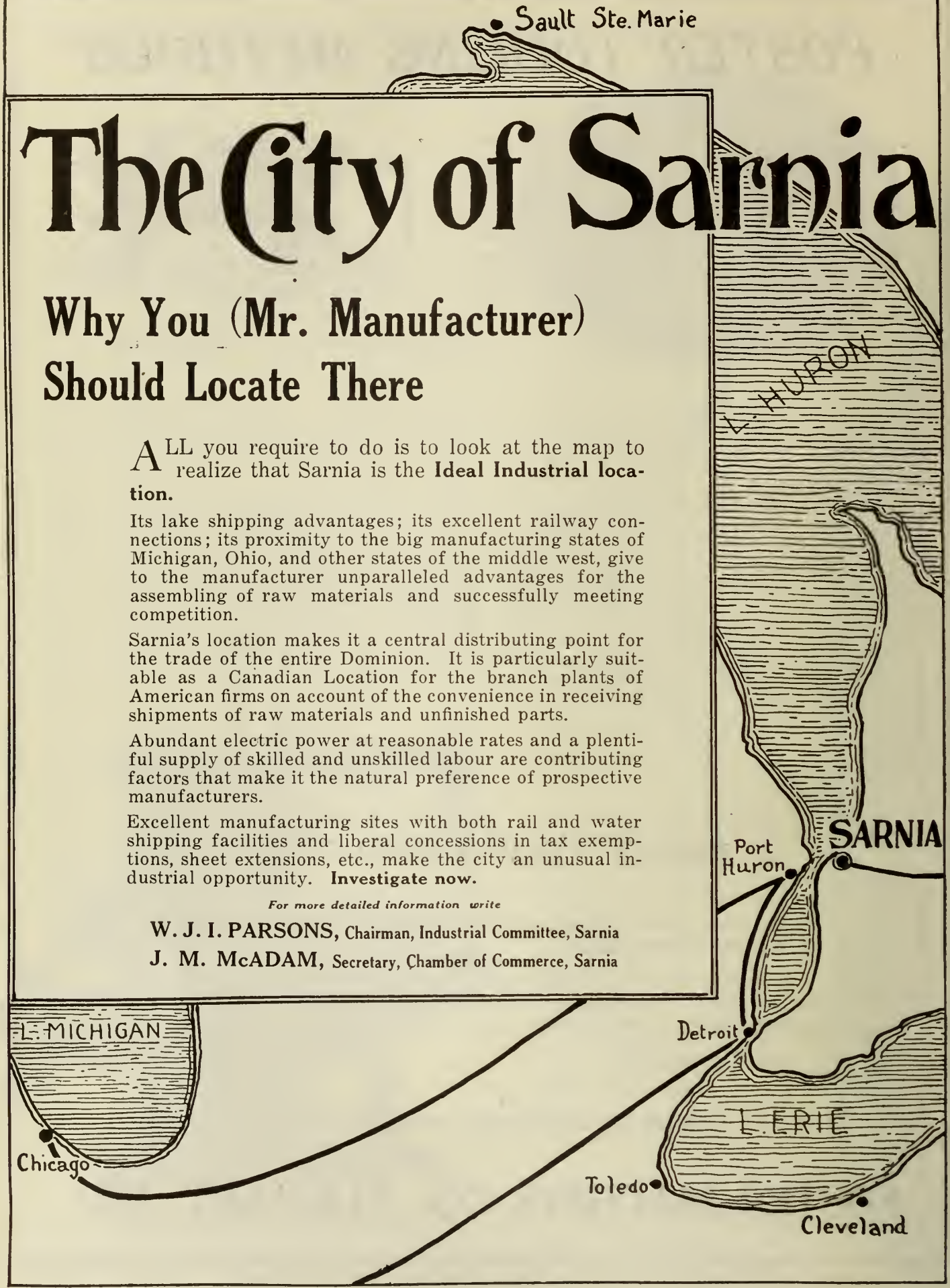
Abundant electric power at reasonable rates and a plentiful supply of skilled and unskilled labour are contributing factors that make it the natural preference of prospective manufacturers.

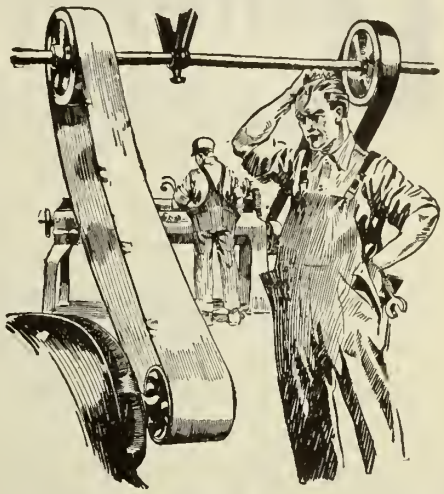
Excellent manufacturing sites with both rail and water shipping facilities and liberal concessions in tax exemptions, sheet extensions, etc., make the city an unusual industrial opportunity. **Investigate now.**

For more detailed information write

W. J. I. PARSONS, Chairman, Industrial Committee, Sarnia

J. M. McADAM, Secretary, Chamber of Commerce, Sarnia





Curing a Mean Drive

Practically every factory of any size has one or more mean drives which seem to defy all attempts to correct them.

Up to date you're beaten—but that's because you want to solve the problem yourself.

Our transmission experts take more real satisfaction in solving mean drives than in selling belts.

Dominion Friction Surface Belting

has helped to solve many transmission problems, and we have yet to find a drive where it will not provide efficient, satisfactory service.

It will cost you nothing to have one of our belting experts study your problem.

If he can't help you he will tell you so. If he can help you it will cost you only the price of a belt that will give you a longer and more satisfactory service than any other belt has given on that particular drive.

The first step to that satisfactory service is to 'phone or wire our nearest service branch.

CANADIAN CONSOLIDATED RUBBER CO. LIMITED
DOMINION RUBBER SYSTEM
AND ASSOCIATED COMPANIES

Our Dominion Hose, Packing and Industrial Rubber Goods are all the same high standard as Dominion Friction Surface Belting.

Dominion Rubber System Service Branches

Halifax	Toronto	Fort William	Edmonton
St. John	Hamilton	Winnipeg	Calgary
Quebec	London	Brandon	Lethbridge
Montreal	Kitchener	Regina	Vancouver
Ottawa	North Bay	Saskatoon	Victoria

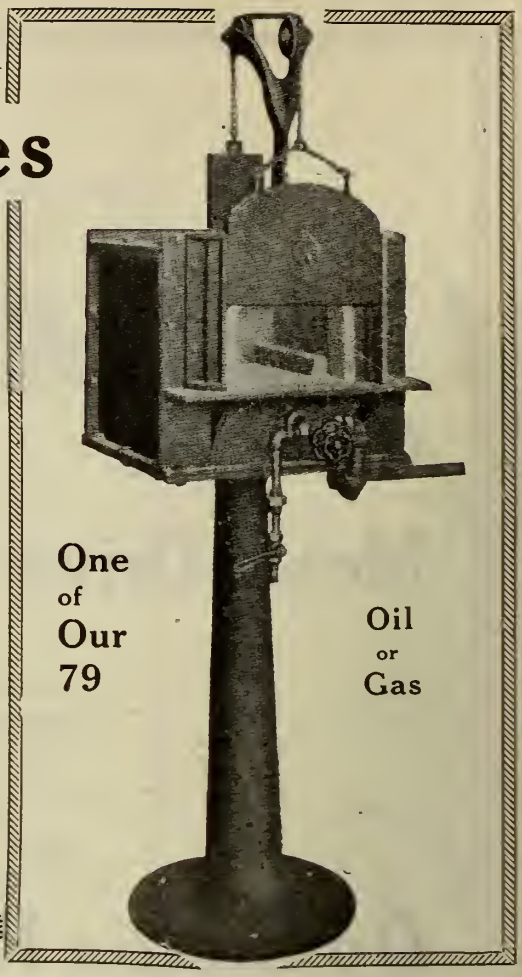
If interested tear out this page and place with letters to be answered.

Bellevue Furnaces

An outstanding feature of Bellevue Furnaces is the accuracy with which the degrees of heat can be controlled by the operator. The furnace shown in illustration burns oil or gas and is particularly adapted for the requirements of the small machine shop for annealing and tempering dies, cutters, reamers, etc.

These tool forges are built to stand the highest temperature. Doors are properly counterbalanced. Perfect combustion insures an intense heat. No flames come in contact with the material. The furnace heats up rapidly and will retain heat for a long period after burners have been shut off with resulting economy in fuel consumption.

We have furnaces of every type for every purpose. Let us prove to you that we can lower the cost of your heat-treating operations. We guarantee results regardless of the fuel you use. Write to-day.



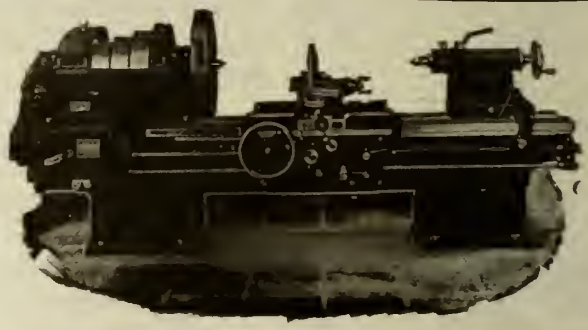
Bellevue Industrial Furnace Company

JULIUS C. HINZ, PRESIDENT

703 Bellevue Ave. — Detroit, Mich.

Representatives in Canada:
H. W. PETRIE, LIMITED, TORONTO

Power to Do Big Jobs

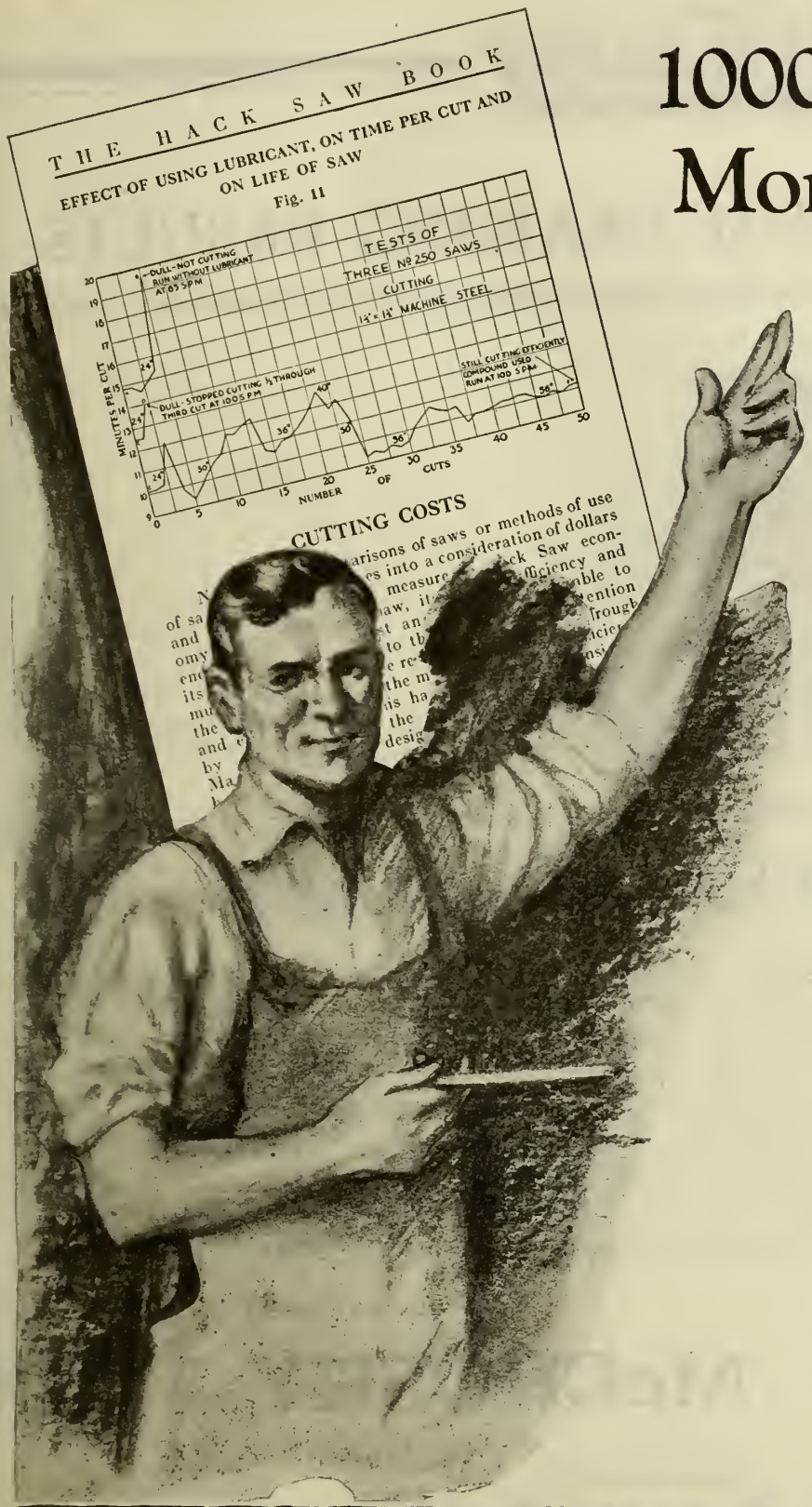


SIDNEY

For Service

Great emergencies can only be met, or big deeds accomplished by the aid of efficient tools.
Sidney Heavy Duty Lathes are designed particularly for the "Big Job." The surplus strength and rigidity of the Sidney makes it a lathe to be depended upon.
The 25 inch Quick Change Sidney shown here is the last word in lathe construction. Every possible improvement is embodied in this late model. Bed length of 10, 12, 14, 16, 18 and 20 feet are available. Also built with a 27-inch swing.
Full particulars of Sidney-for-Service Lathes will be found in our new Bulletin. Write for a copy.

The Sidney Tool Company, Sidney, Ohio, U.S.A.

Canadian Agents: H. W. Petrie, Limited, Toronto; Yeates Machinery & Supply Co., Montreal

THE HACK SAW BOOK
EFFECT OF USING LUBRICANT, ON TIME PER CUT AND ON LIFE OF SAW
Fig. 11
TESTS OF THREE № 250 SAWS CUTTING 1¼"×1" MACHINE STEEL
DULL - NOT CUTTING RUN WITHOUT LUBRICANT AT 63 S.P.M.
DULL - STOPPED CUTTING ½ THROUGH THIRD CUT AT 100 S.P.M.
STILL CUTTING EFFICIENTLY COMPOUND USED RUN AT 100 S.P.M.
MINUTES PER CUT
NUMBER OF CUTS
CUTTING COSTS

1000 Percent More Work

That's what lubricant does for hack saw blades.

Look at the chart above. Three identical blades cutting the same piece of stock. Two of them were run without lubricant—and in each case failed in less than five cuts. The third made over 50 cuts and was still cutting when the test was stopped,—because it was flooded with lubricant.

—That's just one of the charts in "Hack Saws and Their Use". There are more of them in this new Starrett Book, showing the effects of different cutting speeds and weights. There's also the Starrett Hack Saw Chart.

If you use hack saws, you need "Hack Saws and Their Use". Write for a free copy and for Catalog No. 21 "3"

THE
L. S. STARRETT COMPANY
The World's Greatest Toolmakers
Mfrs. of Hack Saws Unexcelled
ATHOL, MASS.

42-65

Use Starrett Hack Saws

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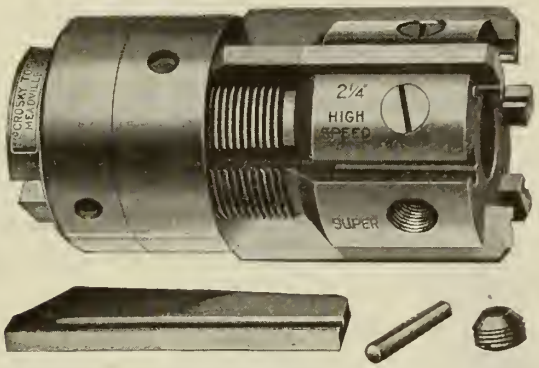
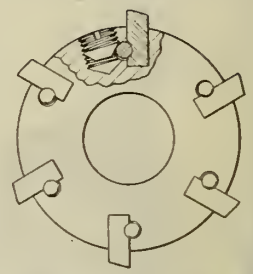
McCrosky

FOR MAXIMUM REAMING RESULTS



McCrosky-SUPER partly disassembled showing Strength and Simplicity of construction.



Cross section plan showing taper pin and screw that locks each blade in exact position, always.

McCrosky-SUPER Adjustable Reamer

Ability to produce holes of standard size and finish over a long period of time is the best test of the efficiency of an adjustable reamer.

In hundreds of shops McCrosky-SUPERS are reaming holes within a tolerance of a small fraction of .001 of an inch. They do this not only on the first job, but throughout the life of every set of blades used. On account of the large range of adjustment, this means that a McCrosky-SUPER with one set of blades can ream more holes with greater accuracy than a dozen solid reamers. When the blades are completely worn a new set can be quickly and cheaply inserted, making the SUPER as good as new.

If you need holes of standard size and finish, standardize on McCrosky-SUPERS.

McCrosky Catalog No. 7 has full deta

McCROSKY TOOL

Represented by

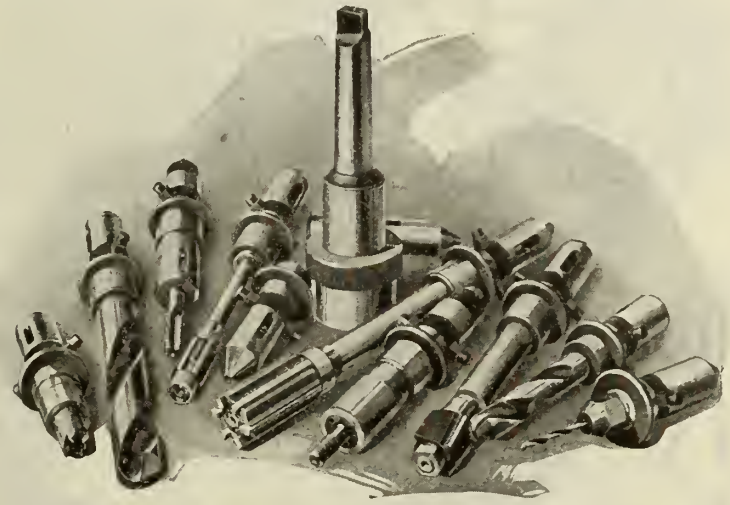
H. A. Harrison

220 King Street, Toronto

Export Agent: **Benjamin Whittaker, Inc., 21 State Street, New York**

McCrosky

FOR INCREASED DRILL PRESS OUTPUT



A typical Wizard outfit, tools fitted with Wizard Collets and a McCrosky Wizard Chuck ready to be installed in the spindle of your Drill Press.

McCrosky Wizard Chucks and Collets

When you have a drill press job calling for several operations put a McCrosky Wizard Chuck in the spindle and fit your tools with Wizard Collets. They will enable you to complete the whole job without once stopping the machine to change tools. They cut the time and cost of production in two.

A McCrosky Wizard Chuck uses all sizes and kinds of tools, and holds each one rigid and perfectly centered. Its powerful drive is equal to any strain.

No mechanical skill is required to operate it. A girl and a Wizard can do the work of two men any day and every day. Before you order a new drilling machine, consider bringing your old Drill Press up to date with a McCrosky Wizard outfit.

and descriptions. Send for it today.

CORPORATION

Represented by

Yeates Machinery & Supply Co.

Montreal

Export Agent: **Benjamin Whittaker, Ltd., 56 Ludgate Hill, London, E.C.4**

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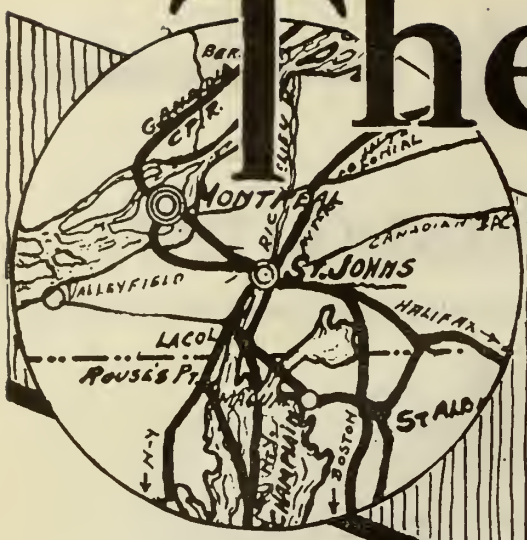
The Mecca o



The City of St. J

Location:

The city of St. Johns is situated on the Richelieu River in the most densely populated district in Canada—the Province of Quebec—which as regards industries bears the same relation to Canada as New England to the United States. St. Johns is distant about 27 miles from Montreal, and has a population of 12,000.

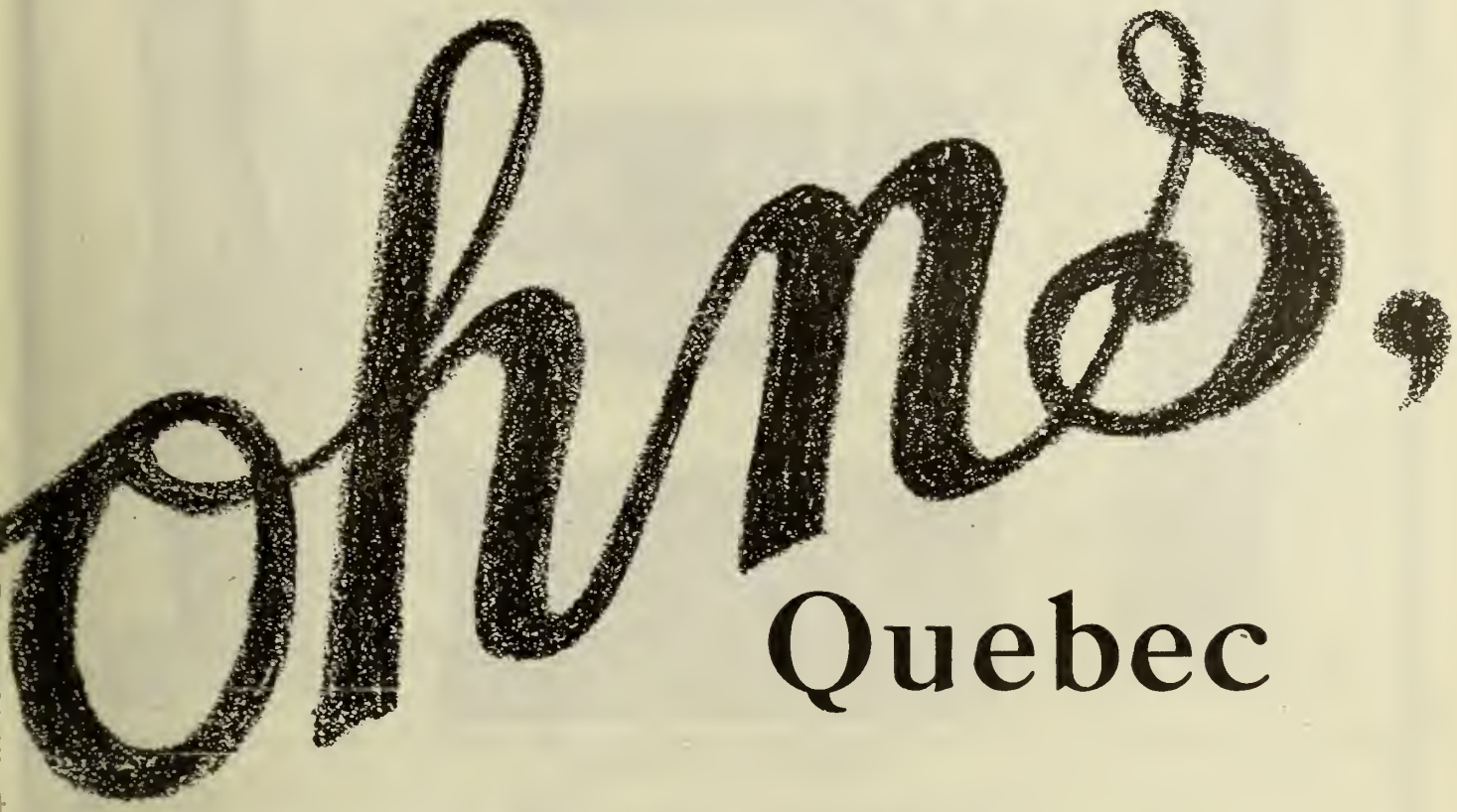
TRANSPORTATION FACILITIES:

By Rail—Unexcelled by any city of its size in Canada. The two main double track arteries of Canadian traffic — the Canadian Pacific and Grand Trunk railways—are the Intercolonial, the D. & H., the G.V., and N.Y., N.H. & H., and the B. & M All eastern U.S. railways are connected with S Johns, while all the roads are inter-connected i the St. Johns yards by a terminal switching com pany at very low rates. There are 50 trains dail to Montreal.

By Water—St. Johns is directly connected by ra with the docks at Montreal, providing unsurpasse ocean shipping advantages close at hand. Th Richelieu River is a link in the chain of canals fro New York to the St. Lawrence, furnishing the cit with a direct water route to the eastern seaboar on the Great Lakes.

For more specific information write to the Secretary of

Manufacturers



Freight Rates:

Because of its geographical location and transportation facilities, St. Johns is able to command a lower freight rate and cheaper coal and labor than any other centrally located manufacturing plant on the North American continent.

Export Conditions:

Due to the subsidizing of the Canadian Steamship lines by the Government, American manufacturers can lay down their products at a lower price in any part of the British Empire if they are shipped from Canada instead of the U.S. In a great many cases large American manufacturing concerns have found it profitable for trade in the British Empire, to locate their factories and even their assembling shops in Canada.

Labor Conditions:

Skilled and semi-skilled labor is plentiful in St. Johns. The city has long been recognized as the cheapest labor centre in Canada, the workmen are happy and contented, and labor troubles are unknown.

St. Johns has this great advantage over larger manufacturing centres because the workman's cost of living is low—as are also their municipalities and land and building rents.

Public Conveniences:

St. Johns possesses a complete system of electric power distribution, waterworks, sewers, driveways, macadamized streets, concrete walks, public parks and buildings, etc.

St. Johns is a beautiful residential city, and is liberally provided with places of amusement for the entertainment of you or your employees.

Inducements:

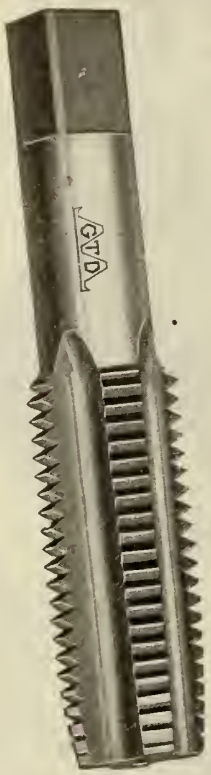
Already a busy industrial centre, St. Johns is rapidly expanding and now offers unparalleled inducements such as:

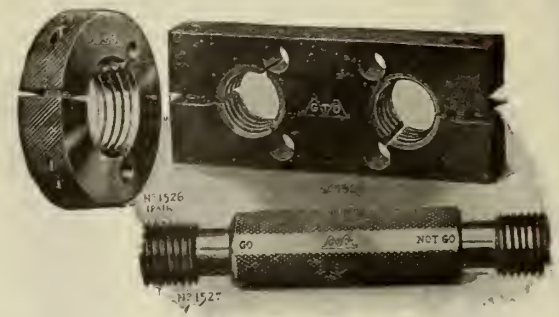
Fifteen years' exemption of taxes; period subject to extensions.

All public improvements required, such as extension of streets, sidewalks, waterworks and sewerage.

A bonus of five per cent. on your payroll for five years. If desired, we shall advance this to you to be applied to the purchase or erection of any building suitable to your purpose.

the Chamber of Commerce, St. Johns, Quebec, Canada





"Made in Canada"

SCREW PLATES

The "Little Giant" Screw-Plates have come to be recognized as the standard equipment for repair work for garages, repair and machine shops. "Little Giant" Screw-Plates are furnished in different assortments and sizes to suit all kinds of threaded work.

TAPS

Our Traps are noted for their excellent workmanship, easy cutting and long-wearing qualities.

GAGES

Our Plug and Templet Gages are made by skilled workmen, with the latest improved appliances for acquiring strict accuracy, precision and finish.

USE THIS COUPON →

WELLS BROS. Company of Canada Ltd. Galt, Ontario

Little Giant

Canadian Plant of the Greenfield Tap & Die Corp

World's Largest Manufacturers of Screw Cutting Tools.

WELLS BROS. OF CANADA, Ltd. GALT, ONT.

Please send me the following catalogs:

No. 42 Gage ☐

No. 40 Small Level ☐

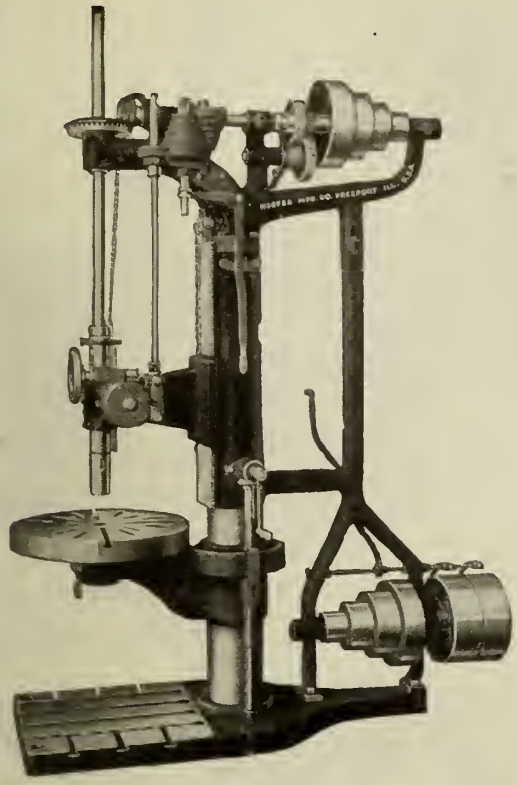
Name..... Position.....

Firm .....

Address .....

C.M. 1004

The Driller for Exact Work



HOEFER

Enable Your Workmen to Eliminate Spoilage

The Hoefer Driller is pre-eminently the one to be found in the best plants. "It's almost as good as a Hoefer," so often heard in the machine and tool trade, indicates the position held by Hoefer Drillers.

Exact drilling, to the last thousandth of an inch, pays by eliminating spoiled material. Hoefer Drillers pay for themselves and increase the workman's pride in his work.

Twenty-five Years on Market

Twenty-five years making drillers has given Hoefer the "Know-how." The Hoefer Drillers are used by many of America's leading manufacturers. Equip your factory the Hoefer way. Take any kind of a drilling problem you have to the Hoefer Manufacturing Company, and the Company's experts can tell you how it was solved by other men, some of whom you may know.

Investigate now. Write to-day for catalog. The Hoefer engineers are at your service.

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FREEPORT, ILL.

More Speed
Better Work
With—

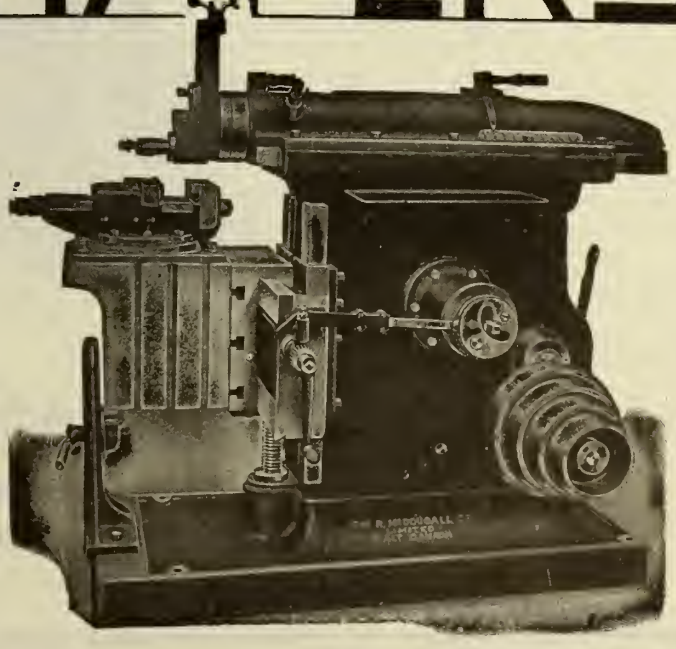
16 and 20 inch Crank

McDougall SHAPERS

Modern methods of manufacture require modern tools. McDougall 16 and 20-inch Shapers embody the best features of all machines which have been placed upon the market and can be depended upon to produce work accurately and fast.

An important feature is the column. It is massive in construction, well braced and reinforced internally. Has ample opening under ram for keyseating or other long work. Bearings for ram extend beyond vertical line of column both front and back. The ram is of exceptional strong construction.

McDougall shapers have other points of interest you should know about. **Write for full description.**



The R. McDougall Co., Limited
GALT, ONTARIO
THE CANADIAN FAIRBANKS-MORSE CO., LIMITED
Sales Agents

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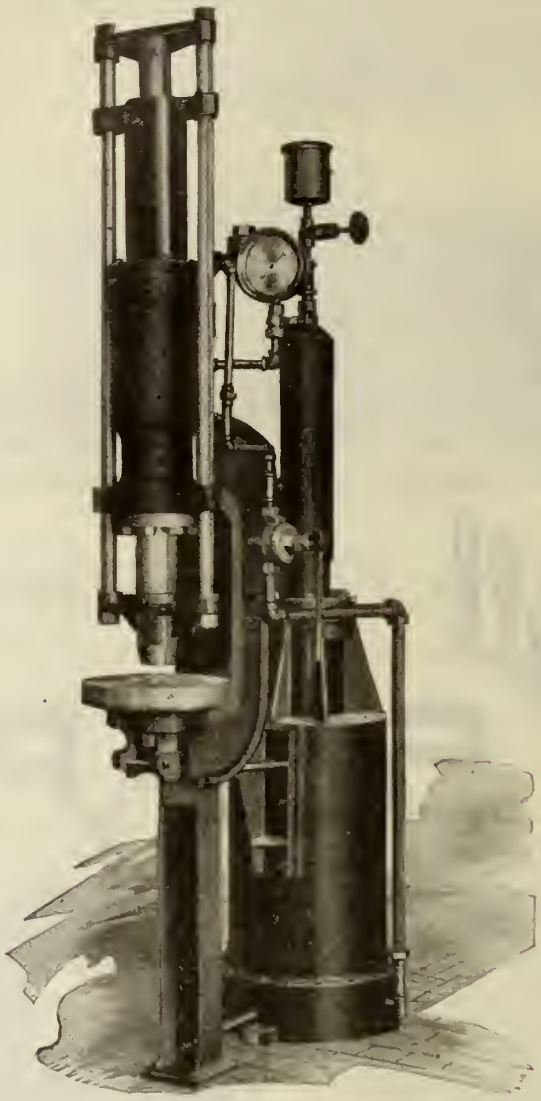
ORIGINALITY

is Characteristic Always of

"METALWOOD"

DESIGNS and DEVELOPMENTS



The "Metalwood" line of these Quick Operating Hydro-Pneumatic Presses comprises a variety of styles, types and sizes.

By performance through a period of years, these presses have established themselves in a wide range of industries as standard tools for light straightening, broaching, forcing and assembly operations.

The "R-149" style press of 20-ton capacity shown here is described in our bulletin B-47.

METALWOOD MANUFACTURING CO.

High Speed Hydraulic and Hydro-Pneumatic Machinery

DETROIT, MICHIGAN

How Work Speed Affects Wheel Action

By Charles H. Norton

The effect of work speed upon the cutting action of the wheel should be more fully understood. The popular idea that the work speed once established for any one piece of work will always be suitable for duplicates is erroneous for the following reasons:

1. It is impo sible for the grinding-wheel makers to guarantee to duplicate exactly the grade and cutting action of a wheel. A small change of grade makes necessary a change of work speed, if we would secure the best cutting action of that wheel.

2. No two pieces of steel are exactly alike. It is probable that the variation of material the wheel grinds is as great in its effect upon the results as are the variations from exact grade of wheel. A small change in the material makes necessary a change of work speed, if we would secure the best cutting action of the wheel.

This is especially true of hardened work. Automobile cam-shafts are a good illustration; rarely will two sets of cams have exactly the same density, and, therefore, it is impossible that one speed for the work can produce the best results with all, whether they be duplicate dimensions or not. No grinding machine or grinding attachment should be used without means for changing the work speed.

3. The work speed should be changed to get the best results as the wheel wears smaller, because when the wheel is worn only a little the cutting effect is changed. We should adapt the work speed to it from day to day, whether we are grinding duplicate work or a variety.

With work that is small and short, the time of grinding is so brief that, with the work speed once found, grinding may continue profitably throughout an entire day without a trial of the work speed; but with work of medium and large size, it should be tried and possibly adjusted to every piece, if we would secure the best results.

The art of quickly finding the be t cutting speed for the work makes for a large part of the operator's success in producing a large amount of good work and in prolonging the life of the wheel.

Attempts to "fix the speed" that the operator shall use for the different pieces of work will result in failure to produce the largest quantity and best quality.

NORTON COMPANY OF CANADA, LTD.

HAMILTON, ONTARIO

Electric Furnace Plants

Niagara Falls, N.Y. Chippawa, Ontario, Canada

Canadian Agents: The Canadian Fairbanks-Morse Co., Ltd., Montreal, Toronto, Ottawa, St. John, N.B.; Winnipeg, Calgary, Saskatoon, Vancouver, Victoria. F. H. Andrews & Son, Quebec, Que. Simonds Canada Saw Co., Vancouver, B.C.

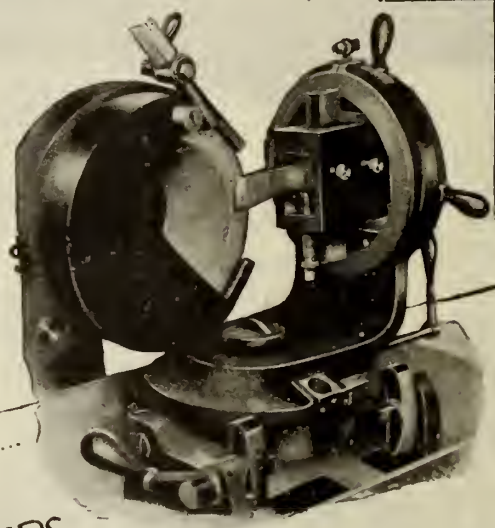
GIS

A Gisholt Tool Grinder Pays back its Cost

That's the kind of a machine to have in your shop! Money applies to your credit every time a tool is ground and in a short time the purchase price comes back. These dividends are paid by increased machine production. Use a Gisholt to Grind the tools for your workmen, and rout them from a central grinding station, then your men and machines will be kept busy producing.

Tool-steel investment is cut down because idle and dull tools do not collect around a machine.

Let us tell you about some of the many other advantages.



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Gisholt Univeral Grinder

GISHOLT MACHINE COMPANY, 1207 EAST

Builders of Standard and Automatic Boring Mills, Tool Grinders,

Eastern Sales Office: 30 Church St., New York,

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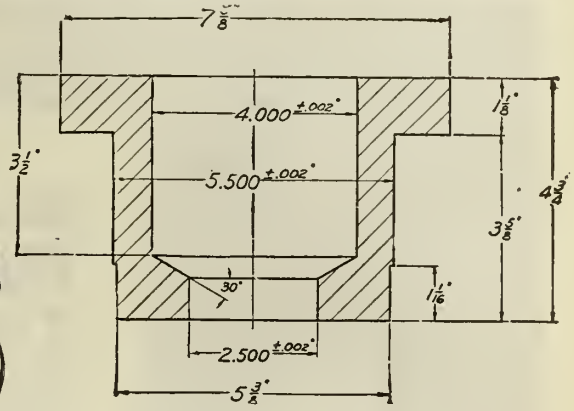
Atlanta, Ga., Seeger Machine Tool Company; Buffalo, N. Y., J. L. Osgood; Chicago, Ill., Stocker-Rumely-Wachs Co.; Denver, Colo., Hendrie & Bolthoff Mfg. & Supply Co.; Detroit, Mich., Chas. A. Strelinger Company; Indianapolis, Ind., Vonnegut Machinery Co.; Los Angeles, Calif., Smith-Booth-Usher Co.; New Orleans, La., P. H. McArdle; Philadelphia, Pa., Swind Machinery Co.; Portland, Ore., Portland Machinery Co.; Rochester, N. Y., Ogden R. Adams; St. Louis, Mo., Colcord-Wright Mchy. & Supply Co.; St. Paul, Minn., Savage & Winter Company; Salt Lake City, Utah. Salt Lake City Hdw. Co.; San Francisco, Calif., F. O. Stallman Supply Co.; Seattle, Wash., Perine Mchy. Company.

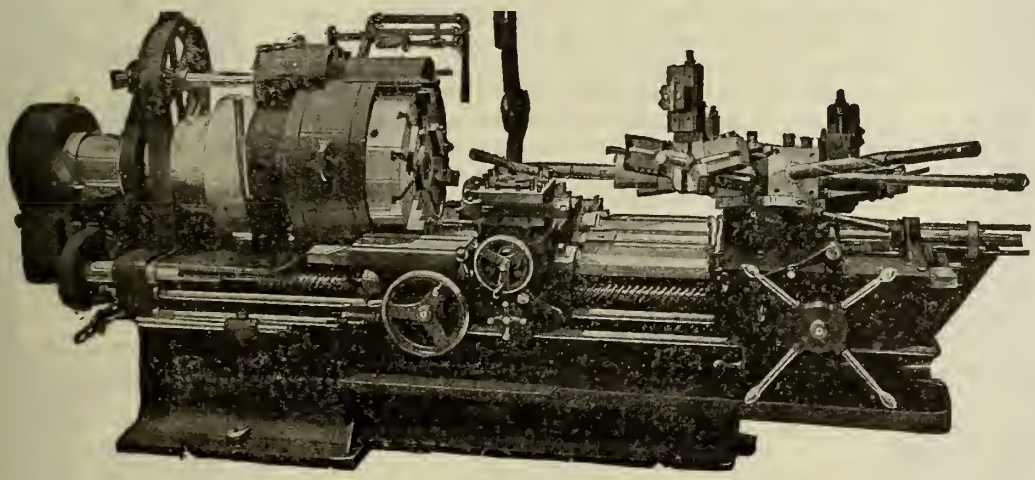
HOLT

11 Minutes

(Stuffing Box Gland of Cast Iron)



Savings on Regular Run of Work



It is the consistent savings made on your *regular run of work* that count.

The piece shown above was selected with this fact in mind. It is representative of the hundreds of other jobs which are daily being handled on Gisholt Standard Turret Lathes with Standard Tools.

Do you see the point? Gisholt Lathes do not have to depend on the exceptional job to make their installation profitable. Savings in time are made on your regular run of work. Their economy is spread out over a large area.

Why not find out what these savings are on the work you are doing? Gisholt salesmen are trained to give you this information.

WASHINGTON AVE., MADISON, WIS., U. S. A.

Turret Lathes, Vertical and Horizontal
Small Tools, Special Machinery, etc.

Works: Madison, Wis., Warren, Pa.

Canada: Canadian Fairbanks-Morse Co., Calgary, Hamilton, Montreal, Ottawa, Quebec, St. John, Toronto, Vancouver, Winnipeg.

FOREIGN:

Australia, Benson Bros., Sydney, Melbourne; Belgium, Ateliers Demoor, Brussels; Great Britain, Burton, Griffiths & Co., London, Birmingham, Manchester and Glasgow, Scotland; France, Aux Forges de Vulcain, Paris; Italy, Emanuele Mascherpa, Milan; Japan, Andrews & George, Tokyo; Norway, Union Machine Co., Christiania; Sweden, Axel Ryden, Stockholm; Switzerland, J. Lambercier & Co., Geneva.

If interested tear out this page and place with letters to be answered.

FAIRBANKS-MORSE

Building a Bigger Canada

THESE are days of progress—days when industry is leaping ahead and Canada is assuming her place in the world of commerce. Giant structures are being reared to house the machinery, men and equipment necessary to a bigger business.

Great highways are being constructed to provide for the easier transportation of Canada's products; elevators, wharves, factories, mills, mines—everywhere the hand of the contractor is set to some big task.

And wherever this construction work is going on, Fairbanks-Morse contractors' equipment is playing an important part—rendering its services as a factor in this work of progress. From the shovel to the steam and electric hoists, from the concrete mixer to the heavy road machinery, drill and jack, to truck and railway car, Fairbanks-Morse equipment is the choice of the contractor, because he knows that behind the smallest tool is the same quality guarantee and service that supports the largest unit of Fairbanks-Morse equipment.

He knows that the Fairbanks-Morse 100% quality seal is the ideal of the Fairbanks-Morse institution—a standard and a guide in building a bigger Canada.

The Canadian Fairbanks-Morse Co. Limited

Canada's Departmental House for Mechanical Goods

Halifax St. John Quebec Montreal Ottawa Toronto Hamilton
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Calgary Vancouver Victoria

11

CANADIAN MACHINERY
AND
MANUFACTURING NEWS

Vol. XXIV., No. 1 July 1, 1920

Common Sense and Sweat Can Do It

CANADA has seen twenty months of business and trade since the signing of the armistice, and in those twenty months Canada has demonstrated a resourcefulness that is remarkable, and a business stability that carries with it a tremendous degree of assurance for the future.

Business prophets, prior to the end of the war, when it appeared likely that munition contracts would soon cease, predicted that the final chapter of Canada's industrial war effort would end in a blur of disaster.

But they reckoned without taking into account the same initiative and determination that made Canada one of the greatest shell and fuse shops in the world.

And to-day almost every industrial centre of the Dominion has a thriving industry of some sort—a monument to the desire of our industrial leaders to hold their war-work organizations intact and make them count in peace-time development.

It is nonsense to claim that everything is rosy, and it is unfair to indulge in booster talk to the exclusion of recognizing adverse facts that are very squarely facing us.

The much-heralded adjustment of values is upon us. So far machinery, iron, steel and metals in general, from their essential character, have not figured in any spectacular deflation. There have been forces and influences at work all over the world that, so far at least, have prevented supply and demand becoming equalized, and it is due to these forces that deflation has not touched this field.

The process, sooner or later, will become operative. The first step may be the elimination of the premium market, and there will be no sorrow when this happens. It is highly desirable that we arrive, as soon as possible, consistent with safety, at a point where a definite market price can be quoted for staple lines of raw, semi-finished or finished material.

The organization that is giving a real service, that is performing some useful function, that is not taking out of our industrial pocket something for which it is not giving value, has nothing to fear.

The hanger-on, the gouger and the schemer—whether in the form of an individual or a company—is apt to be in for a rough passage, and a few funerals in this category will be as tonics and restoratives to legitimate effort.

To men in the control of industry, and to men who wield influence in the workshops, there is a plain message—Don't rock the boat.

Now that's an old phrase and a plain one and its meaning is clear.

Many countries, not yet recovered from the ravages of war, not yet fitted to meet new conditions, are looking to Canada for supplies.

Canada has her chance NOW—not some other time—but NOW—to make advances in a few years that under ordinary circumstances she could not make in two decades.

The man who can do damage now is the labor leader who teaches the suicidal doctrine that by keeping down production it is possible to create more employment. It is a vicious belief, and prevents any man from giving wholehearted and loyal service to his employer.

Not far removed from him is the employer—fortunately his kind is disappearing—who runs his business for the sole object of paying dividends. His responsibility to his community, to his employees and to the furtherance of decent business practices, is conveniently ignored.

In our post-war experience we have had an avalanche of strikes, and we should by now be at the stage where we have learned that the strike hurts the strikers, especially where it is used in defiance of signed and accepted contracts.

Common sense and a little honest sweat can work wonders for this country in the coming months.

Canadian *Exporter* Has His Own Problems

STRIKES, NEW TARIFFS, FREIGHT INCREASES and EXCHANGE

CANADIAN exporters of agricultural implements have had their good spots and their bad ones. Business has been carried on and developed in many cases in spite of conditions rather than with their assistance. Strikes, high freight and ocean rates, lack of certainty in shipping, exchange rates, changing tariffs, and the uncertainty of the war-torn countries of Europe have all been on hand to see to it that Canadian firms had plenty of things to attend to beside making implements and putting them on the cars at the factory.

Massey-Harris Co. have a world-wide organization, and export business is bread and butter to them. "Things are different now to what they were in days before the war," stated Mr. J. N. Shenstone, first vice-president of the company, to this paper. "Then it was simply a case of turning the material out and putting shipping tags on it, and away it went, and the chances always were that it would reach its destination at the earliest possible time. Right now, and starting closest to home, the dock strike in New York is one of the worst things with which we have to contend. We have to go at it about the same as we did when the war was on, viz., advise the people down there that we have certain shipments, and wait until they tell us that they can take them on. In many cases they have to be sent by rail to Portland, Boston, or some other port on that coast, or even as far as Montreal."

Troubles With Material

While the making of agricultural machinery is not exactly a part of the export, it is interesting to note that there is trouble enough in getting supplies of raw material from United States points. Much of the steel that it brought in now is not, as usual, in multiples. It usually comes, say in even lengths of ten feet, so that a quantity of it can be cut up into five two-foot lengths. The material coming now is odd lengths, and often bent, so that operations are interfered with and there is more than usual waste. The manner in which the supplies are coming in makes it almost impossible to get the shops up to speed on any one line, as they have to keep switching from one to another as there is not sufficient raw material to operate on them all at once. Like many another Canadian company, the Massey-Harris people have their own men tracing cars in many United States districts, trying to get in supplies of coal and steel. According to reports from the company it makes a lot of difference who goes after the cars. One of the Massey-Harris men is an ex-railroader, and he knows the business thoroughly, and understands the handling of men. He has that thing most necessary, a personality, and he can get results where others fall down. He has done a big work in keeping cars moving toward the Massey-Harris works.

The Exchange Problem

"Undoubtedly exchange has been the biggest problem that we have had to deal with this year," stated Mr. Shenstone. "It is the cause of an unending stream of correspondence. "In spite of it, we are doing a big French business. France is coming back in a remarkable way. Our French office will buy $100,000 worth of francs and send them here. We deal direct with the dealers in France, and sell the machines at the difference between the value of the Canadian money and the French currency. There is no other way in which we could carry on there. It really has meant that our prices have fluctuated with the changes of exchange, which have been frequent as you know and it has kept us busy following the changes in money values as between Canada and France.

Nothing In Germany

"There is no business to be done with Germany yet in agricultural implements as the value of the German mark is still too low. Foreign offices believe that there will be a recovery in Germany if the country holds together."

One of the correspondents of the Massey-Harris Company who has recently finished a survey of the German situation for the firm, has submitted a long report. Among other things he draws attention to the human element in the situation:

Consideration as to what should be done was, of course, wrapped up with judgment as to the future. There was great need, he pointed out, in view of the heavy discount against German money, of the German people trading within their own limits and employing their own labor and materials as much as possible. They could not afford to do business with the outside world at the existing exchange, and if the political misfortunes of other countries should overtake Germany, it would be difficult to say what might happen. There was always the possibility that the country might break up into various divisions, or that revolt might occur. "Dull despair has settled over every class. They see their lives now chained to a servitude of taxation. . . . Whether this despair will give way to untoward action in an endeavor to avoid the heaviness of the burden, is a matter for speculation."

According to information reaching the Massey-Harris company, there would not be much business done with Germany in any line until such time as the mark had reached five or six cents. Some of those who had studied

the field were rather optimistic in regard to this, and were certain that it would not be long before the mark would have a standing of at least ten cents. In this same connection, it might also be remarked that there are students of the situation abroad who predict that the British pound will be at a premium inside of six months.

An Ingenious Representative

The Massey-Harris Company have a representative in charge of their German business who has displayed no small amount of ability in holding the business of the company during the war. Of course all communication with Germany was cut off when war started, and there were no parts shipped for repairs. When this service was stopped, the German agent took parts of machines he had in stock, which were called for most frequently, and had patterns made, from which castings were turned out. In this way he was able to go ahead and give service to the users of Massey-Harris machines, and in the end had built up a business on which he was actually making money.

The Massey-Harris company now own their German head office, the building being worth about $275,000, but the purchase price at the exchange working out something like $47,000. Other reports on the situation make it plain that it will be necessary for Germany to import agricultural machinery for some time, as the country has neither the raw material nor the facilities for turning out sufficient to keep up the production of the soil.

Russia Still a Closed Market

Nothing has been done to open up trade with Russia, nor does it seem that this will be done in the very near future. The Massey-Harris company had large premises in Moscow, but of course their representatives left there some time ago, and it is not known what has become of the property. Some propositions have been put forward to the London office to send shipments of implements to Russia, but they are usually somewhat involved, and after some investigation, are dropped as too dangerous. Many of the firms that are trying to secure implements to sell to the Russian people want to do so on the barter system —taking raw materials and Russian goods in exchange. "When the banks come to the point where they will loan money on that," stated Mr. Shenstone, "we will probably resume the business, but not before."

The Australian Tariff Changes

The tariff wall which the people of Australia intend to build at the first of the year will be a serious problem for the Canadian firms at present shipping into that territory. Of course many of them are sending large stocks in there ahead of the coming into effect of the tariff, so that it may be some time before it actually begins to influence their shipments.

Massey-Harris have not decided just what they will do to deal with the new Australian situation. They hardly see enough business there to warrant starting a branch factory, which is evidently the object of the Australian tariff. Australian trade has been very satisfactory for some time now, and the tariff that is coming into effect is of the real Haman's gallows type. Canada will apparently come under the intermediate or general tariff, but not under the British preference, at least that is the understanding of the Massey-Harris officials.

Reapers and binders, under the new ruling, pay under the British preference £6 10s; intermediate tariff, £9 10s and general tariff £10, or an ad valorem duty of 30%, 40% or 45%, depending on which will make the highest revenue.

Mowers will pay under the British preference £2 8s; under the intermediate tariff £3 15s, and under the general tariff £4, or an ad valorem of 30%, 40% or 45 %, depending on which ruling will return the greater revenue to the government.

Cream separators, free under the British prefernce; 5% under the intermediate and 10% under the general.

The Australian government go the whole distance, however. They are giving this protection, and they are also setting the price at which machinery under it shall be sold to the purchaser, and the wages which shall be paid to the mechanics making it.

Other items in the Australian tariff indicate that it is the desire to build up a steel and iron industry. Pig iron is to be taxed under the British preference, 20s per ton, under the intermediate 30s per ton and under the general 40s per ton. Ingots, blooms, slabs, billets, puddled bars less finished than iron or steel bars, but more advanced than pig iron, except catings per ton, British preference 32s, intermediate 52s and general 65s.

Bar, rod, angle, tee, per ton 44s, 65s and 80s.

Plate and sheet up to and including 1-16, under British preference, free; intermediate, 5%; general, 10%; on and after January 1, 1922, British preference, 65s; intermediate, 82/6, and general 100s.

Wire, ton, British preference 52s, intermediate 72/6, and general 90s.

As a general thing machinery will be taxed, British preference 27½%, intermediate 35%, and general 40%, while automobiles come under the following, 35%, 45% and 55%.

The Recovery of Spain

In the opinion of Mr. Shenstone, Spain is developing into a good market for the Canadian firms that have anything to sell to the trade there. "In the last five years there has been a great change in that country. Formerly we did not regard it as a good customer. We are shipping implements there now, and the trade is developing in a way that has been a pleasant surprise."

Exchange has been against Italy rather hard, and the uncertain conditions there have not been conducive to attracting trade. Denmark and Sweden are also in the class where exchange and high freight rates are retarding factors.

Speaking of freight rates Mr. Shenstone recalled that there had been rates all the way from 10 to 50 shillings per ton to Australia. Things work in a circle. The ship owners come together and fix rates at a high figure, so high that it induces some other lines to come in at a competing price, until they are taken in, and the operation begins all over again. The rate to Liverpool used to be about 8s to 10s, and is now around 25s. Shippers, though, very often get some measure of relief from the tramp steamers in getting their goods away at a fair price. They may have some space left, and a shipper may have the goods to fill it. It costs these tramps money every day they tie up, so there is often a bargain made at quite a few shillings per ton under the prevailing rate. The tramp fills up her space and gets away, and the shipment gets that much start in the matter of delivery, and there is money saved as well.

With the clearing up of conditions in the war-ridden countries of Europe, Massey-Harris look for a continued development of their export trade.

Handling Export Business

In preparing goods for export there are certain points one must watch carefully. They are stated herein.

By J. H. Moore

HOW do you pack your product? Do you slap some boards around it, stick a brace here and there, stencil the package, or box, with its proper name and destination, then trust to luck for the rest of the journey. If you do, you've got the wrong idea. No matter what the distance, your product should be carefully packed. Should the distance be short, such as local shipment by team or truck, the work entailed is not so great. This also applies to domestic shipment, as generally a good, stout openwork crate will suffice for such purposes, but when you ship to the export trade, you are up against an entirely different proposition.

The damages caused by inadequate packing are already too well known to require comment. Breakage, rust and other attendant evils, even to thieving, generally occur. Many methods have been adopted to overcome these various difficulties, and each firm, adopting what in their opinion is the best practice. Believing that an exchange of these methods would be a good thing for all concerned, we have prepared in this issue various systems adopted. Let us first consider how the Brown & Sharpe Mfg. Co., Providence, R. I., prepare their shipping cases.

Four Important Rules

This concern has four rules to which they strictly adhere. First, they prevent breakage by so boxing and bracing as to protect against, not only ordinary handling, but also against rough usage. Secondly, they see that their product is thoroughly protected against rust, and thirdly, they so arrange their packing as to ensure protection against thieving. Last, but not least, they are very particular regarding invoicing and marking, and at all times aim to meet the many varying requirements of countries to which their goods are shipped.

As we are particularly interested in export shipping, we will pass over their methods of packing for local and domestic shipment and consider only the export trade.

In boxing machinery, there are certain principles which are important to observe. These could be placed as follows: 1. The platform and skids must be strong enough to support the entire machine, and the platform should be attached to the skids by using heavy spikes toed in on a slant both ways to keep the boards from lifting up when barring.

2. The size of the box should be such that when squared up for length, width, and height, there will be a clearance of at least half an inch.

3. The machine should be so blocked in position that if tipped over the weight will be supported, and all delicate parts protected. All blocking should be placed lengthwise of the grain so as to be less affected by swelling and shrinkage.

4.—The top should be sufficiently strong, so as to support any crushing strain which comes on account of the use of a sling in handling when loading on vessels, etc.

5: All small parts, such as wrenches, etc., should be packed in smaller boxes, and attached to the main box in a substantial manner.

Some years ago, a Mr. J. F. Monaghan, who was at that time counsel at Chemnitz, Germany, sent in a report on forty cases of machine parts shipped from America. These were badly damaged in transit, and in his report he called attention to the fact that this serious breakage had occurred in spite of the case being of rugged construction. He commented as folows:,

"The main fault was that the cases were much too spacious for their contents. The heavy material was given the opportunity to flop from side to side, and hence was subjected to tremendous strain when being handled on a rough, rolling sea. The more delicate parts, such as slides, glass plates, and reflectors, should have been packed in separate boxes, with a liberal use of excelsior, or other soft material. Wrenches, latches, bolts, etc., should also have been placed in small boxes.

When assembling a case, make it of sufficiently heavy material. Remember that a box containing a valuable machine of great precision is of no more interest to the laborer or longshoreman handling it, than would be a box of rough building material. Some claim if you mark the case "Handle with Care" that it is assured of careful treatment. As a general rule, little if any attention is paid to such a marking, no matter how prominently it is displayed, or in what language.

Use paper between the blocking and painted surfaces in order to avoid, as far as possible, bruising of the paint. Cover all ways or sliding surfaces with waterproof burlap paper, and wrap all shafts in paper of similar nature. Protect all holes, if practical, with wooden plugs, and always place under the top cover a layer of burlap waterproofed paper. Of course, no matter how careful you may be, accidents can happen.

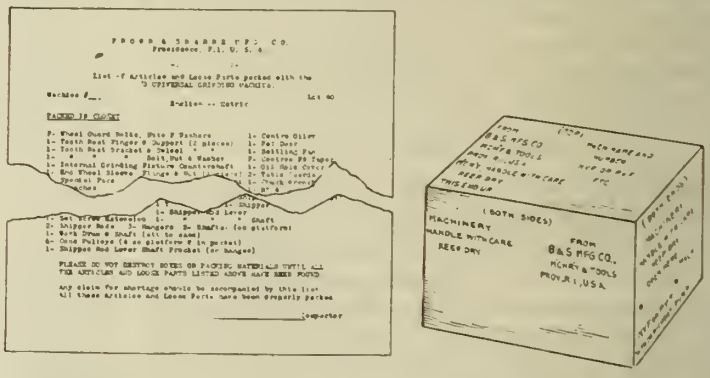


FIG. 5—ONE COPY OF THE PACKING LIST SHOWN GOES WITH INVOICE AND ANOTHER SIMILAR IS PACKED WITH THE MACHINE
FIG. 6—ILLUSTRATING HOW THE BOX IS MARKED.

but if preventative measures are adopted the damage toll will be reduced to almost nil.

In order to present by photograph an actual example of boxing for foreign shipment, we refer readers to Figs. 1 to 4 These pictures illustrate various steps in the packing of a Brown & Sharpe Universal grinding machine. In this case, the platform and skids are arranged to support the base of machine and other small parts. It will be noted that paper is placed between the base and platform for the purpose already spoken of. The pulleys rest on blocking and are firmly held in position. A wooden plug is passed through the holes in these pulleys, then held by the blocking shown. The countershaft hangers are held down with not only blocking, but lag screws as well.

All loose parts, or parts which might become loose are wired in position, or packed separately. It might be well to add that the cupboard of a machine is a mighty handy place in which to pack small parts. The table is lifted from the ways, which are slushed with thick lubricating grease, as is also all interior finished mechanism. The outside is slushed with a good heavy compound. Pine strips are inserted between the table and its ways, and on these the table rests. This arrangement separates the teeth of the table rack and pinion and ensures that shock in transit will not break the teeth.

At Fig. 2 in the foreground can be seen the box in which the grinding wheels are packed in sawdust. The cover of this box is not nailed, but screwed on, to reduce the danger of breakage. This box is so located that it can be readily removed without disturbing other parts of the packing in case the machine is ordered without grinding wheels. This is a provision well worth observing in any type of packing. The cone pulley shown at the right has projecting hubs, and can thus be held in position by the hubs fitting into holes in the blocking.

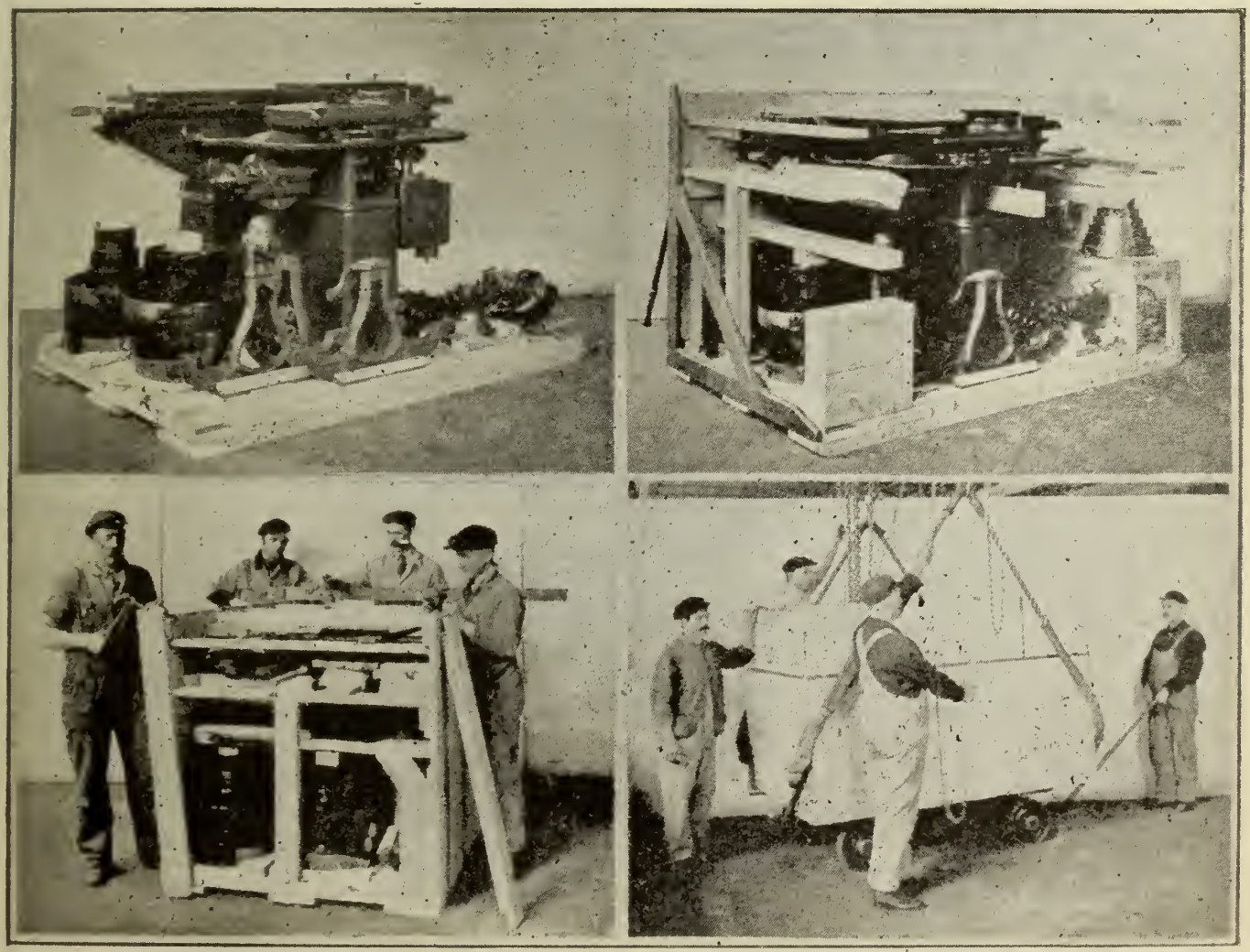
Fig. 3 illustrates four men engaged at further stages of the case. One of these men is always a gang boss, the others working with him. In the B. & S. plant, the packing of all regular machines is standardized, and after once having proved satisfactory, a card record is made of all the details of the boxing, and a stick marked with important dimensions is also kept on the job. This guarantees that should a new gang of men, who have not boxed the particular machine before, but are familiar with the B. & S. method of boxing, can, from instructions at hand, box the machine without difficulty.

The remaining photo, Fig. 4, illustrates the use of metal box strapping bands to further strengthen after boxing, also the method of using a sling in handling the boxed machine for storage or shipment.

A very important point to watch before boxing is that the machine be handled in a way to avoid danger, both to the workman and to the machine. Always look out for the possibility of chafing or cutting of the rope, and where necessary insert a block of wood to overcome any such tendency. Should you sling a rope round a shaft or some finished part, protect that portion with a cloth or some such article. Watch also the slipping tendency, for the slipping of a rope has caused many an accident.

We have already stated the necessity of slushing the inside finished parts wit thick lubricating grease, and the outside parts with a heavy compound. In the plant we are speaking of, this compound was selected by exposing to the weather during long periods of time, various samples coated with different preparations, and, of course, the preparation showing the best results was adopted.

Several kinds of specially prepared papers are used in packing, as it has been found that newspaper, or in fact any ordinary white paper, even when used over the slushed surfaces, encourages rust. A special paraffin paper,



FIGS. 1 TO 4—ILLUSTRATING VARIOUS STEPS IN THE PACKING OF A UNIVERSAL GRINDING MACHINE.

coated on both sides, has been found very satisfactory for this purpose. The waterproofing paper used inside the cover of the boxes is made of prepared tar with burlap rolled in. This style paper is also put on as an additional covering on the entire box should there be any possibility of its being exposed for a long period to the weather. This condition especially applies to large cases which cannot be placed in box cars, and where, due to congestion of shipping, boxes may stand in exposed places for long periods. For small tools, they use what is known as the "Puritan" brand of oil to protect all finished surfaces. This serves both the purpose of a lubricant, and a rust preventative. For general packing of small tools, a heavy waterproofed paper (15 lb. weight) is used. It is not so heavy or stiff as the burlap paper.

A very interesting example of unexpected exposure with no serious results is given by this concern. This was a case of two vertical millers that had been shipped to go to Russia, and were returned over a year afterwards having been in continuous transit. The cases showed the effects of the weathering and rough handling, but on unpacking, the machines were found to be in perfect shape for reshipment.

Other incidents have occurred where cases have fallen into the salt water, and been under water for several days with no ill effects. For some foreign shipments, especially for small tools, a complete zinc lining is placed in the box. The box, when enclosed and soldered, make a complete protection against rust from outside causes.

A difference of opinion exists as to whether in some cases waterproofing covering may be a detriment rather than a help in preventing rust, because some claim that when dampness once penetrates a case, if it is covered, it holds the dampness longer, and therefore does more damage. This, of course, all depends on how the case is protected, and the B. & S. people are of the strong belief that the more thorough the provision for keeping out the dampness, the better the condition in which the machine will arrive.

Unpacking Should be Watched

Is is a peculiar fact that the more thoroughly a machine is packed, the more care is needed in unpacking, to see that none of the parts are lost. One illustration was cited where parties receiving a machine wrote back and stated certain parts mentioned on the packing list were missing. After considerable correspondence the parties receiving the machine decided to look at the portions of the case, to make dead sure the missing parts were not there. A search in the boiler room, where the boxing had been burned, disclosed the remnants of the missing parts which had been through the fire. The portions under discussion were long shafts packed in a long box, and which were mistaken for blocking timber.

In another case the foreman of the packing department travelled quite a distance to prove that the parts which were claimed to be missing had actually been sent. It was treated rather as a joke that he should imagine he could discover the parts after all the search that had been made, but he did just the same, among some packing from another machine.

It is in such cases that the value of a packing list becomes apparent. By having a list such as shown at Fig. 5, signed by the inspector, and verified by the man who boxed the machine, there should be little danger of parts being overlooked.

In the case of very small parts, it is sometimes the practice to make the box larger than the size of the parts in order to draw attention to them. The box has even been painted red in some cases in order to attract attention. The more a machine is dismantled in shipping, the greater the danger of parts being lost, or of difficulty in assembling. Or in such cases special instructions, in addition to the regular printed matter, should be supplied.

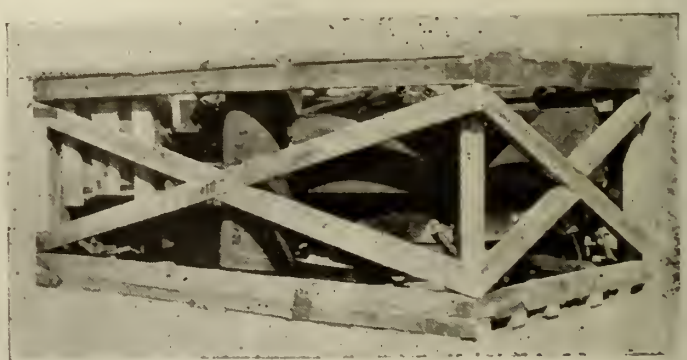
The concern spoken of follow out certain rules for marking their boxes or crates. Fig. 4 and Fig. 6 are good examples of this. The object of marking on both ends and sides is so that whenever boxes are stored, either at the plant, or in transit, whichever side is exposed, always designates its contents. Special markings in foreign languages are very seldom called for, the English weights, etc., being easily understood. Much trouble in shipping is caused by putting the marking on tags, or cards, instead of painting directly on the crate. Never mark a tag for quickness' sake, for the minute or so saved, may mean weeks' delay. Another careless habit is the leaving of some old marking, if using second-hand lumber. The motto of careful shippers should be: "Make sure you are right, then make sure again."

Always get proper information as to the conditions and requirements of the country to which you are shipping. By doing so you will avoid both expense and delay. If at all possible keep the dimension of your case so that it will enter the door of a box car. In shipping small tools some style of manifold form will be found convenient. A good plan is to have six copies, one for the office, one for the stock room, one to be packed and shipped with the goods, one for a numerical record of the shipment, one for an alphabetical record, and one for the correspondence department. Different colored inks can be used for these different sheets.

The main point to be remembered in packing of goods for export is the long and rough journey ahead of them. If you are going a long journey you would make all due preparations to arrive at your destination in as good condition as you left. How much more so then should you see to it that your product, which is after all a part of you, should be so packed as to arrive in perfect condition.

Using All the Shipping Space You Pay For

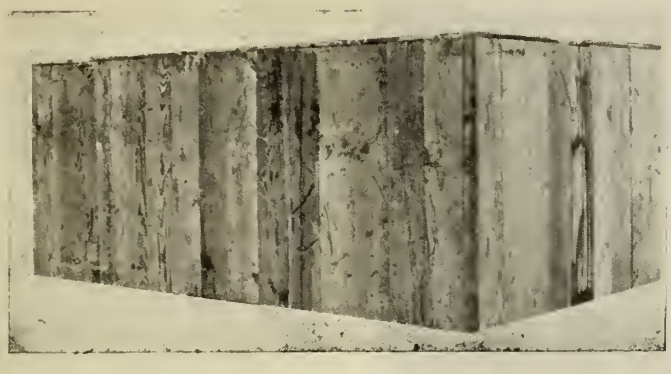
DURING the past few years much has been written about exporting. Especially has the manner in which Canadian and United States manufacturers box their merchandise for export shipment come in for reams upon reams of adverse criticism. No doubt some of this criticism is quite justifiable, but we believe poor packing is the exception rather than the rule among the North American manufacturers, who are making a real effort to gain a foothold in foreign markets. So comments Mr. W. W. Clark, export manager of the Hart-Parr Company of Charles City, Iowa, in answer to our request for information regarding their system of packing their well-known line of tractors. He proceeds as follows:



THE CRATE AS IT APPEARS BEFORE THE COVERING GOES ON.

A few months ago the writer enjoyed the privilege of standing on a foreign wharf and of watching a cargo of American merchandise unloaded. Case after

case of merchandise was swung from the hold by the mammoth winches, to be deposited on the pier. Hundreds of manufacturers in Canada and the United States were represented, and there were all kinds of articles ranging from condensed milk to heavy plantation machinery.



NOTE THE COMPACT AND SOLID LOOK OF THE COMPLETE CASE.

During the several hours that this work was watched, just two breakages occurred. One flimsy case of hardware buckled in the middle and pots and pans rolled into the ocean with a great splash. The second breakage was of a number of boxes of a North American medicinal water, which was put up in boxes jointed at the end but not nailed. They were not sturdy enough to stand the strain put on them in the swing and as a result the fish in the bay received a dose large enough to cure all their ailments for the next fish generation.

We might hold these two examples of careless packing up for our readers as a testimonial to the glaring lack of understanding on the part of our manufacturers of what is necessary in the way of packing service to overseas customers. Most of our contemporaries are doing that. But we don't think that such a policy is right or just. We were very much more impressed by the evidence that ninety-nine per cent. of our manufacturers do know how to pack and that their goods to arrive at foreign ports in just as good condition as the day they left the factory.

The problem of the hardware or condensed milk manufacturer is tame compared with that of the manufacturers who are introducing into overseas markets the agricultural machinery which has made our country famous. The tractor manufacturers especially have had to solve a big problem in the matter of crating their machines in such a way that the minimum of space will be used and that at the same time tractors may arrive at the foreign destination ready to go into the field with no parts broken or missing.

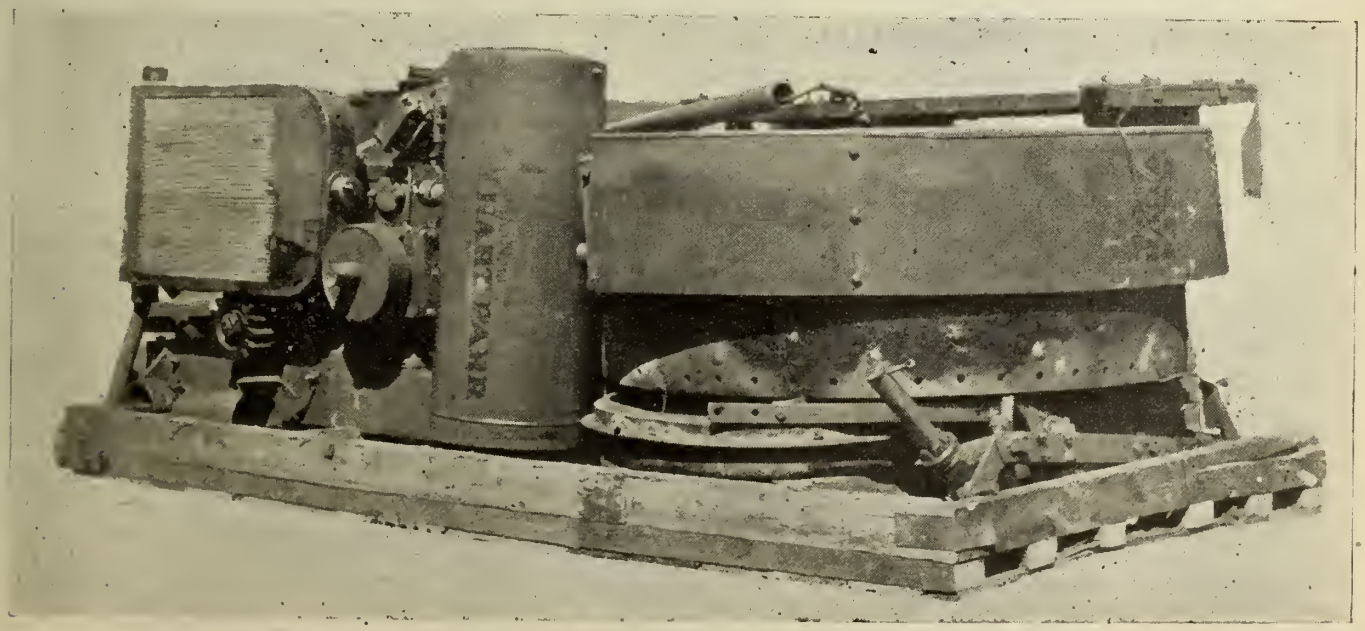
For the benefit of readers who may not be familiar with ocean freight tariffs, we will explain that all merchandise pays either by weight or measurement at the option of the transportation company. The tariff on tractors to a foreign port is so much per ton or so much per cubic foot and in practically all cases the cubic foot rate is the one which is applied. Under these circumstances it behooves the manufacturer to protect his foreign customers in the matter of freights by reducing the number of cubic feet in the case to the smallest possible figure.

As an example of the systematic carefulness tractor manufacturers in general are showing in connection with their export business we will cite our own case, as naturally we are more familiar with it, than others. During the past year we shave shipped several hundred of our model "30" tractors abroad and among all those tractors which have been subjected to all the hazards of five oceans, only two small castings have been reported broken.

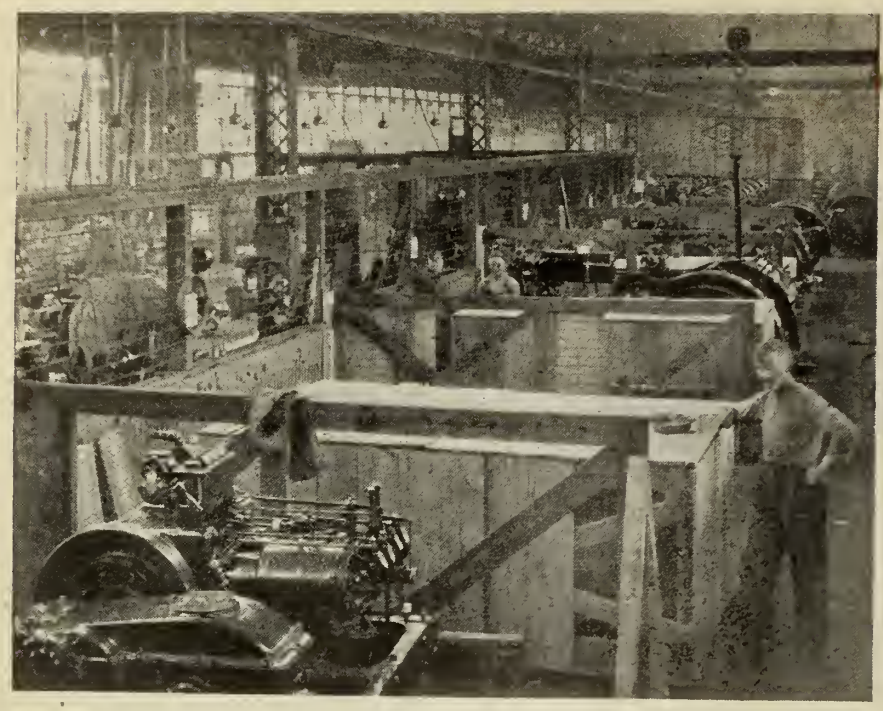
This excellent record is not the result of a run of good luck, but a result of the same specialized effort and rigid inspection that has made our tractors one of the leaders in the domestic markets. Before a tractor was ever exported, we tried out numerous styles of crates. To gain compactness and therefore economize on freight for our customers we found it desirable to partially dismantle the machine. That we have succeeded in utilizing every available inch of space in our case is shown by the photographs reproduced. The customer is not paying for any waste space on a case like this.

Space reduced to a minimum, the problem of absolute security had next to be solved. A study of the photographs showing the design of the case will be well worth while. Note the double sill of two by fours on which the tractor rests, the heavy reinforcements in the construction of the frame, the corner straps of steel. In the case, every part is securely bolted, wired, or pinned to the rugged case floor. Nothing can roll around. No one part may chafe against another and before the case is sealed, a waterproof paper is put inside the tongue and grooved lumber siding so that the tractor reaches its buyer just as bright and shiny as the day it left the factory.

Another of the photographs accompanying the article illustrates our busi-



NOTE HOW EVERY CUBIC INCH OF SPACE IS UTILIZED IN THIS ARRANGEMENT.



EACH TRACTOR IS DISASSEMBLED AND PACKED IN A SEPARATE STALL.

ness-like methods followed out in boxing our tractors. A portion of our plant is given over entirely to the export boxing department. As the tractors destined to be shipped to overseas territory leave the paint shop a giant crane swings them into place in the boxing department. Each tractor to be boxed is set in a separate stall. There are eight of these stalls, each partitioned off from the other so that when the parts are taken off the tractor preparatory to being put into the case, there is no chance for them to become lost or mixed with parts from another machine.

In this department, as in all others, we follow our theory of massed unit production. One group of men go from stall to stall dismantling the tractors. Close on their heels follow the packers who place the dismantled machine on the floor of the case, leaving it in the condition shown in photograph. The result of the same packing specialists doing all of this work, is that every case is packed in the same manner, and because these men do nothing but pack export cases, not only can they accomplish a great deal more work in a given time, but, what perhaps is more important, their long experience in this class of work has taught them how to get every piece in the place which the experiments of the company have proven to be most secure. The carpenters next set up the sturdy framework, envelop the machine in waterproof paper and nail on the sides. Finally the marker, with instructions in hand, stencils each case with the proper shipping marks, thus forming the last link in the long chain of workers, each of whom does his little bit toward preparing the case in the proper manner.

Do not think that this system of packing is the result of guesswork on our part or that we were lucky in hitting on a good design. We have spent a good many dollars in experimenting and knowingly breaking up valuable machinery before we were satisfied that our export packing was as close to perfection as it could be made. Case after case was packed with a tractor. Not until a method of packing was found which would permit the tractor being picked up by a crane and dropped several feet, rolled over several times side-wise and end for end, in short, submitted to worse strains than any tractor could normally be expected to undergo in ocean shipment—not until the crated tractor could pass through such a test and come out unscathed were we satisfied as to overseas packing.

We believe our case as we have cited it is far more typical of the service foreign buyers are receiving from North American manufacturers than are the isolated cases of poor packing concerning which a woeful howl has echoed and re-echoed undiminished through journalistic pages for the past decade. Let's quit giving our foreign competitors sales arguments to use against us. If there are still manufacturers who do not know how to pack, let's try to teach them by example rather than by scathing censure which casts a reflection on the other ninety-nine per cent. who are blameless. In short, when it comes to North American export packing, let's throw away our hammer and buy a horn.

Applying System to the Packing of Millers

"IN preparing for export shipment, just what procedure do you adopt?" This was the question we put to the Ford-Smith Machine Co., Hamilton, Canada, and following is the gist of the information we received. It might be well to add that this concern ship their millers and other products to India, Australia, South Africa, Belgium, England, Russia, Japan, and other countries, so that their method of packing and shipping is worth while studying.

The big secret in making export business a success, said this concern, is to thoroughly understand what you are undertaking. Every country has its own peculiar requirements as to methods of shipping, and these should be thoroughly studied. Some people run away with the idea that the export business is chuck full of red tape and technicalities. This is not the case, for if you proceed in the correct manner, the handling of export trade is just as easy as domestic business.

In our particular case, we make it a point to handle export business in one way only, in as far as payment is concerned. We have an arrangement whereby we receive payment as soon as our goods leave the factory. Of course, readers will understand that we simply present the draft to the bank and they pay on sight.

Suppose we take an imaginary case. We will suppose that someone in South Africa has placed an order for 24 millers and 36 grinders, but has placed this order through our New York agent. What happens? He notifies us as to his receiving an order for such and such a quantity of machines, and requests that we wire him when we can ship these goods. We do so, and also mail him a pro-forma invoice confirming our wire. This invoice is simply a verification of our wire, and shows when we expect and hope to ship the machines.

As soon as he receives our wire, or pro-forma invoice, as the case may be, and taking it for granted the same is satisfactory, he arranges for what is known as a G.O.C. permit from the United States Traffic Control Commission at 59 Broadway, New York. This commission handles and controls all traffic through the States at the present time, and anyone shipping goods to other countries from United States ports must have such a permit.

The agent having secured the permit mails the same to us with all necessary shipping instructions. It might be well to add that this permit generally allows a latitude of some two weeks from approximated shipping date, so that you are by no means tied down to a specified date.

On the back of the official order, which is sent at the same time as the G.O.C. permit, there is usually printed all necessary shipping instructions. To give a concrete example we refer the reader to the following instructions, which were printed on the back of such an order:

Instructions

No. 1 Orders. Acknowledge receipt of order by filling out and returning the acknowledgment card we send attached.

Invoicing

No. 2. Invoices should show order number, mark, gross and net weights, in lbs. and kilos (kilo—2.20 lbs.), contents and measurements of each package. Also kind of package used, whether crate, case or bundle. Send invoices to us at latest on the day following shipment of goods from factory.

No. 3. State net weight (and size of electros), of printed matter separately and case in which packed.

Explanation of Weights

No. 4. Net weight is the weight of the goods alone without any packing whatsoever.

Legal weight is the weight of the goods, plus the weight of interior packages, such as glass, tin or cardboard receptacles, in which the goods are contained; but not including the outside protecting case.

Example: The legal weight in any article in glass, packed in boxes, would be the weight of the article plus the weight of the bottle, but excluding the outside case. When there is no interior packing, the legal weight is the same as the net weight.

Gross weight is the combined weight of the goods and all interior and exterior packing.

Packing

No. 5. Each order must be packed separately. Use strong substantial cases and do not make any package excessively heavy. Iron strap all cases. Pack in as small a space as possible. The condition in which the goods arrive governs the customer's judgment of the goods, and it depends entirely on the packing.

No. 6.—Goods, cartons and packing cases must be marked "Made in Canada."

Shipping

No. 7. Ship promptly. A day's delay at the factory may mean that we miss a steamer, and thus the delay here may be a month or more. Slow shipment means limited consumption of the goods; besides creating a bad impression on the buyer as to your facilities for executing orders.

No. 8.—Ship via fastest freight line.

No. 9.—Prepay freight. Show export marks and the words, "For Export" on B-L. Send R.R.B.L. to us the day after the goods are shipped, at latest. Do not fail to show on B-L our address, 44 Whitehall St., New York City.

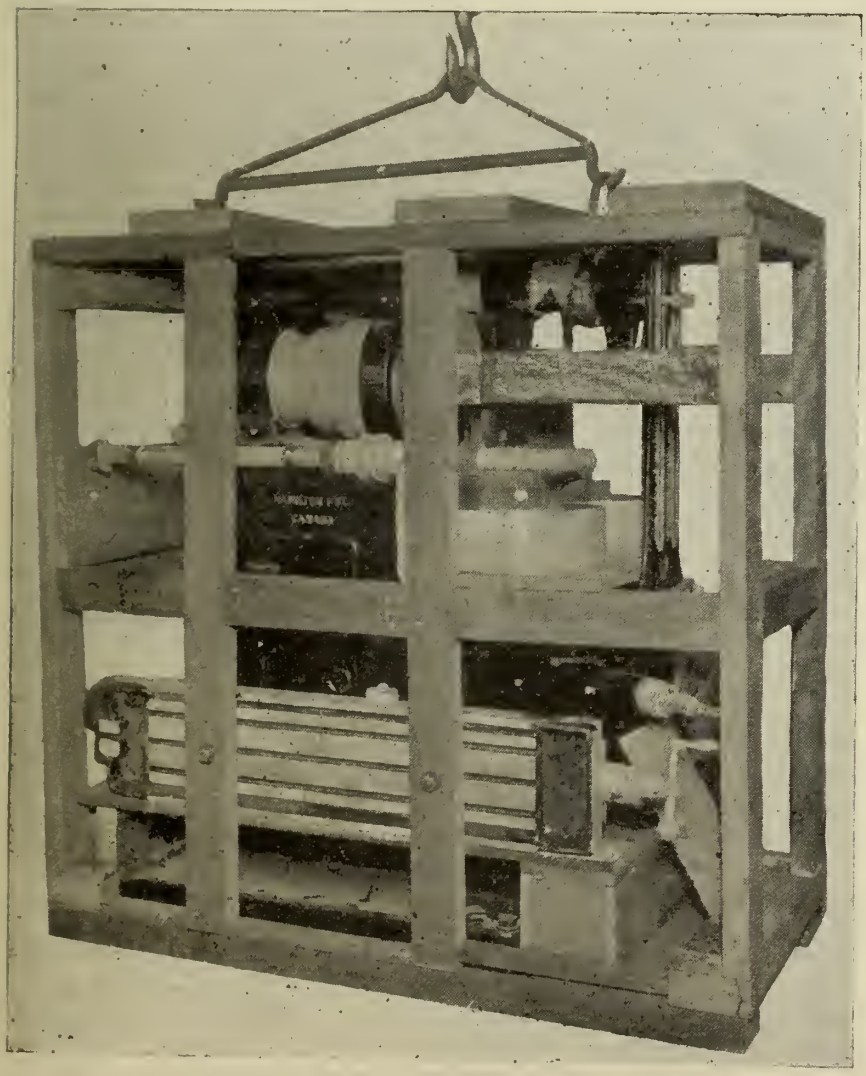
Marking

No. 10. Mark each package with stencil—on four adjacent sides. Marks must be clear. Our name and address should appear on a tag tacked on the case. No other marks should appear on cases except the export mark we give you and the gross and net weights in lbs. and kilos.

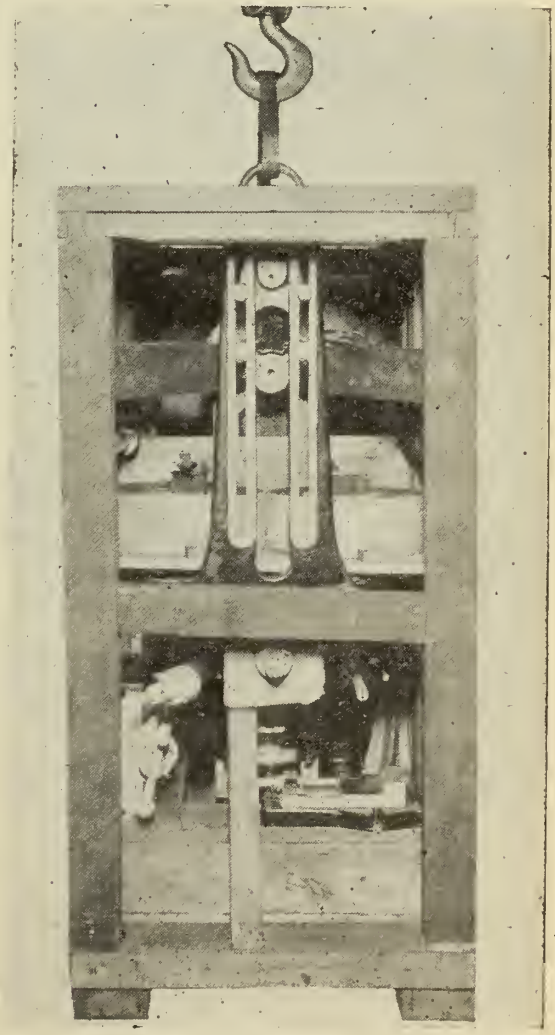
Failure to carry out instructions will oblige us to hold you responsible for consequences.

PASS THESE INSTRUCTIONS TO THE PROPER DEPARTMENTS

In this case quoted the instructions are very simple, but, of course, in other cases the instructions are more varied. It depends entirely on the nature of the goods, and to what country they are being shipped. For example, any goods shipped to South Africa must have the



THIS ILLUSTRATES HOW THE MILLER LOOKS FROM THE SIDE.



AS IT LOOKS FROM THE END.

price of the machine marked on the invoice, also the cost of the case, and as noted in the previous instructions, catalogues, electros, etc., must be stated clearly and separately from the rest of the contents.

We make an unfailing practice of stencilling the cases on all four sides, that is, the two sides, and the ends. On every order we get some sort of a simple shipping mark to go by, and in one particular case this took the form of the letters A D S inside of a diamond shaped frame. This shipping mark is easily remembered, and the loaders at the boat can quickly pick it out. Another simple mark we have had was simply the name McLeod, 56, Calcutta. From these two cases readers can no doubt grasp the principle.

On the upper left-hand side of the case we stencil the gross weight, the net weight, and the case number. At the lower left-hand side we stencil the size of crate in cub. ft., and at the lower right-hand side we state the destination and the fact that the goods are Canadian products.

Leaving the actual packing of the product to the last, let us suppose we have completed our order, packed the goods, and notified the railroad to send their motor truck for the same. We now make out certified invoices and send them as follows: We forward six certified invoices and packing lists to customers New York agent. We send two copies to the transportation company, also two copies of the custom entry papers. The bills of lading are, of course, filled out in the usual manner, with the exception that more are made out than in the case of domestic shipment.

Away goes the goods to the New York port, where the customers shipping agent attends to them and sees they are placed on the boat at the proper time. We know everything is all right as soon as the goods leave our plant. The main point is to state on your proforma invoice a shipping date that you can actually meet. Ship as near that date as possible and avoid confusion and congestion. We believe a great deal of success on our part is due to watching these points.

Regarding Packing

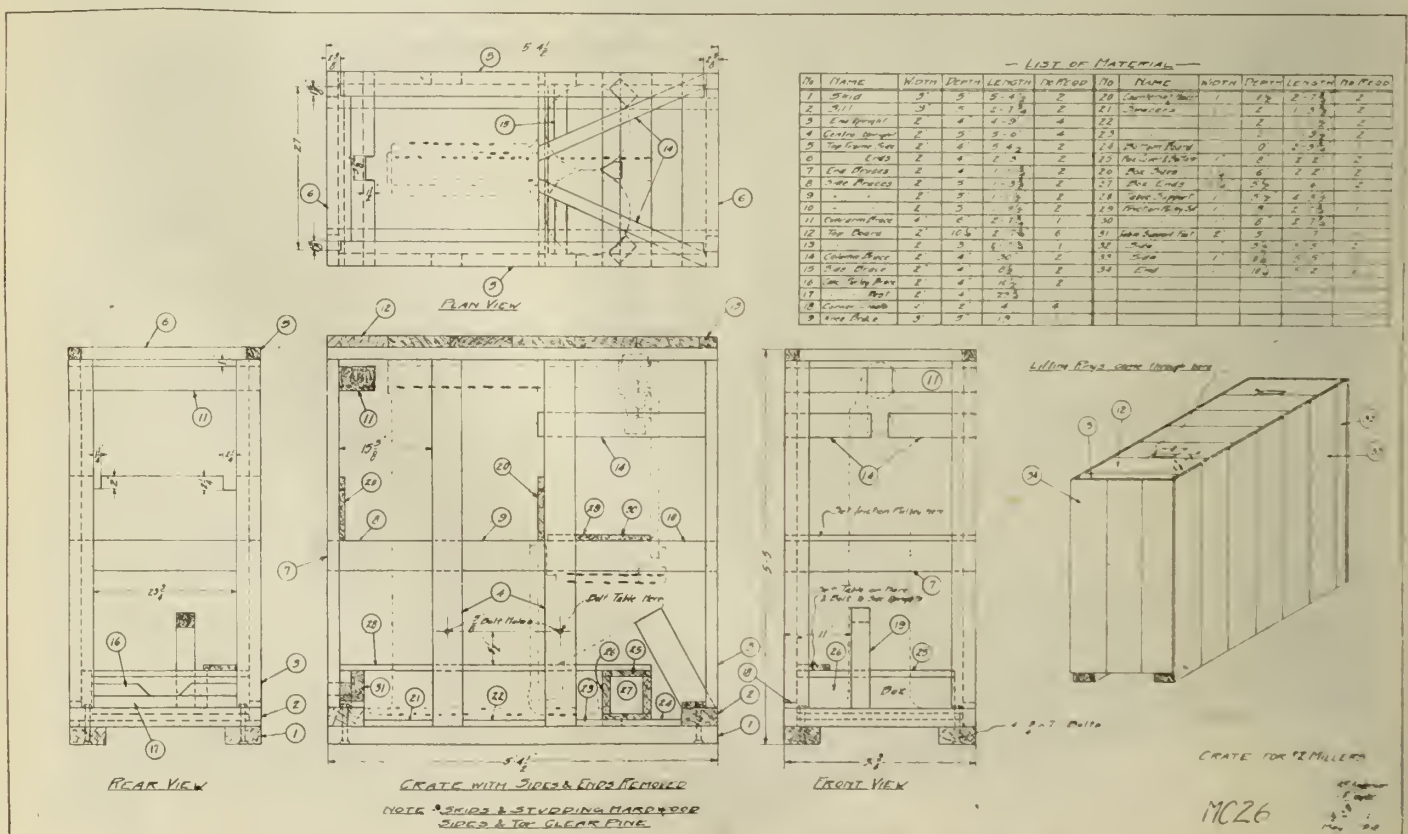
Of course, we know that in all respect to watching the shipping instructions, one could watch them for all they were worth, but their goods would never reach their destination if not properly packed. Packing is the stumbling block in export shipping. Some believe any old thing is good enough, but this is an erroneous impression. An export case must be perfect, for it stands, or should stand unexpected strains. A workman at the docks does not care what is in your case. He knows he has to get it into the hold quickly, and quickly it goes. If you have not built your case sufficiently strong, then it's up to you.

It pays to spend a bit of thought on how to pack your product. Personally, we devoted considerable study to the matter, with the result that we have our cases standardized. Fig. 1 illustrates how our No. 2 miller looks in its case before the outside covering goes on. Note how well every part is braced. Nothing can rock or chafe on another part with the result that the machine arrives in perfect condition. We paint all polished and machined surfaces with a special rust preventative, and, of course, use waterproof paper inside the case before the outside boards go on.

We would suggest that readers do not merely casually glance at this photo, but study all the details, for it is really the small details that count. Fig. 2 illustrates how the machine appears from the end. It will be noted that provision has been made for hoisting hook rings to go through the case and we do this on all our miller cases. To illustrate to what an extent we have gone in standardizing our cases, we refer you to Fig. 3, which gives the details of our No. 2 miller case. Our material list states all particulars as to size, etc., and the detailed view illustrates clearly the construction, so that even a new worker can be sure of preparing a perfect case. We always place band irons around the outside of our export cases, and we cannot too strongly emphasize the importance of proper packing.

Other Features to Watch

There are numerous other points to be watched, but it is, after all, a case of practice makes perfect. The more experience one has in export business, the more simple it becomes. For example, the usual form of f.o.b., New York, is not good practice in stating price re export business. F.O.B. New York can mean both f.o.b. the railroad cars to New York, or transportation to the hold of the ship. Always be specific, otherwise you will lose some



A DETAILED DRAWING OF THE CASE SHOWING ALL PARTICULARS.

money. We usually ship our product f.o.b. railroad cars to point of shipment. Another case is the C.I.F. mark. bourne.

We have shipped goods C.I.F. Melbourne. This, of course, means that we covered the cost of both insurance and freight to that point.

In making up a shipping package remember that the steamship companies have the priviledge of charging you by weight or by cubic measure. 40 cubic feet equals 2,240 lbs., as far as the shipping companies are concerned, so that it behooves you to pay attention to this point, for by careful packing you can save yourself some more money.

Never guess that you are right. Be sure. The Canadian Trade Commission at Ottawa get out a handbook for exporters, and valuable information is contained in these books, which are issued regularly. As they state themselves, "Exporting firms are advised to communicate with the Canadian Trade Commission regarding any matters on which they require specific information."

The different express companies also issue various books of shipping suggestions to the different countries, and they are well worth securing. The Canadian Manufacturing Association issue bulletins of interest, and there is no reason why those desiring to cater to export business cannot do so without any difficulty. After all is said and done, your forwarding agent is really the one who arranges the shipping route. Your best plan is to place your forwarding business in the hands of a reliable firm, forget about that end of the business, and manufacture your goods as speedily and as perfectly as possible. Remember that it depends on how you treat your export business, how it will, in turn, treat you.

Export Shipping is a Standardized Science

WHEN you start to consider an export system capable of being applied to all the plants under the direction of the International Harvester Co., Ltd., then you enter upon a method which has been standardized only after long years of experience. The system as adopted by the Hamilton plant, and which we will describe herein is of course the same as adopted in all other branch plants. The Chicago office, which is the headquarters of the company mentioned, is the pivot point of the complete system.

As they ship to all parts of the world, they have at each plant various traffic experts, men who thoroughly understand their business, and at the Hamilton plant they have a self-contained traffic dept., which takes care of all inland lake shipping. As we are however chiefly interested in the export system, we will ignore the domestic method altogether.

The Question of Packing

In practically every case the weight of their products is so small, that the shipping companies charge them by cubic measurement, and not by weight. This necessitates great care in the arrangement of packing, as every cubic inch wasted means added expense. They export a great amount of material every year, and the total loss by careless packing would be very great indeed were not this point so carefully watched.

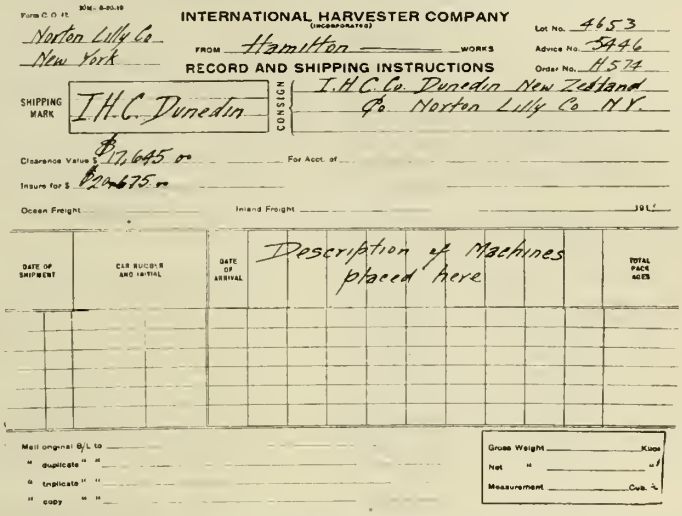
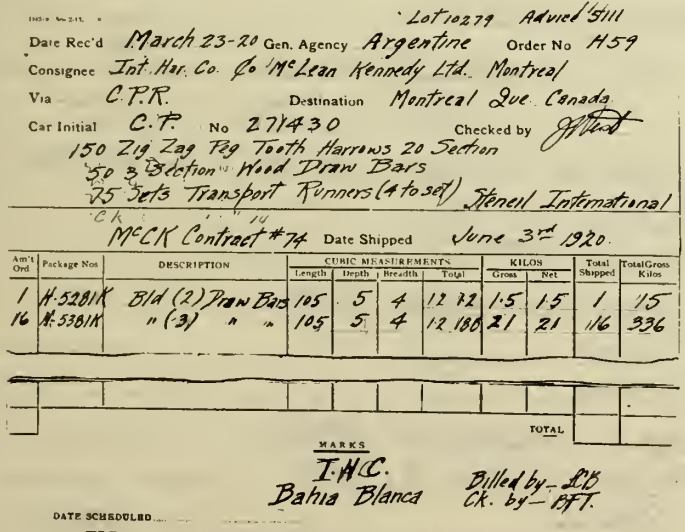


FIG. 2—THE STYLE OF RECORD AND SHIPPING INSTRUCTION FORM USED.

Standard styles of cases, crates, etc are made, depending upon the article or machine being packed. This packing, of course, is handled by the packing dept. only. Band iron is used to protect export cases from damage, and inch lumber is as a general rule used for the outside casing, although on plow and some such heavy machines, stronger lumber is used. In all cases, however, the lumber is made a little over the required strength.


Lot 10279 Advice 5911
Date Rec'd March 23-20 Gen. Agency Argentine Order No H59
Consignee Int. Har. Co. c/o McLean Kennedy Ltd. Montreal
Via C.P.R. Destination Montreal Que. Canada
Car Initial C.P. No 271430 Checked by JJ Flood
150 Zig Zag Peg Tooth Harrows 20 Section
50 3 Section Wood Drag Bars
75 Sets Transport Runners (4 to set) Stencil International
McCK Contract #74 Date Shipped June 3rd 1920.

Am't Ord	Package Nos	DESCRIPTION	CUBIC MEASUREMENTS Length	Depth	Breadth	Total	KILOS Gross	Net	Total Shipped	Total Gross Kilos
1	H-5281K	Bld (2) Drag Bars	105	5	4	12 72	1·5	1·5	1	15
16	H-5381K	" (3) " "	105	5	4	12 180	21	21	16	336
									TOTAL	

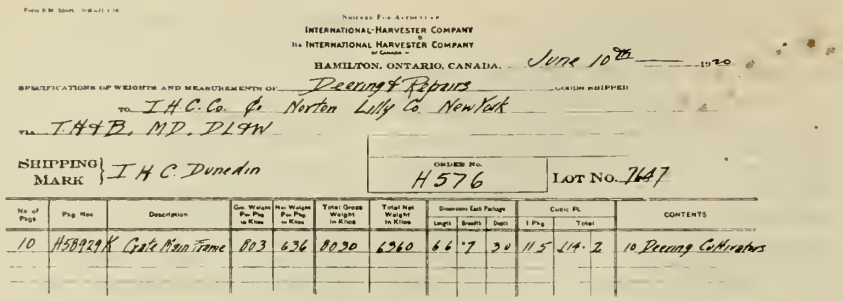
MARKS
I.H.C.
Bahia Blanca
Billed by RB
Ck. by RFT.
DATE SCHEDULED

FIG. 1—ILLUSTRATING WHAT IS KNOWN AS A TALLY SHEET.

To thoroughly understand the procedure adopted by this concern, we will take an imaginary case to illustrate the system. As stated previously, Chicago is the head office, and all orders of course come from there.

We will suppose we are following an order which has just been issued from the Chicago office to the Hamilton office. This order on reaching Hamilton arrives at the proper clerk on this work who enters the order. This might read as follows: "Make 500 eastern drills, type so and so." No destination is stated, nor is any customers name mentioned. The number of machines to be manufactured, with whatever special attachments may be ordered, is all that is given. This order is what is termed a manufacturing order.

Specification lists, which are already prepared for all machines made by this concern, are issued by the experimental department, and these are consulted.



INTERNATIONAL HARVESTER COMPANY
of
New INTERNATIONAL HARVESTER COMPANY
of Canada

HAMILTON, ONTARIO, CANADA. June 10th 1920

SPECIFICATIONS OF WEIGHTS AND MEASUREMENTS OF Deering & Repairs CASES SHIPPED

TO I.H.C. Co. % Norton Lilly Co. New York

VIA I.H.B. N.D. D.L.H.W.

SHIPPING MARK I H C Dunedin

ORDER No. H576 LOT No. 1647

No. of Pkgs	Pkg Nos	Description	Gr. Weight Per Pkg in Kilos	Net Weight Per Pkg in Kilos	Total Gross Weight in Kilos	Total Net Weight in Kilos	Dimensions Each Package Length	Breadth	Depth	Cubic Ft. 1 Pkg	Total	CONTENTS
10	H58929K	Gate Mow Frame	803	636	8030	6360	66	7	30	115	114.2	10 Deering Cultivators

FIG. 3—SPECIFICATION AND MEASUREMENT SHEET AS ADOPTED BY THIS FIRM

These lists not only show what the machine consists of, but what parts are peculiar to the different countries. This point can be readily understood as agricultural machinery can differ considerably to suit the various soils.

An order for the parts as stated on these lists is now isued on the factory. The various departments get busy and eventually the machines are completed. They now go to the packing department, but before this dept. can pack the goods they must receive from the planning dept. as to how the goods must be packed. special packing lists are made out for this purpose which the packers must follow. In previous issues we illustrated some of the packing systems as adopted by this company.

Now comes a shipping order from Chicago. On this order is placed the country to which the goods are to be shipped. The factory order, and the foreign order numbers are also placed on this shipping instruction order. The receiving of this order is entered in a record book for the purpose, and the order is passed over to a ledger keeper who is acquainted with progress of the work.

The tally card as hown at Fig. 1, is now partially filled out. All the upper portions of this card possible are filled out and the card is sent to the inspection department to be checked.

Advice notes are next issued, and copies of these are sent to the different parties interested. In this case, six are sent out, one to their own traffic manager, one to their agent in New York, one to the foreign sales dept., and three to the traffic dept. in Chicago. This procedure would differ of course in other plants, so that six is by no means a standard number to use.

The ledger keeper now looks up to see if the goods are packed, and if so the tally cards as shown at Fig. 1 are sent up to the shipping dept. where they are filled out as the cars are loaded.

The bills of lading are next in order. Five copies are made out, the first, the original, the second, third and fourth for company record purposes, and the fifth for the railroad for custom purposes only. As the standard bill of lading is used there is no need to reproduce this already well-known form of bill.

The record of shipping instructions form as shown at Fig. 2, is the style used by this concern. For illustrative purposes we have filled in certain sections of this form. Four copies are issued, one for their files, one to Chicago office, one to foreign sales dept. of the same office, and the remaining one to the agent at New York, or whatever port it may be.

The invoice form as used by this concern is of the usual design, so no mention need be made.

The customs forms are also of standtard type, so we will take it for granted that readers are familiar with this procedure. There are other numerous forms which are used but are only peculiar to this concern, so in order to avoid confusion we will ignore them altogether.

A very interesting sheet is that known as the specification and measurement sheet. This is illustrated at Fig. 3. For the purpose of example we have filled out a portion of the sheet. A very handy method is employed to find the total cubic ft. of each case, a set of tables known as Nash's Merchant and Seaman's expeditious measure being used. This set of tables gives at one reading the solid cubic contents from the length, breadth, and depth dimensions Baker and Taylor Co., 354 Fourth Avenue, New York, are publishers of this book, and a copy is well worth having.

In a special file in the traffic dept. is kept a list of shipping instructions as standard for the standard for the different countries. For example, refer to Fig. 4. Here we see all particulars as to procedure adopted for shipping goods to Dunedin, New Zealand. Other forms for the various countries are made out in similar style.

To go into the multitudinous methods as practised by this concern would not accomplish anything definite, as ma steps taken by them would not apply to the average case, so that we will leave the matter o the various forms used at this point and conclude by generally summarizing up what, in their opinion, constitutes sensible export shipping.

First, leave the shipping arrangements to those who understand such a business. Every firm cannot afford to have their

Continued on page 15

Country - New Zealand

Shipping Instructions

I.H.C. Co. Dunedin New Zealand
Agents Name + Address

Are we to arrange for freight? Yes - Prepaid Oc. F.

" " " " " Insurance? Yes. At invoice value plus 20% + Oc. Fr.

If freight is arranged for by consignees what is name of forwarder

Will we cover Marine Ins. — Yes

" " " War Risk — No.

Dispose of Shipping documents as follows

Original B/L to

Duplicate B/L To.

Original Invoice & Meas. Sht. to

Duplicate " " " "

Triplicate " " " "

Copy of Measurement Sheet to.

Balance of Papers to Chicago

Remarks

Date ____

FIG. 4—THE STANDARD FORM OF SHIPPING INSTRUCTIONS AS KEPT ON FILE.

Canada is by no Means a Midget of a Country

We Can Lay Claim to Some of the Largest Engineering Achievements.—We possess the greatest pulp resources, and our industrial Development Has Been Very Rapid Indeed. Read These Facts.

DID you ever pause to consider what a wonderful country this Canada of ours really is? Do you know that we can lay claim to some of the largest agricultural and engineering achievements in the world These facts should be on everybody's tongue, for every true Canadian should be a booster, especially as we have good reason to be proud of the country in which we live.

For instance, we have the largest grain mills, the largest lift-lock, and the largest and richest nickel mines in the world. Our Quebec bridge has the largest span of any bridge in the world, and at our harbor in Montreal is the largest grain conveying system known.

We also possess the greatest pulp resources of any country, and have one of the largest single canal locks at Sault Ste. Marie. At Port Arthur we have the largest elevator in the world, having a capacity of nearly ten million bushels. There is a huge dam at Bassano, Alberta, that is the largest project of its kind on the American continent. Our mines are also noted for their production, and one of our coal mines at Stallarton, Nova Scotia, has the honor of having shown a coal seam measuring 47 feet. This is said to be the largest ever discovered.

We are no midget of a country as the following figures will show. Our area is actually one-third the area of the British Empire, and we have approximately 13,000 miles of coast line. This distance is almost half the circumference of the earth. We can also lay claim to the largest body of fresh water in the world, that being Lake Superior, which has an area of 31,800 square miles.

Our fishing industry is also well known, for we have some 12,000 miles of coast line fishing, and some 220,000 square miles of fresh water fishing. Would you believe that we produce over 80 per cent. of the world's output of nickel, and that on a basis of populati we have the highest ratio of railroad mileage of any country. Take the St. Clair tunnel as an example of efficient engineering. Here is one of the largest tunnels of its kind in the world, the trains being carried through by electric locomotives. One point of particular interest is that this tunnel is actually a passageway between Canada and the United States.

In scenery we take no back seat, for every province is noted for its special style of beauty. We have fishing for those who like to ply the rod, we have mountains for those who like to climb, and last, but not least, big game for those who care to use the gun.

Our water power facilities are simply enormous, and more use of this source of energy is being adapted every day. Our potential water power is approximately twice that of the United States, and equal, if not greater, to any other in the world, over 25,000,000 H.P. are available from this source.

Our agricultural record is something of which we can be justly proud We exported alone during 1919, 35,223,983 dollars worth of dairy produce. We have colleges, agricultural and otherwise, that ensure the correct type of Canadian citizens, and our educational system is general needs no championing. In Ontario alone, we have an approximate forest area of 260,000 square miles, so one can judge our enormous timber limits.

We can also point with pride to our waterway system of transportation. This

DOMINION BUREAU OF STATISTICS

Ottawa, May 6, 1920

1. Summary of the Trade of Canada.

	Twelve months ending March. 1918.	1919.	1920.
IMPORTS FOR CONSUMPTION—			
Dutiable goods	$ 542,319,623	$ 526,475,717	$ 693,643,211
Free goods	421,191,056	393,230,085	370,872,958
Total imports, mdse.	$ 963,510,679	$ 919,705,802	$1,064,516,169
Duty collected	161,588,465	158,044,456	187,520,613
EXPORTS—			
Canadian	$1,540,027,788	$1,216,443,806	$1,239,492,098
Foreign	46,142,004	52,321,479	47,166,611
Total exports, mdse.	$1,586,169,792	$1,268,765,285	$1,286,658,709
IMPORTS BY COUNTRIES—			
United Kingdom	$ 81,302,403	$ 73,024,016	$ 126,269,274
Australia	2,356,655	4,963,446	1,369,218
British East Indies	16,454,226	15,223,434	16,235,738
British Guiana	6,716,647	6,747,072	7,412.931
British South Africa	553,362	1,300,259	676,070
British West Indies	10,550,550	8,437,825	12,093,144
Hong Kong	1,805,515	2,121,909	3,194,959
Newfoundland	2,947,527	3,098,834	2,139,614
New Zealand	3,735,559	7,855,436	3,415,096
Other British Empire	1,611,037	888,207	1,267,322
Argentine Republic	984,955	1,139,267	3,057,269
Belgium	12,973	6,270	911,407
Brazil	990,777	1,156,332	1,973,768
China	1,336,890	1,954,466	1,201,579
Cuba	1,085,547	3,040,953	17,585,528
France	5,274,053	3,641,244	10,604,357
Greece	20,296	33	700,899
Italy	771,187	555,112	999,040
Japan	12,255,319	13,618,122	13,635,680
Netherlands	1,054,176	495,409	2,222,434
United States	792,894,959	750,199,879	802,102,187
Other foreign countries	18,796,066	20,238,277	35,448,655
EXPORTS BY COUNTRIES—			
United Kingdom	$ 845,480,069	$ 540,750,977	$ 489,151,806
Australia	8,653,635	14,019,629	11,415,623
British East Indies	3,774,475	3,831,741	6,762,259
British Guiana	1,978,323	2,646,169	3,109,381
British South Africa	5,065,658	11,992,299	8,649,756
British West Indies	6,838,563	10,200,582	10,868,693
Hong Kong	1,003,900	995,116	1,343,867
Newfoundland	10,191,564	11,325,618	16,176,443
New Zealand	4,089,823	6,227,509	6,987,008
Other British Empire	1,712,366	3,170,149	7,323,323
Argentine Republic	1,203,142	4,603,130	6,126,457
Belgium	4,909,453	950,318	28,463,855
Brazil	974,388	4,088,534	2,703,488
China	1,954,055	2,856,933	6,659,805
Cuba	4,015,940	5,035,975	6,329,783
France	201,053,676	96,103,142	61,106,938
Greece	4,262	16,902	29,588,984
Italy	3,336,059	13,181,514	16,961,312
Japan	4,861,244	12,245,439	7,732,514
Netherlands	2,462,574	198,985	5,653,218
United States	417,812,807	454,873,170	464,029,014
Other foreign countries	8,651,832	17,129,975	42,349,571

method has been a great help in reducing the cost of transportation.

And what of the industrial developments of this Canada of ours We do not need to point out any specific case, for our plants and their products are known all over the world. In that dangerous period of uncertainty, when blood was flowing freely in Europe, Canada not only sent her boys to help, but her industrial efforts as well. That record stands to-day as something unique in the annals of history. The munition business was something entirely new to us, yet we turned out the different styles shells, etc., in record time.

We have over 15,000 factories in Ontario alone, and the total imports for this province up to March, 1919 were $470,650,679, while the total exports were $298,270,478. To state the nature of factories throughout Canada would be to name every conceivable product imaginable. Iron and steel, foundry products, heating appartus, agricultural implements, motor vehicles, and in fact every line of industry is represented.

There is a saying that facts and figures carry more weight than mere words, so lest we should be accused of idle baosting, look at the folliwing items:

In 1879 we done a total trade of $149,489,188; in 1889, $196,309,107; in 1899, $304,227,339; in 1909, $548,139,881; in 1919, $2,185,194,620; and in 1920, year ending March 31st, $2,351,174,886. Note the steady and rapid increase. These figures show that we grew from $35.60 to $261 per capita during the last 41 years. In no department of Canadian industry has development been more rapid than in that of manufacturing, the value of annual production having increased from $71 to $360 per capita from 1881 to 1917.

Export figures show us that in 1920 we exported $1,228,359,325 worth of goods, and in May, 1920, we were $12,000,000 over the mark of the similar month in 1919.

Everthing in Canada is on the upward trend. Our banks paid up capital and reserve is greater than ever before. Our crop situation is better than ever, our insurance companies report more insurance than ever before, and all branches of industry are digging their toes in and intend making 1920 a banner year in every way. Water power development in Canada is proceeding very rapidly. According to a recent computation, the water power resources of the British Empire have geen placed at 50 to 70 milions horse power. To this total Canada contributes in the neighborhood ot 20 milion horse power, and continued investigation will no doubt add to ths figure. It is supposed that after recent installations are complete the total horse power will reach 3,385,000. We could go on quoting figures indefinitely but, why go further. These figures need no comment, they speak for themselves as to what Canada has been accomplishing, and there is no reason why 1920 should not be a still greater year, a period memorable in the trade annals of our country. If you meet a pessimest, knock him cold with come of these figures. Boost your country for all you are worth and let your sloggan be "All together for a bigger and better Canada."

DOMINION BUREAU OF STATISTICS

Ottawa, May 6, 1920

3. Principal Articles of Canadian Produce Exported from Canada

	Twelve months ending March. 1918.	1919.	1920.
Animals, living .. ..$	$ 19,707,242	$ 35,278,269	$ 50,026,158
Butter ....Lb.	4,926,154	13,659,157	17,612,605
$	2,000,467	6,140,864	9,844,359
Cheese ....Lb.	169,530,753	152,207,037	126,395,777
$	36,602,504	35,223,983	36,336,863
Clothing ....$	9,702,207	13,426,235	8,928,906
Coal ....Ton	1,902,010	1,826,639	2,120,138
$	8,684,038	10,169,722	13,183,666
Cartridges ....$	351,343,138	213,432,531	7,366,733
Other explosives ....$	34,997,155	37,506,294	4,675,047
Fish ....$	31,752,258	36,392,626	40,687,172
Furs ....$	8,199,312	13,737,621	20,921,971
Grain—Oats ....Bush.	54,877,882	17,879,783	10,768,872
$	37,644,293	15,193,527	9,349,455
Wheat ....Bush.	150,392,037	41,808,897	77,978,037
$	366,341,565	96,985,056	185,044,806
Other grain .....Bush.	8,139,887	4,706,232	17,128,122
$	11,027,411	8,457,052	25,511,421
Hides and skins ....$	8,925,063	7,700,048	19,762,646
Leather ....$	10,986,221	12,437,712	18,057,152
Meats—Bacon and ham .....Lb.	207,833,118	124,688,741	223,642,600
$	60,082,494	40,242,175	70,123,580
Beef ....Lb.	86,565,104	127,810,294	110,047,800
$	13,016,378	26,594,814	19,637,656
Canned meats ....Lb.	13,422,624	14,140,717	2,812,706
$	3,695,384	5,701,510	1,102,842
Pork ....Lb.	7,909,803	37,318,106	6,682,300
$	2,052,192	11,711,024	1,641,570
Other meats ....$	1,053,257	1,340,738	3,655,586
Metals—			
Aluminum, ingots, etc.....Cwt.	215,740	202,839	192,069
$	7,581,838	6,712,053	5,680,871
Asbestos ....Ton	141,099	149,244	129,202
$	5,693,153	9,158,022	8,767,856
Brass, old and scrap .....Cwt.	521,108	72,685	91,512
$	8,083,864	1,148,819	1,217,940
Copper ....$	21,576,611	20,991,179	13,879,332
Gold ....$	13,688,700	9,202,033	5,974,334
Iron and steel ....$	45,810,367	58,854,318	61,912,659
Nickel ....Cwt.	830,499	791,644	441,407
$	9,029,535	11,170,339	9,039,221
Silver ....Oz.	21,960,827	19,759,478	12,379,642
$	18,428,571	19,519,642	14,255,601
Milk and cream ....$	5,862,976	7,882,799	10,216,861
Paper—Printing ....Cwt.	12,101,865	13,248,542	14,272,513
$	33,978,347	40,718,021	53,203,792
Other paper ....$	3,886,983	8,447,774	10,049,627
Rubber ....$	2,911,505	5,629,590	10,069,963
Seeds—Flax ....Bush.	6,424,550	1,890,978	1,127,986
$	19,764,255	7,759,852	5,395,675
Textiles ....$	21,103,575	14,819,058	22,063,620
Vegetables ....$	19,034,528	12,841,422	11,656,483
Vehicles—Autos ....No.	8,447	14,180	24,506
$	3,807,278	7,303,678	14,883,607
Auto parts ....$	1,557,712	1,552,296	3,097,466
Wheat flour ....Brl.	9,931,148	9,205,439	8,863,068
$	95,896,492	99,931,659	94 262,928
Wood—			
Unmanufactured ....$	51,829,121	70,487,288	105,336,768
Manufactured—Wood pulp ...Cwt.	9,696,704	11,841,656	15,389,582
$	25,620,892	34,706,771	41,383.482
Other manufactured .....$	777,053	1,055,029	3.449,576
Total principal and other articles exported	$1,540,027,788	$1,216,443,806	$1,239,492,098

CHOOSING THE RIGHT BELT GUARD.

There is more to guarding a moving belt than the mere act of placing a guard about it. In fact, many instances are recorded where guards have turned the popular slogan to "Safety Last." Assume, for example, that a pipe rail guard is thrown about a vertical or slanting driving belt from the main shaft on the floor below to a machine on the floor above. If close to the belt the guard may be the means of a workman's hurting himself.

This is easily imaginable should the employee lean against the guard on the floor through which the moving belt passes. He is quite likely to have some part of his clothing drawn into the narrow slit in the floor by air suction, or by the belt lacing, or perhaps even by the belt clips as they go by. If the

clothing does not tear, a serious accident is probable.

For that reason, in safeguarding belting it is advisable to consider each particular case, and not hope to settle upon one style of guard to meet every condition. One rule which fits a great many cases provides that all vertical and inclined belts, and also rope drives, be completely enclosed to a height of 6 feet above the floor, if the guards have to be less than 15 inches from the belts. It is better to omit a would-be guard entirely than to make that guard itself a hazard.—*Belts.*

ACETYLENE WELDING OF ALUMINIUM.

The chemical factory Griesheim-Elektron, Frankfort am Maine has introduced a new process which entirely prevents the formation of oxide of aluminium, and produces a weld which is of the same strength as the metal itself, and can be rolled and hammered.

The method is applicable to castings, sheet metal, etc., and depends chiefly on the admixture of a small quantity of fluorine to the ordinary flux made with 60 parts of chloride of potash, 12 parts of chloride of soda and 4 parts of sulphate of potash. This flux, which may be used as powder mixed with water to a paste, melts under the acetylene flame sooner than the aluminium and fully protects the heated surfaces from the air. A perfectly homogeneous joint is obtained with the greatest ease and without risk of impurities entering. The flux can also be used in crucibles for melting scrap aluminium, as it effectually prevents any loss of metal by oxidation.

The latest pattern of night landing light for aerodromes, says Acetylene & Welding Journal, is a complete oxy-acetylene unit in itself. The light and all the necessary apparatus for its maintenance are mounted on a trolley fitted with aeroplane type wheels. All conditions of the landing grounds have been taken into consideration, and the high mounting of the axle, etc., enables the light to be taken to any part of an aerodrome. As the units are each complete in themselves, and the light can be got going in two or three minutes; emergency landings can always be assisted.

DOMINION BUREAU OF STATISTICS

Ottawa, May 6, 1920

2. Principal Articles Imported into Canada for Consumption

	Twelve months ending March.		
	1918.	1919.	1920.
Animals, living	$ 2,764,371	$ 1,637,549	$ 2,568,307
Articles for army and navy	130,773,475	50,704,709	1,679,079
Asphaltum and asphalt	374,997	440,722	446,587
Books and printed matter	6,358,839	7,824,499	11,240,814
Breadstuffs	16,941,510	26,717,140	26,519,958
Bricks, clays and tiles	4,302,884	4,298,745	2,470,812
Butter	136,269	715,671	176,994
Cheese	118,635	64,867	206,500
Chemicals	26,522,172	32,788,704	19,785,974
Clocks and watches	2,248,934	2,448,449	3,126,267
Coal—Anthracite	28,047,226	26,191,798	32,647,759
Bituminous	46,277,715	44,411,207	27,424,870
Cocoa and chocolate	3,008,427	3,783,426	7,626,745
Coffee	2,122,058	1,865,612	5,077,103
Cotton	58,922,808	73,377,554	89,367,984
Curtains and shams	357,328	367,320	474,779
Earthenware and chinaware	2,562,776	2,256,600	3,511,447
Eggs	1,504,234	681,849	2,837,442
Fish	2,316,629	2,497,054	3,491,579
Flax, hemp and jute	11,511,778	13,513,913	15,943,245
Furs	3,967,470	4,523,037	12,511,205
Hides and skins	8,794,289	5,426,008	23,020,976
Jewelry	871,816	750,771	1,242,010
Lard	758,142	554,367	2,220,413
Leather	8,916,611	11,468,787	17,102,702
Meats	24,418,720	5,905,271	22,100,333
Metals—Brass	5,410,881	5,231,230	4,565,756
Copper	8,545,300	5,997,626	8,568,035
Gold and silver	292,810	247,870	704,938
Iron and steel	159,309,323	161,619,059	149,846,502
Lead	1,384,082	966,982	937,312
Tin	15,241,179	15,131,175	11,419,016
Zinc	1,993,356	1,180,412	835,596
Musical instruments	3,707,407	3,164,227	4,329,093
Paints, colors and varnish	3,196,602	3,603,231	4,121,681
Paper	7,516,389	9,044,390	9,970,656
Pickles and sauces	449,532	418,503	819,630
Ribbons	1,560,695	1,885,632	2,899,429
Rubber	12,864,355	12,065,693	17,655,992
Seeds	1,887,697	2,038,006	4,208,845
Settlers' effects	6,367,291	5,691,029	10,181,034
Silk	14,943,206	21,183,592	34,432,789
Soap	1,156,953	1,267,868	1,534,082
Stone, marble and slate	1,857,421	2,194,247	3,277,420
Sugar and molasses	39,484,978	39,493,078	73,618,354
Tea	13,713,427	3,793,724	8,336,163
Tobacco	7,875,796	11.815,350	14,673,550
Tobacco, pipes, etc.	831,804	754,757	1,000,023
Vegetables	4,621,555	3,896,463	5,602,017
Vehicles	22,508,227	18,423,384	32,655,350
Vessels	2,202,740	3,901,424	6,166,391
Wood	14,615,607	18,925,455	22,431,670
Wool	35,086,969	40,167,935	63,493,535
Total principal and other articles imported	$ 963,510,679	$ 919,705,802	$1,064,516,169

EXPORT SHIPPING IS A STANDARDIZING SCIENCE

Continued from page 12

own traffic staff, they can at least employ expert advice at a reasonable figure. Money spent on such advice is not money lost, but money gained, for by the advice given you will more than likely save both money and delay.

Always be sure of your shipping package. Use the best of material and pack intelligently, not haphazardly. We have brought all our cases and crates to a standard which we know gives ideal results. Having arrived at this point we can safely advise. Make your case heavier than just heavy enough, if you get the idea. Rough usage is one of the things an export case has to contend with, so prepare it for such treatment.

Having manufactured and packed your product, follow out the shipping instructions implicitly. Do not deviate from them one iota. You may not see the sense in them, but your forwarding agent does.

Last, but not least, treat your export business as you would have them attend to your wants were you in the reverse position, for if this is done the relations will not only be friendly but profitable.

One of the reasons why wireless telegraphy has not been made compulsory on smaller vessels is that its value has depended upon an operator being continuously on duty. Important calls might come at any moment, night or day, and unless there was an operator always with his ear to the telephone, the value of the installation would be enormously reduced. This drawback has been removed by a recent invention by a British wireless telegraph expert. It is described as an "automatic call device" whcih rings a bell when messages of a certain kind, such as the ship's special call signals or the S.O.S. signal for help, are being sent out. When this device is installed, a ship does not need relays of operators continually in the wireless cabin. It is enough to train two or three officers in the use of the wireless telegraph instrument. The bell calls them when they are likely to be required—as in the case of the ordinary telephone.

The Making OF Morrow Drills

BY
J. H. Moore

IN preceding article dealing with the screw producing portion of the John Morrow Screw & Nut Co., we commented on the splendid lighting provided, proper aisle space and other features that go to make up ideal working conditions. The same holds good in this the second portion of their plant, which is devoted to the manufacture of drills of all kinds.

The number of operations necessary to complete a drill would surprise the uninitiated, there being more work on the same than one would imagine. For instance, before even the first operation is performed, the question of proper proper steel must be gone into. Without the correct quality of steel no amount of careful workmanship will make an efficient drill. This portion of their business is perhaps the most closely watched of all, for they pride themselves on the fact that only steel of proven quality goes into their drills.

After a proper test has been made to ensure that the steel is of correct grade, the drill goes through the following operations:

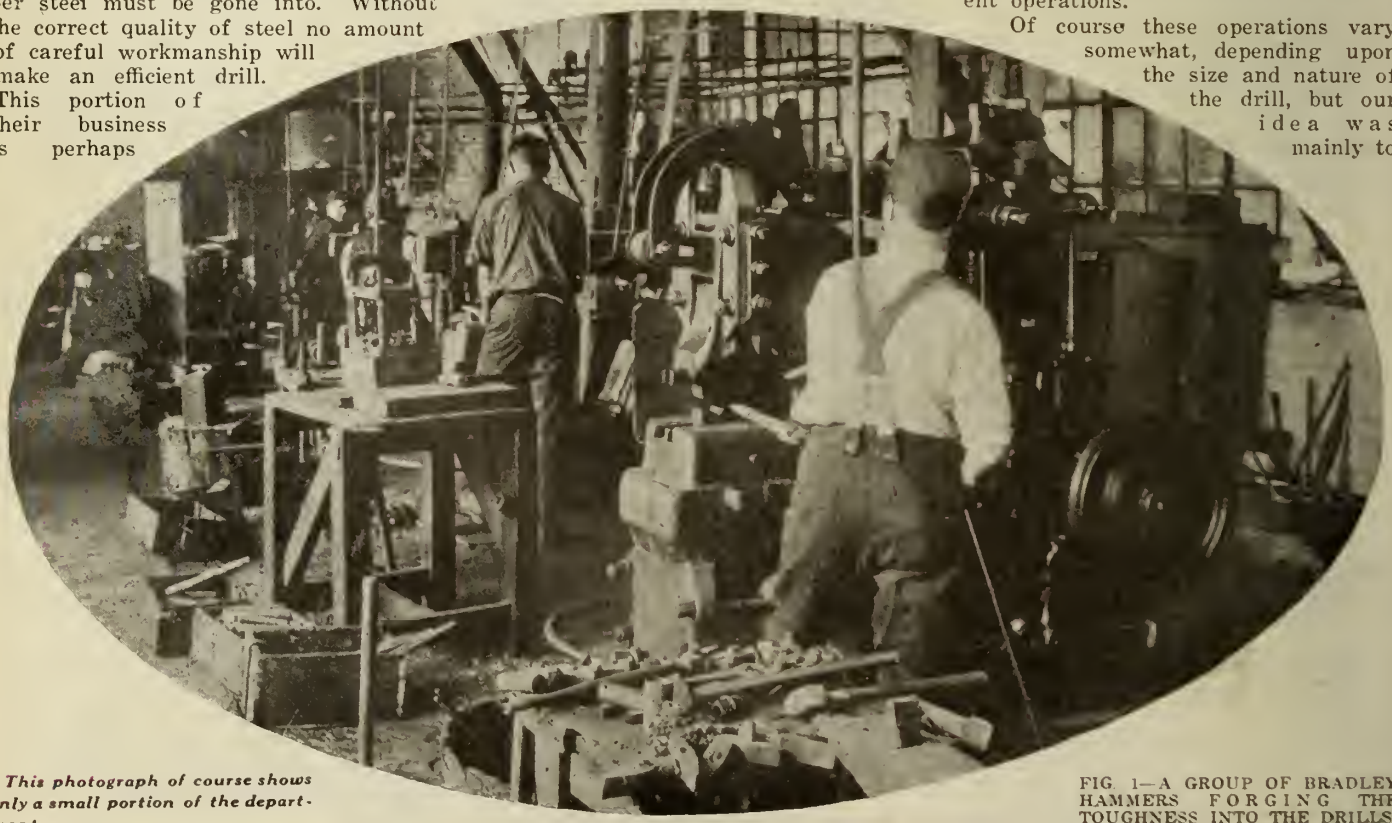
The stock is first cut off to length, the cut-off bits are snagged on an emery wheel, then the lengths are pointed to shape. Next comes the centering operation, followed by turning to size, that is the turned, and not the ground size of drill.

The tangs are next slab milled, after which the grooves or lips are milled. Next in order comes the filing of burrs, etc., folowed by the soft grinding of the grooves. They are now soft cleared and the points soft ground, after which they are stamped as to size, style, etc.

They are next hardened and tempered, hard straightened and the grooves polished, after which they go to the sand blast. Now comes the grinding to size, hard clearing, and drawing up operations.

The shanks are next polished, also the margins and the points. This completes the drill with the exception of inspection, which makes a total of 23 different operations.

Of course these operations vary somewhat, depending upon the size and nature of the drill, but our idea was mainly to



This photograph of course shows only a small portion of the department.

FIG. 1—A GROUP OF BRADLEY HAMMERS FORGING THE TOUGHNESS INTO THE DRILLS.

illustrate to readers the many operations through which the average drill passes. All high speed drills above ¾ in. diameter do not follow the routine already given, but are forged in place of milled. The sequence of operations are also varied for different style drills, but on the whole the list as given will allow readers to form a fair idea of the routine adopted.

Method of Storing Steel

The method of storing steel in this plant is well worthy of comment. Special racks with sections of about 6 in. to 12 in. square are installed. Each section is labelled plainly as to the quality of steel contained in that section, what it is to be used for, and so on. A card system is in operation which ensures an accurate knowledge of stock on hand, amount used, etc., so that no confusion arises when material is required.

The first few machine operations are so widely known that we make no comment on the same, but for illustrative purposes we will suppose it is a forged drill that is about to be manufactured.

After cutting off, and welding stock to the shank if necessary, the next operation is that of flattening to proper shape for twisting. This work is done on Bradley cushion hammers, and Fig. 1 will give a good idea of a small portion of this hammer and forging department. To see the operators at work is a pleasure, for they are so accustomed to their duties that not a single blow of the hammer is wasted. When flattened out to shape, the stock is placed in a very simple but ingenious twisting fixture, and the drill now assumes more of the finished product appearance.

After twisting, the drill is annealed, then pointed and centered, after which it is soft straightened. These few remarks will show readers what we have already mentioned, namely, that although the operations do not occur in the same sequence, they are almost identical in style.

The Milling Operation

Omitting the next few operations, let us consider the milling of the grooves. At Fig. 2 we illustrate the machines used for drills from No. 80 up to ¼ in. diameter.

This type machine is known as a horizontal drill miller, and one girl attends to as many as six to a dozen machines. When we state that the No. 80 drill is only 13 thousandths in diameter, and that it takes 30,000 to make 100 lbs. weight, readers can no doubt realize the delicacy of the milling operation on a drill of this size. It is the intention of the firm to build a larger size machine of the horizontal type to accommodate up to ½ in. diameter, but at present anything over ¼ in. is milled in a vertical style machine. On the horizontal type only one groove is milled at a time, while on the vertical machine the two grooves are milled at once. Of course the advantage of the smaller type machine is that they are automatic in action, and one operator can attend to a battery of machines.

At Fig. 3 we show a general view of one of the vertical style machines, while at Fig. 4 we illustrate a close-up view of the same type machine busily engaged at work. Note the angle to which the cutter is set, and of course there is another similar cutter on the other side milling the second groove.

The complete machine is operated through gearing, the action being as follows: The central spindle, which holds the drill in position, turns slowly at a predetermined rate while the cutters mill the grooves. As the spindle turns, it rises, until the drill grooves are completed. It is no doubt a well-known fact that a properly milled drill is thicker in section between the grooves at the back, than at the point. This is also allowed for in the setting up of the machine.

Miscellaneous Operations

The grinding operations are very important and these are performed on high-grade grinders, both the Landis and Norton style being used. Fig. 5 illustrates a small group of these machines, the general style of grinding practice being adopted. We need not go into any special comment in this regard.

The grinding of the clearance on the drills is accomplished by means of spe-

FIG. 2.—GIRLS OPERATE THESE SMALLER TYPE HORIZONTAL DRILL MILLERS.

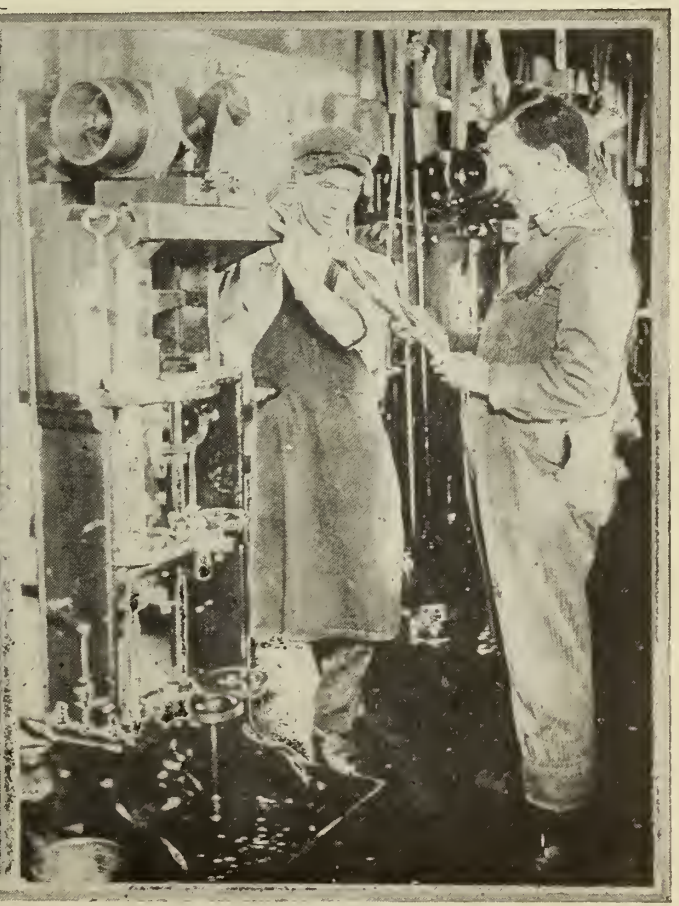


FIG. 3.—A GENERAL VIEW OF THE LARGER STYLE DRILL MILLING MACHINE.

cial shaped wheels, mounted on small grinder frames as shown at Fig. 6. The operators get very expert on this work and can produce the drills at a surprising rate of speed. Starting the drill at the point, they can, with a twisting movement of the hand, follow the groove to a nicety, even to the difference in thickness between the grooves already spoken of.

The sand blasting operation is also a very interesting one to watch. The best of silica sand is used for sand blasting purposes, the result being a perfectly clean and smooth finish drill.

The Heat Treating Department

This department is the place par excellence as far as the plant is concerned. It is here that the product can be made or marred, for without proper heat treatment all the previous operations is time wasted. There is no danger, however, of the product being marred, for every precaution has been taken to ensure against such a possibility. Even the pyrometers are placed to a considerable depth in the ground. to insure accuracy and a double check is kept on all furnaces and baths. Special handling tongs are adopted and nickel chrome tubes are used in many instances, especially in the hardening of the smaller size drills.

After the drills are tempered, they go to what is known as the hard straightening department. This is a room specially constructed for the purpose and everything is painted green, even to the windows, which might cast a confusing glare on the workman's eyes. In separate compartments, these men painstakingly see that every drill is straight before passing on to the next operation. If not, they proceed at this point to work with it until perfect. This is a very important operation and con-

FIG. 6.—GRINDING THE CLEARANCE ON THE DRILLS.

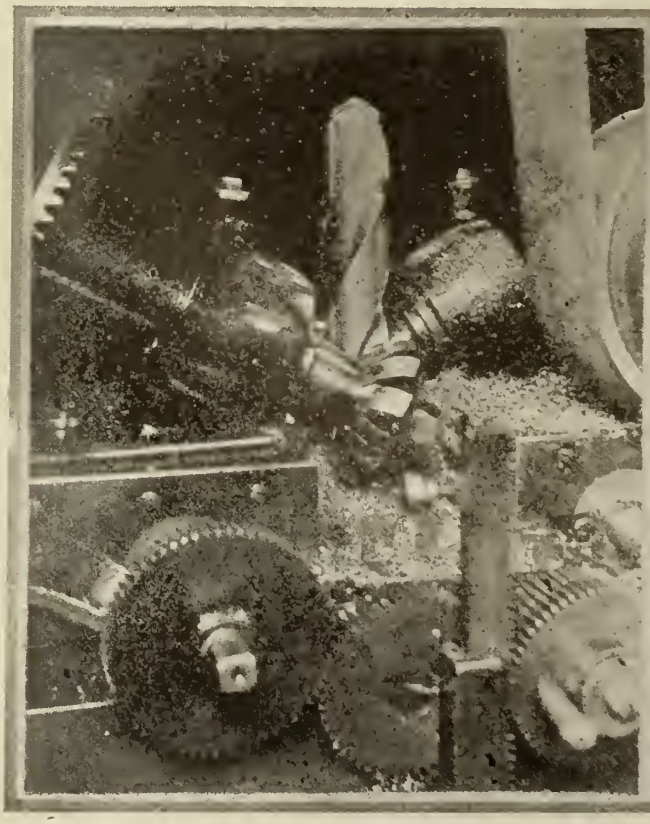


FIG. 4.—A CLOSE-UP VIEW OF THE DRILL MILLING MACHINE.

FIG. 5.—A GROUP OF GRINDERS FINISHING THE DRILLS

siderable trouble is taken to be sure that only first-class work passes through their hands.

The Inspection Department

Having taken readers through the general procedure of the making of a drill, it would not be fair to leave the subject without discussing the most important operation of all, namely, inspection. This department is pointed to by the Morrow Co. with pride, and justly so, because rather than pass a drill with the slightest flaw, they scrap it immediately. There are no such things as seconds. They must be first quality or nothing. The men in charge of this department are old-timers, who believe in taking a personal pride in their work, and are, I believe, actually delighted if they discover a flaw. This, however, is the exception rather than the rule, but they nevertheless look for flaws with painstaking zeal.

When the drills have been inspected they are dipped in a non-rusting compound before being packed and shipped.

Card systems are in vogue in this section of the plant, that keep track of the customers' requirements, the progress of work, material used, time spent on the work, etc., etc. In this way all orders can be carefully checked as to costs and so on. In other words, if a customer is promised an order on a certain date, it is so marked on the card, and in as far as is humanly possible, the order is shipped in plenty of time to reach its destination on the promised date.

In conclusion, we might add that anyone imagining the making of a drill an easy proposition had better take a walk through a drill-making plant such as described, then change their mind, for the main object throughout is absolute accuracy. If a drill is not accurate, it is worthless. If a drill has the slightest flaw, it is likewise of no use, and if a drill is not properly heat treated, you might as well use a chunk of iron in place of the more expensive steel. The art of drill-making is a study in itself and it is hardly necessary to add that the company whose plant we have described are well equipped and experienced in that art.

Proposed Network of Wireless Communication

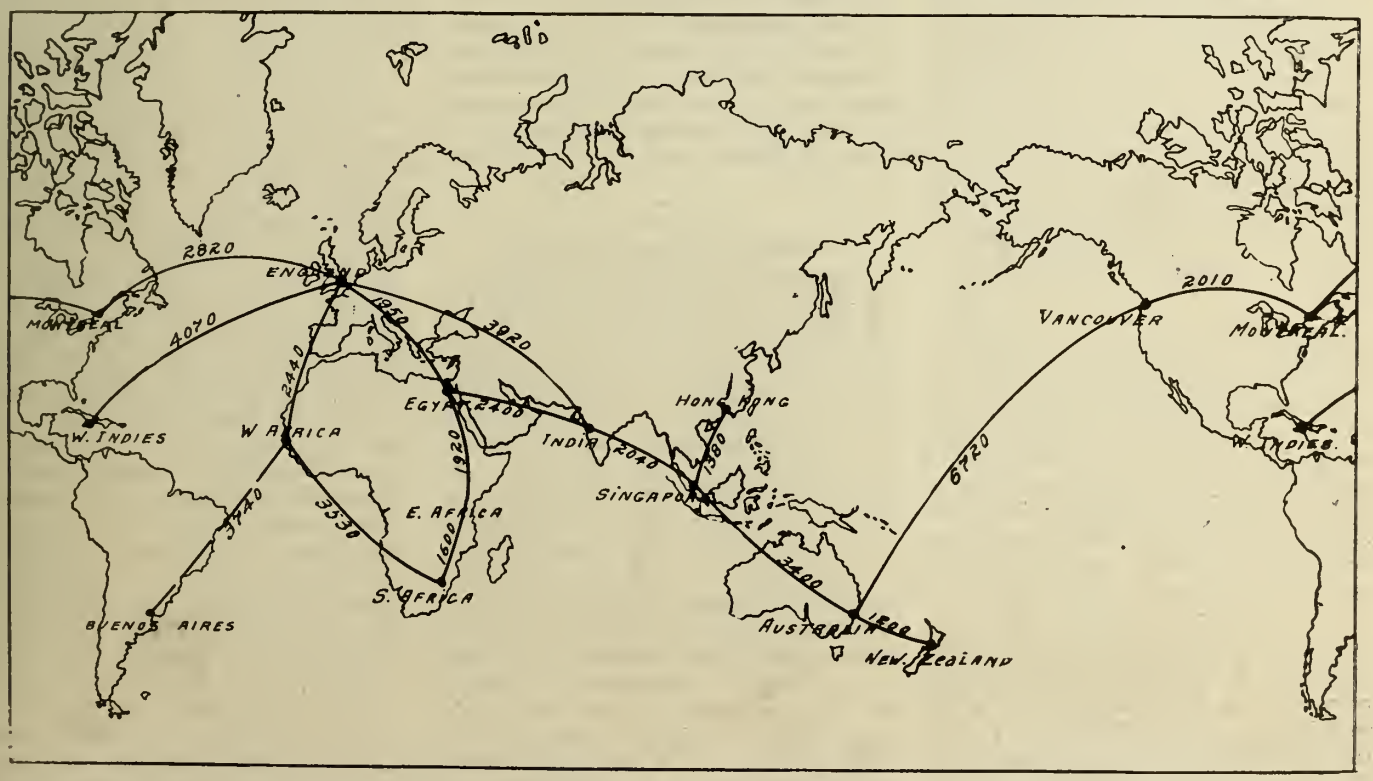
This Plan, as Proposed by the Marconi Wireless Telegraph Company to the British Government, is Hoped to Relieve the Abnormal Congested Condition of Submarine Cable Service

By J. H. RODGERS

THE proposed network of wireless communication covered by the plan submitted by Marconi's Wireless Telegraph Company to the British Government, would appear to provide the much desired Imperial chain, and as such it is hoped the scheme will be approved and adopted, either in its entirety or with some slight modifications, where necessary changes may seem advisable for the best interests of the system and the various countries that it will serve.

Realizing the abnormal congested conditions of submarine cable service, the Marconi Company has developed and perfected a plan that will not only give relief to existing systems, but will eventually prove of inestimable value to Great Britain, the overseas Dominions, and outlying British colonies. The late war has shown the imperative need of direct and uninterrupted communication between governments and operating field forces, and in no instance has wireless been equalled for reliable and effective service. The wireless mthod does not give the enemy the opportunity of severing communication, and therefore establishes an independent and effective means of creating a network of rapid communication, capable of embracing, not only all British territory, but also those equally important units of the Empire: ships at sea.

The terms upon which the proposal is submitted may be stated, briefly, as follows: The Company agrees to bear the entire cost of construction, maintenance, and operation of the complete network of wireless system, and pay a sum equal to



MAP SHOWING PROPOSED TRUNK ROUTES.

25 per cent. of the net profits of each station or stations to the Government in whose territory such stations are located.

On the expiration of thirty years of service of any portion of the network, the system affected may become, if so desired, the property of the Government concerned, free of any payment. Special terms are provided should the Government, before the expiration of the thirty years, desire to acquire the system. The Government will have the right to take over the control of the stations during any period of war or national emergency, under arrangements agreed upon between the Company and the military authorities of the Government.

The proposal requires that the Government concerned issue all requisite licenses during the term of agreement, and grant every facility for the acquisition of sites, and that the Government construct and maintain the necessary underground and overhead cable systems that would be required for the telephonic and telegraphic feeder services. Special provision is made in the proposal to take care of the world trade in general, but the fundamental principle of Imperial preference is the keynote of the system.

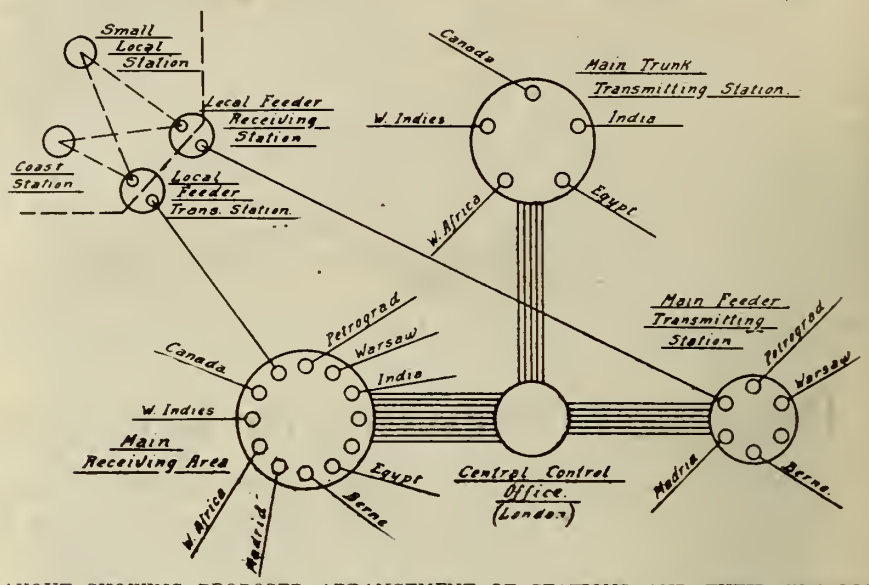
The construction of the network would call for the erection of one or more main trunk stations in each country, for the carrying on of communications over long distances. In a country which forms a terminal of more than one route, and would necessitate a trunk station for each line of communication, the trunk stations would be grouped as close together as avoidance of mutual induction would allow, so as to maintain only one trunk transmitting area in any country. These areas would also include smaller transmitting stations, which, in turn, would be grouped to form a main feeder transmitting area. The receiving areas for the various services would be similarly arranged for economical and efficient service. The entire network would be under the control of a central office situated in a convenient telegraph centre of the country, with the transmitting and receiving areas located as nearby as economic condition would permit.

In proposing a network of this character, the Company has in mind, not only the commercial value of the enterprise, but the stategic value as well. As range is not restricted to definite distances the choice of sites would be a very important factor, and selection of location would be decided by joint conference between the Company's engineers and officers of the various fighting forces of each country.

The proposed main trunk routes are shown on the map, the necessary number of main trunk stations for this tentative network being twenty-six, five of which would be located in England. Two of the twenty-six would be located at Montreal, and two others at Vancouver, with feeder stations for Western and Eastern communication.

While the system of network has been developed on the best experience of wireless engineers, the final details and modifications, if any, would be agreed upon between engineers of the Marconi Company and representatives of the different countries. While the primary object of the proposal is to advance the commercial interests of the Empire, the future possibilities of war have been given due consideration, and with this in view, the personnel of such a network would become members of naval or military reserve forces, and capable of immediate mobilization in ranks comparable with the position they hold at their different stations.

The advantages of such an Imperial scheme of communication cannot be overestimated and it is hoped that the cooperation of the various Governments will enable the proposed network to become an integral part of British enterprise.



LAYOUT SHOWING PROPOSED ARRANGEMENT OF STATIONS AND THEIR CONTROL.

PROMET BEARING METAL

HEAT treatment as a means of increasing the efficiency of steel has become a universal factor in engineering problems, but little knowledge has been acquired as to the heat treatment of non-ferrous metals for adding to their strength and durability. In Promet metal the manufacturers, the American Crucible Products Company of Elria, Ohio, have obtained a metal that possesses all the advantages that has been accorded to the bronze and other non-ferrous metals of olden days, when such metals contained all the tempering characteristics now possible only in steel tools. While the actual process used by the Egyptians of olden times will probably always remain a mystery, the results obtained in the making of Promet are in many respects identical with existing specimens of those pre-historic bronzes and other metals.

While the analysis of Promet is the same before and after heat treatment, the process undoubtedly changes a relatively good bearing metal into one of incomparable superiority in both bearing and lubricating qualities. The accompanying cuts will show the remarkable change in structure and the marked similarity to steel before and after treatment. It is claimed that the properties of this metal will remain permanent under any and all conditions; heating up to 2,000 degrees F., time or exposure, conditions of storage or long and exacting service, have no deteriorating effect upon the metal, and the metal can be remelted and re-used over and over again, and still retain all the advantageous qualities of the virgin metal.

It is also claimed that it has many times the bearing properties of any tin base babbit, and many times the lubricating properties of any lead base babbit. Many working tests have been made with material, and loads of 9,700 pounds per sq. in. have been carried without distorting the metal, and the co-efficient of friction is remarkably low, particularly where lubrication has been seriously neglected. It will melt at 600 degrees F., and can be heated to 2,000 degrees without the least injury. The recommended temperature for pouring is between 700 and 850 degrees F., and it is claimed that the metal is non-shrinkable when worked at this heat. An important feature of the metal is that it will not stick to the shaft when the bearing becomes overheated. Hot slag and molten metal cars, fitted with Promet, have shown no signs of wear after four or five months' service. Promet is equally adapted to high speeds and heavy loads. The Engineering Sales and Service Company, 55 St. Francis Xavier Street, Montreal, are the Canadian distributors.

Strike Did Not Stop the Bonus System

McKinnon Industries at St. Catharines Are Working Out Several Plans in Their Plant

Cafeteria is a Good Centre for Social Side of Shop Life to Work From—Their Own Orchestra Too

ONE might imagine that a firm, after experiencing the inconvenience and loss of production attendant upon a strike, might not be very keen about putting into effect such things as bonuses for efficiency or long service, cafeteria service, etc. But that is just what is taking place at McKinnon Industries, Ltd., at St. Catharines. No resentment is held on the part of the company that the men should have gone on strike, as they did a short time ago, the belief being that the men quit work in order to retain membership in their international bodies, and that many of them were reluctant to walk out. Of course, a man who went out forfeited his length of service bonus, and has to start from the bottom again to regain his standing.

Officials of the McKinnon organization are not anxious to talk of what has been done, nor of what they intend to do. Above all else they seem to fear that the impression may get out that they are "doing something" for the men in the shops, whereas, as far as can be gathered, they are simply aiming to make working conditions favorable to the man who really wants to turn in a good day's production, and to reward service in a tangible way. The social side of the business is being developed and encouraged, but what leadership there may be in this is coming from the men themselves, and in this the company is ready to give every encouragement.

McKinnon Industries, Ltd., is situated on the outskirts of St. Catharines, in splendid surroundings, and the construction of the buildings is such as to give plenty of light and air to the men in the plant. The firm consists of a group of industries that have grown, one after the other, until now they have a plant where some 1,000 hands find employment. Roughly there is the malleable iron and hardware shops, then the plant turning out automobile differentials and transmission, and also automobile radiators. The McKinnon Columbus Chain Co., where electric-weld and fire-weld chain is manufactured, is also situated in the same group. The present company is really the outcome of the business established some forty years ago when the making of dashboards and fenders was the extent of the lines developed. Now the company makes malleable castings, drop forgings, carriage, wagon and saddlery hardware, automobile accessories, etc. L. E. McKinnon is president and general manager; J. C. Notman, vice-president and sales manager, and W. A. McKinnon, assistant treasurer and in charge of export sales.

Like many other Canadian plants, McKinnon Industries were engaged on war contracts, turning out large shipments of shells and fuse. On the completion of these contracts part of this war plant was utilized in developing the making of automobile parts, and a substantial peace-time line has grown out of the shut-down munition plant.

Making a Social Centre

The need for a cafeteria had been felt for some time, especially in the winter months. Many of the employees are in that enviable position where they can go home for dinner at noon, but bad weather often interferes with this. The company built the cafeteria, and then turned it over to one of the employees of the firm, who had had previous experience in this line of work. A very substantial meal can be secured for 30 to 35 cents, and those who bring their lunch are invited to use the place and purchase what they care to. In the winter season the company seeks to combine entertainment with instruction in the noon hours, so they bring in moving pictures or lantern lectures. Of course, they keep these events from being dull or academic so they never lose their interest, but at the same time always strive to keep them educational as well as entertaining. Song sheets are also used, containing a lot of popular and patriotic airs. But where do they get the music for all this? A lot of it from the shop orchestra. Yes, that's just what we said—shop orchestra. Never had one in your plant? Well, neither did McKinnon Industries until they got busy and organized it, and it's a success. A man in the office had a good knowledge of music and was interested in orchestral work in the city. Notices were posted through the works, calling a meeting of all who would be able to assist by playing any instrument. The result is an organization of piano, drums, three violins, saxaphone, flute and cornet.

One of the latest ventures is the publication of the McKinnon Bulletin, a shop paper. St. Catharines recently lost one paper, so this shop is seeking at an early date to keep the number of publications up to normal. Suggestion boxes are placed in the works, and the men in the various departments furnish most of the material for the paper. The employment manager is at present the editor of the Bulletin, but as the plans work out it is the intention to have a committee from the shop elect their own editor. Bowling and baseball leagues in season are encouraged.

The Office Viewpoint

Through the paper the office also takes advantage of putting certain phases of business before the men. The pay envelope is also used to bring out any points that it is considered advisable to emphasize in order to keep the shop organization up to a good standard. For instance, here is a little "stuffer" that was put in the envelopes recently:

"How long has that man worked for you?" asked the Caller.

"About four hours," replied the Boss.

"I thought he had been here longer than that," said the Caller.

"He has," said the Boss. "He has been here for four months."

The above little story is just to attract your attention, and, by the way, that reminds us of the man who was taking a course in short story writing. He was advised to use an unusual beginning to his story to startle the reader into immediate attention, and on being instructed to write a story illustrating this principle, the introduction to his story read like this "Oh Hell, said the Duchess, as she spat on the floor."

What we really want to talk to you about is "Loafing on the Job." Bill passing Fred in the Plant stops for a five-minute chat—ten minutes lost. Along comes Sam, and stops to hear the latest—fifteen minutes lost—and so it goes on. Now try to realize this. Under an eight-hour working schedule, "loafing on the job" one hour a day would mean the defrauding of more than three full days out of every month, about six weeks out of every year. If a man draws $100 a month, it would mean that he accepts $150.00 a year without giving anything in return. If other employees be led by his example to do the same, he touches his employer for a great deal more. "Loafing on the job" one hour a day means that eight men are required to do seven men's work. If one thousand people be employed in a given industry, and all waste one hour a day, the employer is put to the expense of keeping one hundred and twenty-five more people at work than would be necessary. If these one hundred and twenty-five men, who would otherwise not be needed in that

Plant, draw an average of $1,200 a year, it would mean that the operating expenses are $170,000 a year more than they should be.

The next time you find yourself tempted to stop for a chat, or see others doing it, remember the figures given above, and be fair to the employer, giving a "fair day's work for a fair wage."

The Shop Bonus Idea

McKinnon Industries have two bonus plans, one of them based on the production and efficiency of the employee, and the other on the length of service and his earning power combined. The bonus rate table, part of which is shown in this article, is posted in various parts of the works in order that the employees may see just what can be done when they attain certain degrees of efficiency. The average rate in the McKinnon Industries is 50 cents per hour. According to the table the employee at that rate is supposed to be 65 per cent. efficient. As he leaves that point and moves toward 100 per cent. his wages automatically increase as his production increases, until at 100 per cent. efficient he has come up to 75 cents per hour.

Do most of the men get in on the bonus? They do. In order to have this plan working satisfactorily it is necessary to have a standards department, where special attention is given to time studies. In this department a group of men, independent of the foremen or superintendent, analyze each operation that is to be put on a bonus plan. They find out what should be reasonable time under average conditions to complete the work, and on this the price is adjusted. It is not meant to suggest that the work is done over the superintendent's head, as the findings are submitted to him.

Canadian Machinery put the question that at once suggests itself: Will these rates stand if an operator gets to the point where he can make well above the average rate? The answer was that as a general thing the rates stood for a year, and the men were encouraged to go ahead and get as far along the bonus line as they could. There have been few complaints about the time set as standard for the operation. Of course, there will always be some who will object, but the average find them fair and quite within reach.

Every effort is made on the part of the company to allow men to get to the operation where their special talent or bent will allow them to make the bonus. They prefer bonus employees. If a man cannot make good in one department there may be another where he will get along much better. Before an employee is dismissed as not being able to fit into the organization, he is given all possible chance to find the position where he can make good and be of service in the plans of the organization as a whole.

The Inspection Department

Any tendency on the part of a worker to crowd material through in order to run up a day's work is checked by the inspection department, which is well organized and maintained in this shop. That the men are not trying to take advantage is shown by the small percentage of rejects, which, according to the records of the shop, show around 2 per cent.

There is no trouble now in getting all the employees needed. Replacement figures in recent months show the following:

February, 8 per cent.; March, 15 per cent.; April, 14 per cent.; May, 12 per cent.

The Service Bonus

Three years ago McKinnon Industries commenced the payment of a yearly bonus, calculated on the earnings and the length of service. It starts at the end of the first year's service at two per cent., and increases until at six years the employee gets ten per cent. This is paid in a lump sum, and is quite separate from any other wage bonus paid in the shop. If a man leaves or goes on strike he automatically loses his standing as an employee of so many years' standing. This is what happened when the strike of moulders and machinists took place at the plant, and on their return after being out some ten or twelve weeks they had to start in again to qualify for the service bonus.

"Did the strike change the attitude of the company toward this form of work?"

"It did not," was the answer of Mr. R. A. McKinnon, who has had considerable to do with the operation of the various plans outlined above. "We considered it good business before the strike and we consider it good business now. Many of the men did not want to go out, and went only through fear of losing their membership in their union. We try to avoid anything that looks like giving the men favors, but rather aim to put something worth while before them and make conditions so that they can go ahead and make good themselves."

A recent paper presented to the Institution of Automobile Engineers deals with "The Electro-deposition of Iron as Applied to Motor Vehicle Repair Work," Mr. B. H. Thomas describes work of this class which was carried out during the war in a heavy repair shop. The parts reclaimed included stub axle arms, steering swivel pins, brake and clutch shaft ends, change-speed lever shafts, insides of wheel hubs, outsides of axle tubes, and universal joint pins. Putting the case generally, the author states it was found possible to deposit a layer of iron up to about 2 mm. in actual thickness on any simple cylindrical surface of wrought iron or steel, mild or cast. If properly done, it is practically impossible to chip this layer away from the basis metal with hammer and chisel. It is deposited direct on the surface without "coppering" first, and can be subjected to red heat without apparent deterioration. It can be carbonized and hardened in the ordinary way and can be filed or ground, and takes a high finish. Its wearing qualities on a fast-running journal are, as far as the author knows, untried. The chief limitation of the process is, in the opinion of the author, the inability to deposit satisfactorily on such materials as cast iron or aluminium. If it were possible to deposit an adherent coating of iron on such parts as worn gear-box ball race housings, etc., the scope and usefulness of the process would be greatly increased.

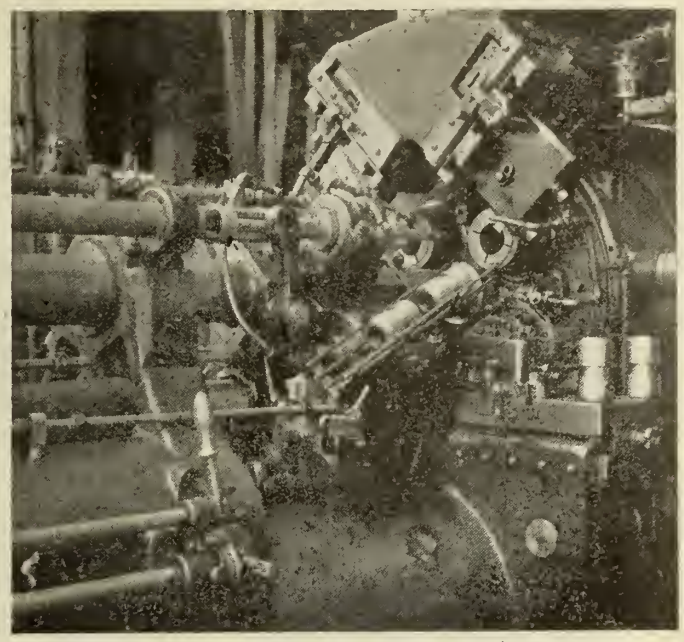
Bonus Rate Table

Rate Per Hour	65%	70%	75%	80%	85%	90%	95%	100%	105%	110%	115%	120%	125%
20	.20	.205	.21	.22	.23	.25	.27	.30	.315	.33	.345	.36	.375
22	.22	.225	.23	.24	.26	.28	.30	.33	.345	.36	.38	.395	.41
24	.24	.245	.25	.26	.28	.30	.32	.36	.38	.395	.415	.43	.45
26	.26	.265	.27	.28	.30	.32	.34	.39	.41	.43	.45	.47	.49
28	.28	.285	.29	.30	.32	.35	.38	.42	.44	.46	.48	.50	.525
30	.30	.31	.32	.33	.35	.38	.41	.45	.47	.495	.52	.54	.56
32	.32	.33	.34	.36	.38	.41	.42	.48	.50	.53	.55	.58	.60
34	.34	.35	.36	.38	.41	.44	.47	.51	.535	.56	.59	.61	.64
36	.36	.37	.38	.40	.44	.46	.50	.54	.57	.595	.62	.65	.675
38	.38	.39	.40	.42	.45	.48	.53	.57	.60	.63	.65	.685	.71
40	.40	.41	.42	.44	.47	.50	.55	.60	.63	.66	.69	.72	.75
42	.42	.43	.44	.47	.49	.53	.58	.63	.66	.69	.725	.755	.79
44	.44	.45	.46	.51	.52	.56	.60	.66	.69	.725	.76	.79	.825
46	.46	.47	.48	.53	.54	.58	.62	.69	.725	.76	.79	.83	.86
48	.48	.49	.50	.53	.56	.60	.65	.72	.755	.79	.83	.86	.90
50	.50	.51	.52	.55	.58	.63	.68	.75	.79	.825	.86	.90	.94
52	.52	.53	.55	.58	.61	.66	.71	.78	.82	.86	.90	.93	.97
54	.54	.55	.57	.60	.64	.69	.74	.81	.85	.89	.93	.97	1.01
56	.56	.57	.59	.62	.66	.71	.77	.84	.88	.92	.97	1.01	1.05
58	.58	.59	.61	.64	.68	.73	.80	.87	.91	.96	1.00	1.04	1.09
60	.60	.61	.63	.66	.70	.76	.83	.90	.95	.99	1.03	1.08	1.13

Modern Methods of Production

The Automatic is herein discussed as one method of increasing production

By
J. M. Harrison



"WE want more production." In these four words is echoed what is on the lips of practically every manufacturer at the present time. Ignoring the labor and material phase of the situation, let the writer suggest that the tool equipment be looked over thoroughly. Is it up-to-date? More important still, is it the proper kind of equipment to suit your product? All these factors enter into the solution of added production. Suppose we had 50,000 screws per week to make. Would we think of producing these on ordinary lathes, modern though they might be. Of course not, for that is not the proper field for that style of machine tool.

True, the average manufacturer would not think of using an ordinary lathe for rapid production of standard screws, still there are many cases where the wrong type of equipment is used for other classes of work. A more common danger existing than the one already spoken of, is the hanging on to, and continuing using of, out-of-date machinery. If we had a long journey to cover in a hurry we would hardly take a mule as a means of transportation, but would pick on an express train, or better still, an aeroplane if possible. In other words we would use the quickest method to get there. This same spirit of "get there" can be used to advantage in the manufacturing plant of to-day. Added production necessitates some means of speeding up, and a study of your tool equipment will often produce surprising results.

It is not our intention, however, to offer any definite solution to any one class of manufacturer, but rather to present in article form different modern methods of production. Various classes of machine tools will be shown, together with interesting set-ups, and the readers will be left to decide for themselves if such style of equipment meets with their own particular requirements.

The Automatic

When we speak of automatic machinery, we realize that the term covers a very wide field. For our purpose, we will confine ourselves in this article to one class of automatic machine, namely, the style of equipment known as the Acme Multiple-Spindle Automatic Screw Machine.

In order that readers can become familiar with the general appearance of this class of machine, we illustrate at Figs. 1 and 2, two different styles. At Fig. 1 is shown what is known as the smaller standard plain type. This type of machine is built in capacities from 9-16 in. to 2 1-4. At Fig. 2 is illustrated the 3 in. to 4 in. machine, and as can be noted this is a much heavier and more rigid machine in every way, being designed for speed, heavy work and accuracy.

Digressing from the subject proper for a moment, and delving into the history of the manufacture of screws, we find that they started to make screws about the time Rome was built. For eighteen hundred years the progress in screw-making was very slow, but crudely made screws of bronze and iron came into use about the fifteenth century.

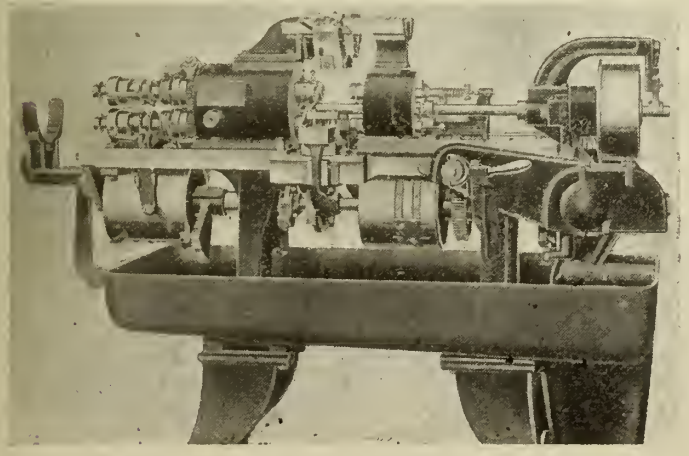


FIG. 1—A GENERAL VIEW OF AN ACME MULTIPLE SPINDLE AUTOMATIC.

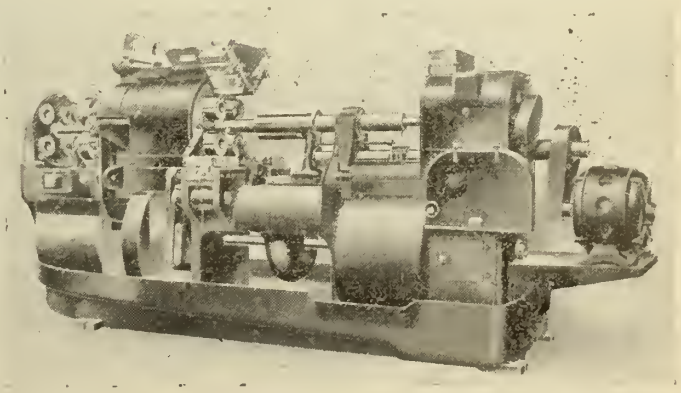


FIG. 2.—THIS IS THE NEW TYPE OF ACME MULTIPLE SPINDLE AUTOMATIC HAVING A CAPACITY FROM 3" TO 4".

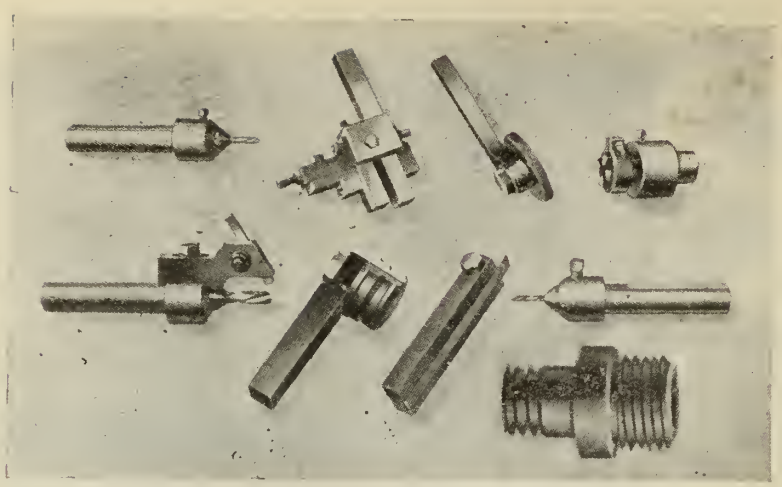


FIG. 3—AN EXAMPLE OF WORK, AND THE TOOLS USED ON THE SAME

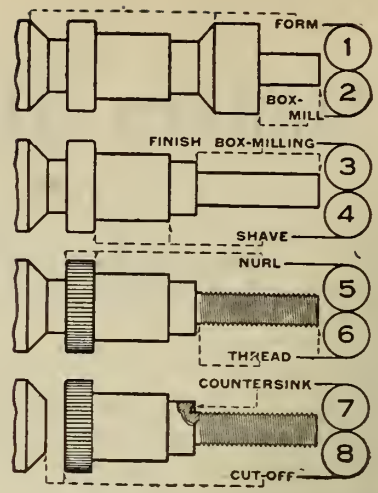


FIG. 5—EACH TOOL STEP CAN BE CLEARLY FOLLOWED.

In 1775 came the invention of the ordinary lathe, although a poor example compared with the lathe of to-day. Of course this innovation made screw-making somewhat simpler, but in 1835 another type of machine was invented that still reduced the labor in making screws. In 1873 another machine was built that did practically all the work automatically.

Progress of real worth occurred from this date. The multiple spindle idea still further increased production, as it allowed a number of bars to be used in place of one. Leaving the history at this point, let us consider the principle of design in the modern machine we now have under discussion.

Principle of Design

In principle, these machines comprise four work spindles, which are held in a

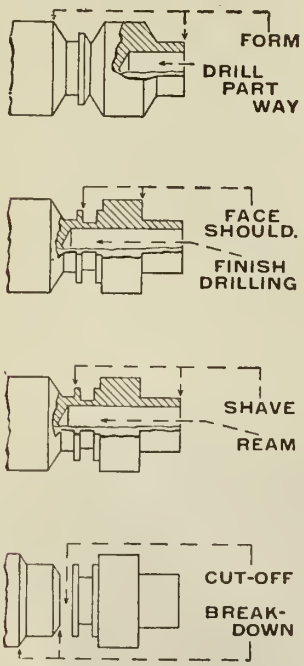


FIG. 4—A GOOD EXAMPLE OF TOOL LAYOUT.

cylinder and rotated by gears, the cylinder being indexed to bring these work spindles consecutively into position in front of the side-working, and end-working tools. It requires one-quarter cycle of the cylinder to complete one piece, this being accomplished in the time required to perform the longest cut, which is usually a drilling, forming, or box tool turning operation.

In many cases it is possible to complete a piece in less time than the time required for the longest cut. Take for example, a long milling cut, which can be divided between the box tools in the first and second positions. In that case the time for the completion of the piece is considerably less than the usual time for box turning, being slightly more than half.

In drilling, three tools are frequently used in this manner, so that only a trifle over one-third of the time necessary for drilling the hole is required to complete the piece. The feeding of the bar takes place between the first and fourth positions, when the cylinder is indexing (on the smaller machines) and in the first position on the larger machines, the stop swinging out of the way before the tools approach the work.

By referring to Fig. 1, it will be seen that there are eight standard tool positions, namely, four end working tools, two horizontal forming and cut-off slides, and two stop slides working in the second and third positions. With this arrangement it is possible to have two tools working on each of the four bars at one time. This is, of course, a great advantage from production standpoint. The only idle, or non-productive moments in the style machine under discussion, are the withdrawing of tools, and indexing the cylinder carrying the work spindles. These moments occur at the completion of each piece.

No general rule can be stated as to tooling, or the use of same, as that depends entirely on the nature of the piece. As a general rule the operations performed at first position are forming, (with a tool held on forming side), turning, drilling, facing, counterboring, etc., with tools working from the end and held in the main tool slide.

The second position is sometimes as follows: From the end we might have turning with box tools, drilling, reaming, countersinking, counterboring, facing, etc. We might also have such operations as shaving, light forming, burling, and frequently thread rolling can be performed at this position.

In the third station, such operations as threading (with dies, taps, or chasers), drilling, reaming, counterboring, etc., can be performed, while turning with a box tool can be accomplished from the end. This position also lends itself admirably to the use of special attachments for milling, cross drilling, etc., their use being made possible because of the fact that the rotation of work spindle can be stopped in this position for the threading operation. Shaving, thread rolling, and knurling operations are often performed in this position, the tools being held on the top slide, and operating in this position.

The fourth and last position is used in many ways. The slide working tool cuts the piece off, in some cases after a forming operation has been performed. Tools from the end can counterbore, countersink, ream, recess, drill or turn. In many cases a variety of these stated operations are combined, in order to still further speed up production. The study of proper tooling on any style machine is a very important one, and the same condition holds good on these machines. By a careful study of the product, maximum production tooling can be installed. In this regard, the company whose machine we are describing lends valuable aid and suggestions.

Take for example, the product and its tools shown at Fig. 3. This set of eight tools was used for the production of the piece shown at lower right hand of picture. In the first position, the piece was formed, and a large hole drilled. In the second position the already formed piece was shaved on the shaving tool shown, while at the same position a smaller hole was drilled. The third position devoted to the rolling of the two threads, while the fourth position was used to drill another smaller hole completely through the piece, at the same time cutting it off, thus completing.

Other interesting examples illustrating

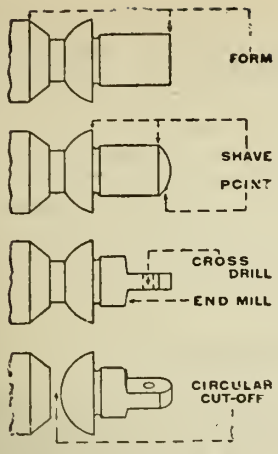


FIG. 6—ANOTHER EXAMPLE OF TOOL LAYOUT.

the different positions and tooling, are shown at Figs. 4, 5 and 6. As these diagrams are self-explanatory no mention need be made.

Various Attachments

On certain classes of work it is advisable to use other attachments in addition to the regular tool equipment. For example, suppose you desire to mill some piece from the side without removing from the machine. This can be accomplished by the use of the attachment shown at A, Fig 7. It is used while the other tools are working, therefore the piece is finished in the same length of time as without the milling. In other words you can perform an extra operation any additional time.

Should special reaming be necessary, the attachment at B, Fig. 7, will accomplish the work, as it is so constructed to feed farther and faster than the tool slide or drills. At C is shown another attachment for slabbing and slotting. One, two or three slitting saws or milling cutters can be used, and may be set horizontally or vertically, or may be swung at any desired angle in between.

At D, we see a combination arrangement for drilling. In this case the attachment is fitted with a gear drive, and telescopic ball-jointed shaft. At E is illustrated an end milling fixture, with belt drive attachment. Such a fixture is very easily taken off or placed on the machine. Lastly, at F, is shown a cross drilling attachment which is very often used.

Every attachment illustrated is really a standard attachment, but in addition to these shown, other special fixtures can be used, such as auxiliary forming, special threading, self-opening die, left-hand threading, and so on. The beauty of a machine such as we are describing is the fact that you can suit your tooling to the nature of your product.

To illustrate all the attachments described would entail more space than we can devote to it, but at least we have spoken of the possibilities of such attachments.

It has been said that one thing at a time (as far as the making of screws are concerned), is too slow, and there is no doubt about the truth of this remark. From the preceding examples we have shown where added production has been possible not only because of the four spindles, but because of the other attachments as well. Complicated work can be successfully turned out by the use of such attachments, whereas without them, an added, and separate operation would be necessary.

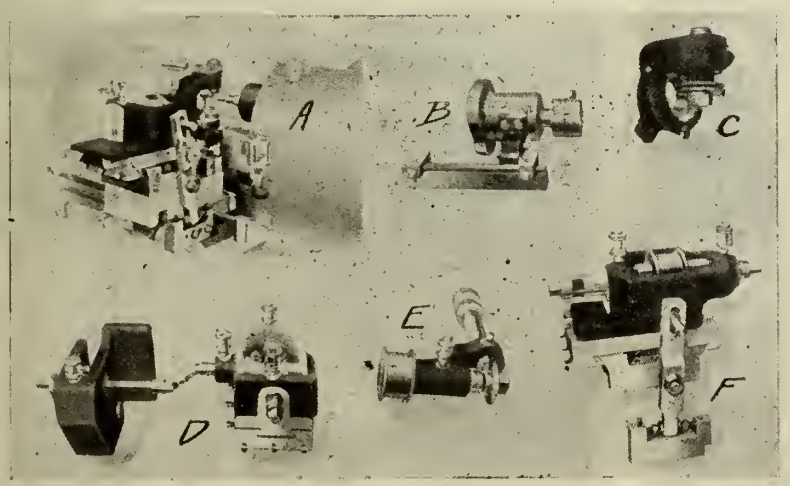


FIG. 7—VIEWS OF VARIOUS ATTACHMENTS USED IN CONJUNCTION WITH SUCH MACHINES.

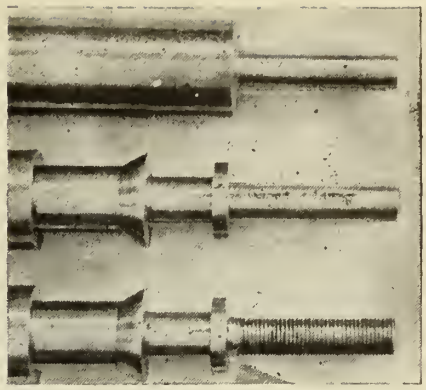


FIG. 12—VARIOUS STEPS IN A TYPICAL SCREW JOB.

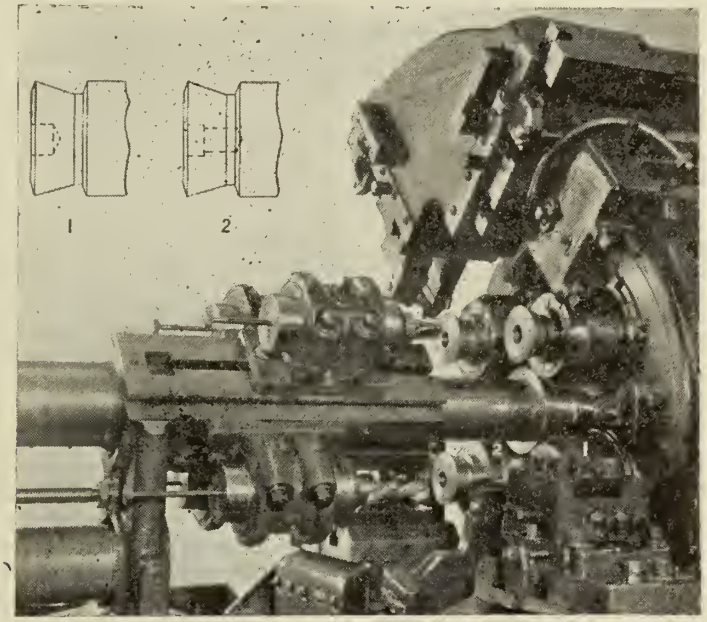


FIG. 11—TOOL SET UP FOR MACHINING GEAR BLANKS. THESE BLANKS WERE 3¾" DIAMETER AND 45 WERE COMPLETED EVERY HOUR.

Heavier Class of Work

Leaving the smaller type of work, and entering into the use of the larger machine, we feel the best method of explaining the use of such machine is to show actual examples of work being performed. At Fig. 8 is illustrated a typical tool set up on this machine. The completed product can be seen to the lower left-hand side of photograph. while the other work spindles and tooling are clearly shown. Note the compact arrangement of these tools, and how they have been so placed so as to attain maximum production.

A threading attachment is illustrated at Fig. 9, and again the nature of work performed can be seen on the photo. It will be remembered that we stated that the work spindle, in the third position, stopped rotating if necessary, and it is,

of course, at this position that the operation shown is performed. The die being used is one made by the concern itself and is known as the Namco self-opening die head. This same head can be used as a knurl holder, if so desired.

At Fig. 10, shown in heading of article, is illustrated an example of accelerated reaming. The special reaming attachment is clearly shown, and the method of taking the work from the machine, also the nature of the product can be clearly noted.

Fig. 11 illustrates an interesting tool set up for machining gear blanks. These blanks are 3 3-4 ins. diameter, made from cold rolled steel, and with tooling shown 45 pieces are completed an hour. Every detail being so clear, no further mention is necessary.

To show in actual photographic form the steps in the making of a typical screw job, we have prepared Fig. 12. We have not illustrated the completed portion, simply because the piece is completed with exception of cut-off in the lower position on photo. A picture such as this speaks louder than words, and while only a common example, it serves the purpose of bringing to the eye the procedure adopted. The piece, as shown, was slightly over 4 ins. in length, the threaded portion being about 2 1-4 in.

In order to ensure that readers are not running away with the erroneous impression that a machine of this nature is useful for screw work only, we might say, that not only is such machine used for all kinds of screws and nuts, but also for all classes of complicated bar work.

Study Your Product

Once more we emphasize the importance of studying your product. Where duplication work is concerned the first thing to do is to turn over in your mind what type of machine is best suited to produce the piece. Supposing you have decided on an automatic, such as we are describing, the first thing to consider is the best method of applying the various tools, dividing the cuts, etc. Make sure you get the greatest possible production without crowding any of the tools with a heavier feed than they will stand under continued service. Another point to bear in mind is to cover the work as much as possible with top and side working tools, to avoid the ne sity of making elaborate or expensive gauges for inspecting, where, if forming tools were properly designed, a simpler gauge would serve the purpose as well.

Parts which should be accurate as regards diameter should be covered with a shaving tool and every possible advantage should be taken to produce the work accurately. Experience is of course the best teacher, and to secure the advantages from such a machine, a clear understanding of its possibilities is absolutely necessary. Actual use brings that experience and operators are naturally always keen to devise, or find out quicker means of production.

As it is not our intention to go into the actual operation of the machine, but rather to discuss its possibilities, we leave the matter at this point, allowing readers to form their own judgment as to whether automatic machinery of such a nature as describing will solve their production difficulty. In our next article of this series we will discuss another machine tool of interest.

The Hugh Park Foundry Co., Ltd., Oshawa, Ont., has been incorporated with a capital stock of $200,000 by Frank A. Park, Oshawa; James Parker, 157 Bay Street; Maurice Crabtree and others of Toronto, to manufacture castings, forgings, tools, etc.

CHANGE NAME OF LATHES

An effort is being made in the machinery manufacturing trade to change the name of the lathes now commonly called screw machines, says a Cleveland despatch. The development in turret lathes and broadening of their uses has made earlier designation inappropriate. General support of the change is indicated from manufacturers in all parts of the country.

INSURANCE POLICY FOR EMPLOYEES

An insurance policy for the sum of five hundred dollars is now given entirely without cost to every employee of the American Westinghouse Electric and Manufacturing Company who has been in the service of the company for a period of six months or more. Furthermore all employees who have been in the company's service for six months or longer and who deposit a sum each pay-day in the Employees' Saving Fund equal to 2 per cent. or more of their earnings, will not only receive 4½ per cent. interest compounded semi-annually on such deposits, but, in addition, will automatically have their insurance increased to amounts up to 2,000 dollars, depending on the length of time they have been with the company. For example, a man who has been in the service of the company for at least fifteen years, and has regularly deposited in the Employees' Saving Fund 2 per cent. or more of his salary, on which he regularly receives 4½ per cent. compound interest, is presented with an insurance policy in one of the established companies for the sum of 2,000 dollars at no cost whatever to him.

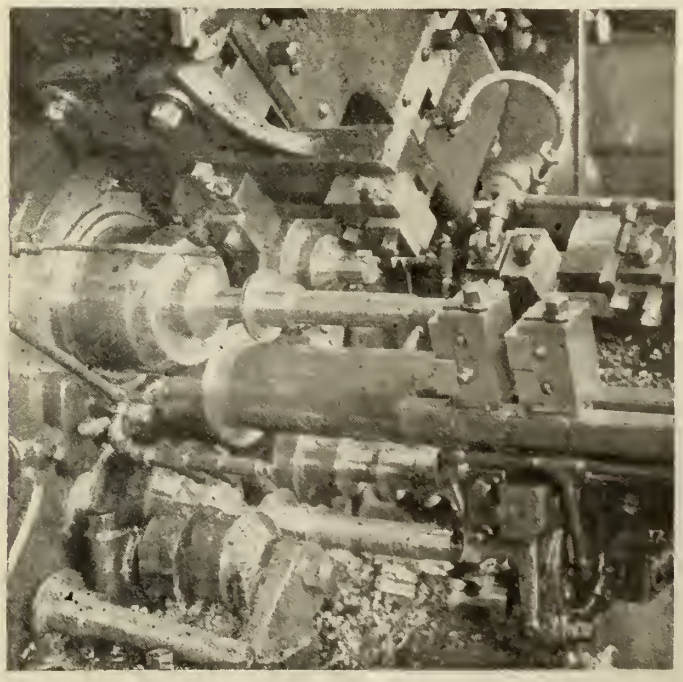


FIG. 8—NOTE THE COMPACT ARRANGEMENT OF THESE TOOLS.

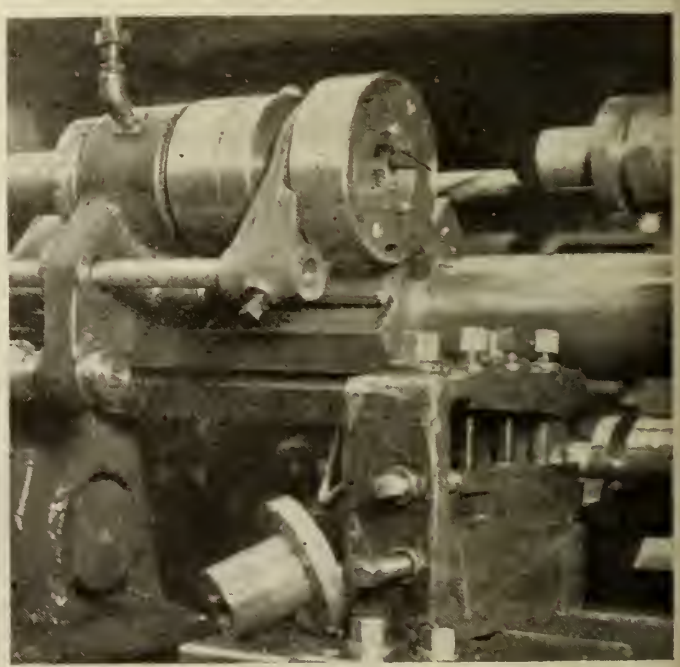
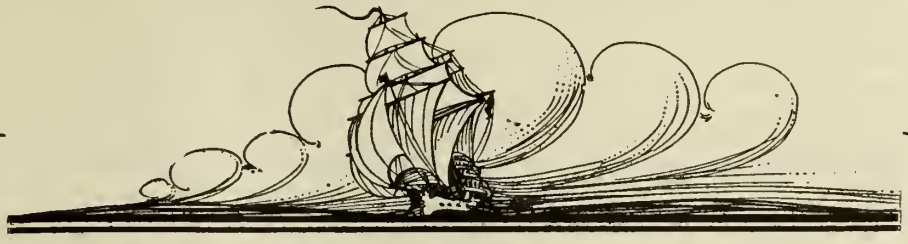


FIG. 9—SHOWING THE MACHINE IN ITS THREADING POSITION.

What Goods *Must Stand* on the High Seas

By T. H. FENNER, Editor Marine Engineering



SINCE the galleys of the Phoenicians came over the seas to take tin from the mines of Ancient Britain, vessels and methods have improved, but the perils of the old ocean remain much the same. Science has provided us with stronger weapons to overcome the treachery of wind, sea and fog, but ships laden with valuable cargoes still leave port to be heard of no more, or to arrive battered wrecks, with cargoes water sodden, fit only for sale by auction to the hangers-on of commerce.

The day of the supercargo has passed, but it might be worth while in many cases for a manufacturer who is selling goods for export to far countries to send a representative for a voyage to see for himself what his goods have to go through before they arrive at their port of destination. He would come back with stronger impressions of the necessity for expert packing than the reading of a thousand articles would convey to him. Even when goods are crated and packed with the most meticulous care there are many ways in which they can be damaged during their voyage overseas, ways which the shipper has very little chance to prevent or control.

One of the most annoying sources of loss, and one which seems almost impossible to eradicate, is that of pilfering by longshoremen and others who contrive to find their way to the docks where ships are unloading. Sometimes this is aided and abetted by the crews of the ships themselves, and so serious has it become that shipowner and forwarding agents, together with underwriters, are getting together to find some effective means of combatting it. Of course the exporter of heavy machinery is not much bothered with this class of loss, but manufacturers of goods that are exported in packages are the victims. Such articles as boots, shoes, textile products, cigarettes and tobacco, which are readily hidden away, are favorites with the dock-side robber. The packages may be rifled at the port of shipment while they are being loaded, as well as at the port of destination. Some ports are notorious for this class of thieving, while others having more efficient supervision by the dock police keep it within bounds. When the stealing is done on the dock side it is out of control of the ship's officers, but when it is done in the hold of the vessel it will depend on the calibre of the officer in charge of that hold how much can be got away with. If he is a man of long experience and some personal courage he can prevent a great deal, but if he is a young chap and susceptible to intimidation, it will be carried on almost openly.

The favorite method of ascertaining what class of goods is in a case, and of making it accessible at the same time, is to have it slip out of the slings when lowering. This will be done at a height just sufficient to burst the case open. If the packages are being lowered in a cargo net where it is not very convenient to slip them out, the signal to the winchman to stop lowering is delayed long enough to let the net reach the bottom of the hold with a good sharp bang, which does the trick very nicely. The broken case is then put over in a wing of the hold and left strictly alone for a while. Then an opportunity comes when the officer is in some other part of the hold to abstract a few pairs of boots or boxes of tobacco, suits of underclothes, or whatever it may contain, and these are rapidly distributed and cached till the time comes to get them ashore. If the officer who is looking after the loading happens to catch them, it will depend on his ability to handle men whether they are put back or not. While as a rule these men will not resort to violence, they can act and look ugly enough to get the average man to look the other way. The officer usually consoles himself with the thought that his business is only to see that the cargo is stowed properly, and it is up to the dock police to see that nothing gets out of the gates. There is considerable stealing done also at night time by men who come alongside in boats, clamber up the side by means of a handy rope, and abstract goods wholesale. They are usually aided by the fact that the nightwatchman is stationed at the side of the ship next the wharf to watch the gangway. The thieves are not only bold, but possess a certain sense of humor. The writer was in a ship lying in Genoa, a notorious port for thieving, and the skipper had made a vow he would get some of them as they had not been content with cargo but had been stealing the bo's'n's stores. The old man had spoken pretty freely of his intentions, and word had evidently reached some of the gentry ashore. The ship lay moored to a buoy at the bow and the stern on to the wharf, and a ladder was over the stern to give access to and from the ship. Just at noon one day, when practically all hands were on deck, the red ensign (affectionately known among sailors as the "blood and guts of Old England"), which floated lazily from the jack staff at the stern, slowly disappeared, and just as the rush of angry men reached the poop, the communicating ladder was wafted away. Three brown-skinned rascals laughingly put our ladder up against the freight shed, mounted it, pulled it up after them, laid flag and ladder on the roof of the shed, and disappeared over the other side with a wave of the hand and a parting smile. It was many days before our skipper heard the last of that.

Just to show that ingenuity in thieving is not confined to any particular place, a case occurs to my mind that happened in Liverpool. This was not connected with cargo, but doubtless the perpetrators had gained experience in that field of endeavor. A large valve, made of bronze and weighing about 600 pounds was to be sent ashore for repairs. Three men arrived at the dock with a hand cart, one from the shipowner's own repair shop, and stated they have come for the valve, which was promptly given to them, and pushed their cart with the valve on it out of the dock with the accustomed stately deliberateness of the British working man. It was never seen again, for by the time the hoax was discovered all traces of it had disappeared. It was so common a sight that no one took a second glance at the men, and they no doubt had a convenient foundry to dispose of it without loss of time.

Damage by Salt Water

The foregoing, while showing a very prolific source of loss, does not really come under the definition of perils of the sea. When everything is safely stowed, hatches battened down, and the vessel squared away for her run, there are many opportunities for damage to cargo.

An instance occurs to me where a cargo was carried safely for 12,000 miles through fair weather and foul, only to have a very valuable portion of it almost irretrievably ruined while lying calm and peaceful in harbor. Modern cargo vessels are equipped with what are called deep tanks. These are situated in the main hold, just abaft the engine room bulkhead, and are carried

up to the twin decks and provided with watertight covers. When the ship is loaded they are used for cargo, but when the ship is in ballast they are filled with water, and serve the purpose of making the ship trim by the stern. This gives the propeller a better hold on the water and reduces the metacentric height, both desirable purposes. The deep tanks in this case had been utilized for a shipment of pianos and organs, and the vessel was at her final port of discharge in New Zealand, and was to proceed to Newcastle, N.S.W., in ballast after discharging. Everything was out of the holds except the lower tier of pianos in the deep tank, and these were expected to be finished late that night. The ship's carpenter had instructions to close up the tank when the cargo was finished and pass the word to the engine room to fill the tanks. Now there is always supposed to be one officer and one engineer aboard the ship, but this rule, like many others, is often broken. In this case the fourth engineer and third officer, who were the respective deck and engine-room officers on duty, decided that everything would be alright for a while aboard the ship, while ashore the girls were pretty and the wine was good. "Chips," which is the carpenter's official name, promised the third officer that all would be well, and the fourth engineer relegated his duties to the donkeyman. For some unexplained reason the longshoremen decided they would not finish the job that night, and left about 9 o'clock. "Chips," who had spent the intervening time communing with the spirits in his room, sensed the silence which ensued, and the spirit of duty, among others stirring within him, roused out his mate, and proceeded to close up the tank. This being done, the donkeyman was notified, and opened up the valves, letting the sea water rush merrily in. The third officer, coming aboard shortly after, was notified by the attendant "Chips" that all was shipshape and Bristol fashion. The fourth engineer was duly informed by the donkeyman that the tank was filling up. Everybody was happy with that contented feeling that comes with a duty well done. It was only in the morning when the crew were putting the finishing touches to battening down and making all secure, ready for sailing, that a cynical and sarcastic boss longshoreman arrived and delicately conveyed to the skipper the news that some thirty pianos were enjoying the benefits of a salt water treatment. As it is impossible to convey by cold type the impassioned utterances of the old man to the third mate, we will draw a veil over the harrowing scene. Suffice it to say that the third mate, like a good shipmate, kept quiet about the fourth engineer's absence. The engine room staff were clear, anyway, as they only carried out orders, but it would have been decidedly unpleasant for the fourth had it been known he was ashore also.

Another case was in carrying a cargo of soap, lye, and stuff of that nature down the Mediterranean. This cargo was in the after hold, and crossing the Bay of Biscay the vessel got a severe trouncing. The ship was pretty old and the straining caused the shaft tunnel to draw away from the tank top in places, besides which the after peak tank commenced to leak. The stern gland, which prevents, or should prevent the water leaking through the stern tube into the tunnel, was leaking badly, and the water found its way through the tunnel to the after hold. Some of the cases on the bottom of the hold got water soaked, and the contents disintegrated, so that the cases got smashed up, and the weight above them settled down, loosening up the whole stowage. The hold bilges naturally got choked up, and as these bilges act as a receptacle for all drainage being pumped out from the engine room, the water rose in the hold. The result was a greasy, slimy mess sweeping through into the tunnel, which made the tour of inspection necessary while on watch, a thing of peril to the unfortunate engineers. The leakage made it necessary to keep one of the bilge pumps continually pumping in the tunnel, and when the hold was finally opened up the whole of the cargo in the lower portion was a beastly mess, fit for nothing but pumping overboard.

Even such sturdy things as barbed wire and steel rails are not immune. It is usual to provide ventilators from the holds to the deck to use when the cargo makes it necessary. When not in use these ventilators are made so that the top part can be unshipped and the opening of the pipe, about two feet above the deck, is covered with tarpaulin to make them tight.

On the occasion I have in mind we were bound from Cardiff to Buenos Ayres with corrugated iron, barbed wire, and steel rails. The ship ran into very heavy weather while in the Bay of Biscay, that famous old bay. She had been hove to for about twenty-four hours, when, the weather moderating, it was decided to go ahead. The sea was still very heavy, and she made bad weather of it, finally shipping a sea that stove in the starboard bulwarks and swept the ventilators clean with the decks. The result was that tons of water found their way into the holds, and a considerable amount of barbed wire was so badly rusted on arrival that the consignees refused to accept it.

There is of course always the danger of fire and collision, resulting in total loss, and damage through hatches being stove in as a result of bad weather. Cargo is still damaged through inefficient stowage, though this is rare. These few instances will serve to show that the merchant with goods on the high seas is still liable to the anxieties which best Bassanio and gave Portia the opportunity to show that a lawyer may still be a lover.

INTERESTING FACTS TO BE FOUND IN THIS WEEK'S ADVERTISING SECTION

How to secure 1,000 per cent. work.

Why a micrometer cross-feed stop is a valuable asset.

How you can keep your workmen smiling.

What you should get when you purchase files.

A nut lock that compresses into the thread.

How to eliminate the "Ifs."

A new time-saving tool.

How one firm claims they are not making a market, but simply meeting a demand.

That it pays to get your money's worth.

An accuracy that is beyond question.

An outfit that is used for repairing broken machinery or tools of medium size.

How to make a square hole square.

How to remove a tap quickly and efficiently.

How to obtain a wide range of die work with the least amount of dies.

Some new truths and old fallacies.

How to turn out work rapidly and accurately.

That you can tell a file by its teeth.

Why business needs more cars.

How to grind small, short work.

How to keep the cutting edge of tools cool.

How to obtain thread production.

That Canada has an industrial need.

Extensive deposits of graphite exist in North-western Siberia on the left bank of the river Kureika, near its junction with the river Yenisei, ninety miles from the mouth of the latter river, says Engineering. The graphite area, forming a horizontal plateau, contains two layers of graphite, which is of a solid, steel grey colour, soft, and of an excellent quality. The carbon constituent found in graphites in other parts of the is said to be superior in quality to that world. The graphite is not inflammable, and is very plastic. It is believed that in the future the graphites from these mines will supply Russian demands, and that large quantities will be available for export. The chief sources of graphite have hitherto been Ceylon, Bohemia, Germany, France and the United States. The annual world production has been, approximately, 120,000 short tons.

Mechanical Features of the Modern Tannery

Various Details of Belt Splitting Machines Are Shown—Other Mechanical Problems Encountered in a Modern Tannery Are Discussed and Construction of the Building in Itself is of Interest

By DONALD H. HAMPSON

IF we speak of leather manufacture, nine out of ten hearers will unconsciously tilt their nose to escape the odor of tanning and hides they fear will accompany the words. But the manufacture of hides through all the processes up to the shipping room is full of interest to every man, while the odor—always a healthy one—tapers off toward the end into a fascinating aroma.

It is not the purpose of this article to describe the manufacture of leather in detail, but rather to set forth some of the mechanical features of the special machinery, its construction and repair, and the shop practice in the plants. Unwarned, the machinist would be apt to remark: "A tannery, huh, there's nothing there but a lot of tubs and sliminess." But ask that machinist how they cut a sheet one-sixteenth thick off a hide roughly eight feet square, how they get a micrometer measurement at any part of that sheet when cut, and he will straightway "register interest," as they say in the movies.

The "splitting" machines are the most important ones in the plant—and the most complicated. A hide as tanned is approximately ¼ inch thick; except for sole leather and belting and a few similar purposes, all hides are split, dividing this ¼ inch thickness into several sheets called "splits," which are then treated to various finishing processes according to uses, whether automobile seat covers or shoes or bags or the thousand and one other demands for leather goods. That part of the hide next the outside of the animal is best in every respect, and a section about three by four feet at the middle of the back possesses to the greatest degree those desirable qualities of toughness, pliability, and close texture.

With the upholstering of the automobile there came a demand for vast numbers of the largest and best hides, and this work furnished new problems for those who man the splitting machines. The cattle from South America furnished hides which met the requirements very nicely—hides of the largest sizes—and incidentally their weight added much to the physical exertions of the men in the leather plants.

There are in use two styles of splitting machines; one a hand-operated machine for the finest class of work, where two operators pull and roll the hide against a blade of razor sharpness and the other, the production machine, outlined in Fig. 1, being a power-driven machine, massive and complex, and manned by four operators, who are able to split a hundred hides a day into the requisite thicknesses. Those who are familiar with special handling machinery are accustomed to parts which are regular in shape—they will appreciate more than others the difficulties of handling hides which are irregular in outline and bear the "projections" left by including short sections of the legs and neck in the hide, besides being a material which is heavy, damp, and limp at the time of working.

This belt knife splitting machine bears some resemblance to a band saw, though it uses a "saw" which has no teeth and its wheels are set horizontally instead of one over the other. Referring to Fig. 1, the blade passes over two wheels 30 ins. in diameter, one of which is adjustable to take up any wear or stretch in the parts. The blade is of spring steel, without joints, tempered so it marks a file and having a section when new of 1/16 in. x 2½ ins. with a double bevelled cutting edge whose included angle is 10 degrees to 15 degrees.

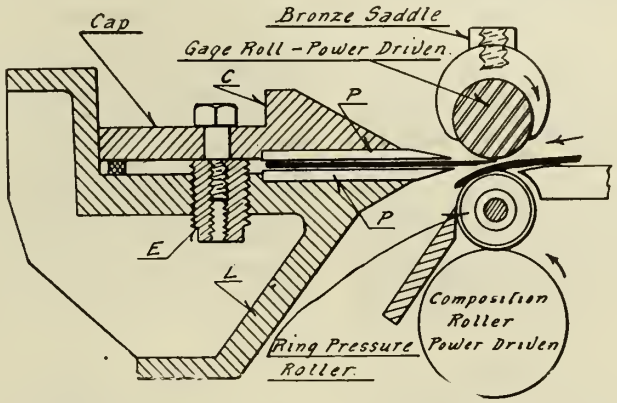


FIG. 2—A SECTION THROUGH THE MACHINE KNIVES.

The machines are built with a working section from 100 ins. to 120 ins. long. On the upper of these tangents, the knife does the cutting; on the lower, it is kept constantly sharp by the two emery wheels as shown. Naturally, to do accurate work the knife must be well supported. It runs between hardened steel surface of undoubted straightness, which guide the knife close to the cutting edge. These surfaces are blades similar to machine knives; they are fastened to massive lower and upper jaws, marked L and C respectively in Fig. 1. A section is shown by Fig. 2.

It will be noticed in Fig. 1 that the lower jaw is suspended on end keys between the frame of the machine; this always locates the jaw in the same relation for bolting fast. Portions of the trussed top, A and B, which are adjustable, are set by tissue paper feelers before bolting fast as additional supports for the jaws. The frame members also carry the bearings and supports for the various parts shown in the sectional view.

Referring to this section, the lower jaw L is a ribbed casting of a thousand pounds weight. The upper jaw C is known as a cap. Between the hardened surfaces P and P there runs the knife shown in heavy black. The jaws are shown separated for the sake of clearness; there is a means of adjustment when drawing down the cap bolts by setting up the special tapped screws E from

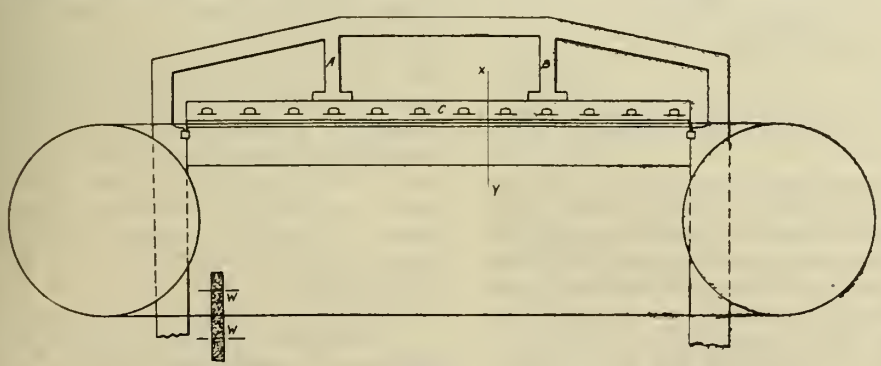


FIG. 1—GENERAL VIEW OF BELT KNIFE SPLITTING MACHINE.

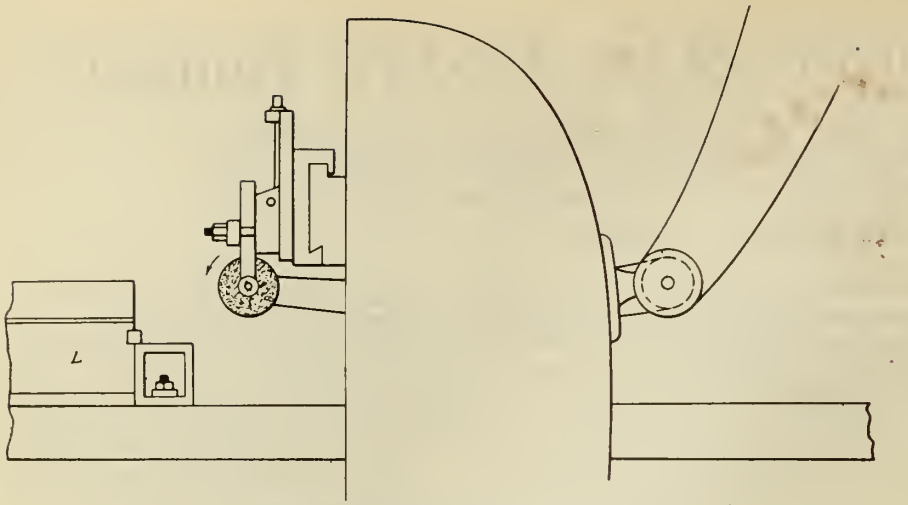


FIG. 3—THE SET UP ON THE PLANER TO GRIND JAW.

below—the cap is tipped very slightly to make a close bearing near the front of the knife. The hardened faces of the jaws have to be ground very accurately; when this is done and the machine properly set up, there is provided a keen-edged knife, true within a thousandth of an inch and rigidly held so. A series of steel plates (not shown) back up the knife, taking the thrust and keeping the cutting edge in a known relation to the hard blades.

Method of Feeding

The means for feeding and gaging the stock are shown in Fig. 2. A driven roller, called the "gage roll," is fixed directly over the knife; it is adjustable in a vertical position to allow for wear and the taking of splits of different thicknesses. It is adjusted by tissue paper feelers from the knife, and owing to its length and small diameter two or more bearings called saddles must be provided about forty inches apart. With these saddles the upward pressure is supported and the sag is kept out while setting.

Beneath is a heavy rubber composition roller driven by power and bearing upward against a roller made up of a series of brass rings shaped like ferrules which are loosely strung on a rod. This soft roller and the sectional one above make it possible to counteract any difference in thickness to any point in the hide—an important consideration in

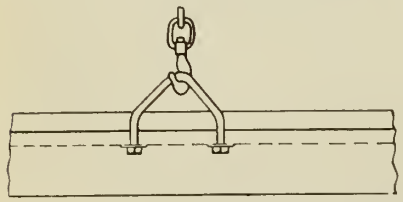


FIG. 4—HOW JAWS WERE HANDLED.

maintaining the split to an even thickness.

This description will enable the reader to see from Fig. 2 just how a hide is split. The finished piece is taken off over the top of the knife, while the surplus passes down below to be again split up when ready. Setting the parts of the machine is as close a job as anything in machine shop work. After that, operation is a matter of speed in handling the hides. The rolls above and below the knife act as feed rolls—they travel at about forty feet a minute surface speed while the knife travels around a thousand feet per minute.

Besides the general interest, much of this description would be necessary

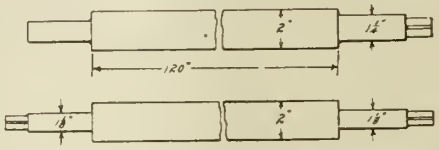


FIG. 5—A DETAIL OF THE ROLLS.

to enable one to grasp the machine shop maintenance problem. Accurate jaws and gage rolls are essential. Most tanners send their equipment to shops who specialize on this work, usually located in leather centres; for instance, in Eastern United States, Newark is the leather centre and there exists the feeling

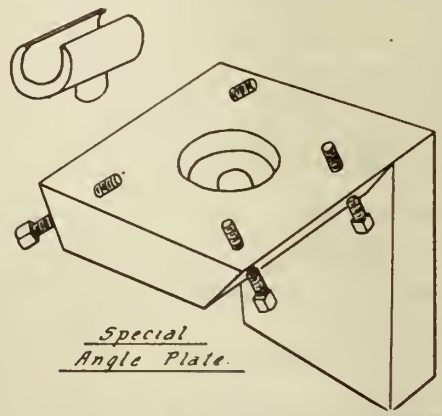


FIG. 6—SPECIAL ANGLE PLATE TO HOLD CASTINGS FOR REBORING.

among manufacturers within a thousand miles, that they must send their repair work to Newark to get it properly done.

Some years ago the shop with which the writer was connected decided to make a try for this business as found in a large local manufactory and several smaller ones within a fifty mile radius. At first, the manufacturers were loath to believe that our shop could handle the work, but after much harping on the point that every metal working job naturally falls in a certain class regardless to the use of the piece outside, we were permitted to go ahead on one set. Once the requirements were thoroughly understood and the best method of doing the work settled, there was no trouble at all in turning out as good or better work than the manufacturer had been in the habit of getting. And that at a somewhat lower figure—coupled with no freight charges, and no long weights for work in transit and awaiting its turn in a distant shop. These latter points have proven especially valuable during the unsettled conditions of the past six years.

Our policy was to attack the hardest job first—this being the re-facing of the hard plates P and P. Following a year's running, the plates get worn bell mouthed, when they have to be loosened up, papered under them, and ground off on top. Enough paper has to be put under to keep the newly ground surface 1/64 ins. above the level of the iron just back of them.

The weight and the near-sharpness of the blades make some handling arrangement necessary. The cap may be handled by two men, but not so with the lower jaw, which is also "tippy" when set down right side up. We made the fork shown in Fig. 4 of 1 inch steel to span three holes, and by removing two of the adjusting screws, E E, we could put the fork in their place and lift the lower jaw in perfect balance, handling it this way from truck to the planer and avoiding all risk.

Fig. 3 shows the set-up on the planer. Five-inch parallels are clamped at each end and on these rest the keys in the end of the jaw—this holds the jaw just as it is held in its own frame. A grinding arrangement was fixed up as may be seen, taking power from the countershaft down to a jack shaft bolted to the planer housing and driving from here to the shaft held in a fork clamped in the tool block. On the jack shaft the driving pulley has eight inches of face, which permits of side feeding without the belt running off.

This makeshift has ground scores of jaws to a most satisfactory degree of accuracy. Though not shown, the emery wheel is fitted with a hood and the clapper is secured against lifting. The direction of rotation is such that during the return stroke of the planer, the wheel cuts against the work, an arrangement found by trial to give the best all-around results. A Norton 80 M wheel is used, the size being 6 inches by 1-2 inch by 3-4 inch. Sometimes when new blades are put on, there is as much as a thirty-second of metal to remove. This is ground entirely, both the hard front and the soft metal toward the back of the blade.

In re-grinding a set of jaws, they are set up on the planer and clamped. Then

the blades are loosened up to permit the insertion of strips of paper along the edge of the jaw, which raise the blade so the worn top is up about the wearing level for properly ground blades. To get the right height, a surface gage carrying an indicator instead of a pointer is used—this gives a direct reading at

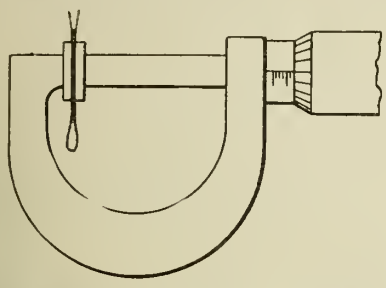


FIG. 7—HOW THE HIDES ARE MEASURED.

any spot and makes it easy to re-set for a minimum of grinding and to get the maximum wear from a set of blades. It takes about two nine-hour days to thus set up and finish the old blades on one jaw.

Our practice was to finish the cap first. Then do the lower jaw. Next to place the cap on the lower jaw and bolt it down in working position. The emery wheel would then be lowered and run along the edge of both blades, making one directly above the other in a continuous straight line from end to end, thus affording equal support both sides of the knife as well as a true surface for measuring purposes. If this edge grinding showed up thick or stubby portions, the wheel was tipped and a bevel cut run over the surface, for it has been found that a thickness of a sixty-fourth is all that may be left without catching the leather as it passes through.

Turning of Rolls

Gage roll turning is quite similar to shafting turning, a job that modern machinists know but vaguely, because of shaft-turning lathes and cold-drawing processes. These rolls when new are 2 inches in diameter and there are adjustments on the machine allowing a decrease to 1 7-8 ins. before scrapping. As made, these rollers are turned on centres, but we didn't have any lathe long enough to take them that way. The rollers are made of maganese steel and must run very true.

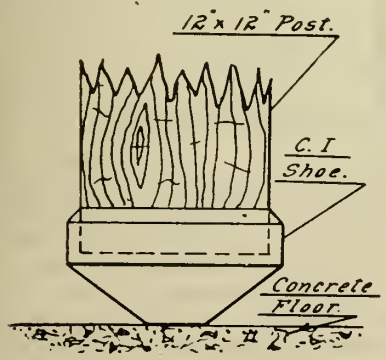


FIG. 8—PUTTING THE POSTS IN CAST IRON SHOES.

Fig. 5 gives the details of the rolls. In turning, we put one end in an independent chuck, grasping it by the journal and truing by that portion also. With the tailstock removed there is an overhang of three feet beyond the steady rest set at the end of the lathe. Between this rest and the chuck, we put another rest to absorb the vibration and avoid chatter. It is a well-known fact that a heavy cut is less apt to chatter than a light one; on this work, all that was permitted was a light cut and to avoid chatter on this relatively slender piece, a narrow round-pointed tool was used and as coarse a feed as could be worked with a fairly smooth cut. With but one steady rest, it was impossible to avoid chattering.

The belt speed of the lathe was resorted to instead of the gear speed, not so much to save time as to produce a smoother cut—the lathe we had was not of the heaviest type and it was found that there were a series of longitudinal marks, one for each tooth in the back gears, and the marks, though not measurable, were sufficient to impair the finish of the roll.

Our plan of turning was to first micrometer the worn spot of smallest dia-

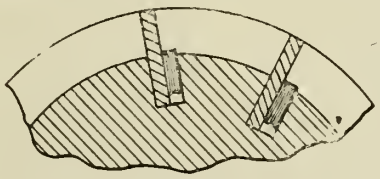


FIG. 9—FITTING AND CALKING THE BLADES

meter, then start a cut about five thousandths smaller than this. We would turn as far as a steady rest would allow, then shift and carefully re-set the rest, and turn some more. We would keep our cut between .001 in. over and .001 in. under the set diameter. The difference was wiped out in a careful file finish. After turning the seven feet within the travel of the carriage, the roll was reversed and chucked by the opposite journal and trued up by it and the nearest point of the newly finished cut. The remainder was turned as before. The points of greatest wear are always where the saddles bear, for these resist considerable thrust during the leather splitting.

Fig. 5 illustrates well-known points in machine design. Practically all machines come through with rollers like the lower drawing, with sharp corners at the inner end of the journal and with a driving gear at both ends. During the operation of changing rolls, a man might drop one a foot or so—which invariably meant a broken end; sometimes one of these journals would twist off in the machine while running. There is the same drive to each end of the rolls and the only way we could account for the twisting off when working was that the leather caused more drag one place than another, setting up just so much torsion in the roll that could not relieve itself because tied to gears at the end.

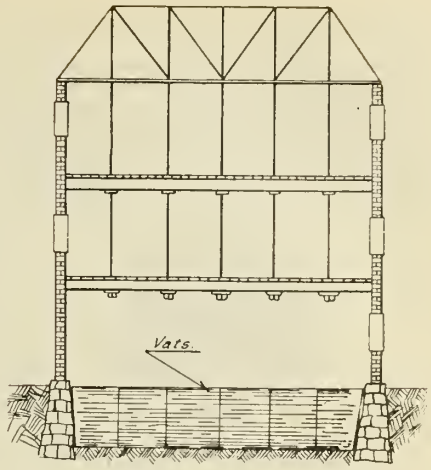


FIG. 10—PECULIAR CONSTRUCTION OF BUILDING.

By doing away with the double drive, as shown by the upper drawing, the breakage in the machines ceased entirely.

Rolls with broken journals were repaired by drilling out the end and setting in a new piece slightly larger and two inches longer than needed. This piece was chucked, trued up by the body of the roll, and turned a new journal with the gear fit beyond—the extra two inches was sawed off after the turning was over. In drilling, the roll was caught in the two steady rests and the drill in a universal chuck, then with a dog on the roll the carriage feed was used to feed the work on the drill. All this details one way of doing long work on a short lathe and doing it accurately too.

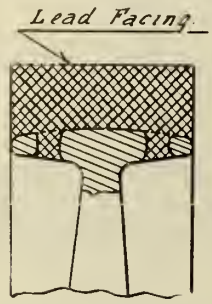
The upper drawing Fig. 5, shows filleted corners. which were adopted after it was shown that the rolls themselves were amply strong for the work. Likewise the diameter was increased one-eighth—then no careless man could snap off a journal by dropping it.

The roll saddles that have been mentioned are shown both in Fig. 2 and Fig. 6. They are bronze castings and would be made to encircle the roll entirely but for the clearance needed toward the bottom for the passage of the leather. Along with the wear on the roll, the saddles themselves wear, making a loose fit. When the rolls are turned up, the decrease in diameter makes a still looser fit. Then the metal is bent or hammered into a smaller size, which, of course, is only approximately round.

We made the special angle plate shown in Fig. 6 to hold these castings for reboring. There will be noticed a counterbore in which the hub sits, while a bolt from the back holds it firmly in position. Then the four set-screws set on the angle are brought up to support the open sides of the piece—and this they do very nicely. The rig provides a quick and most satisfactory means of holding while the bronze is bored out. Many places scrap the saddles when worn because they have no cheap way of boring out to a close fit—the fixture shown is

a good example of one that will save its cost on the first job.

There are in use saddles made with two swinging sides, pivoted at the top and drawn together by a screw. These find favor because they may be taken up from time to time—there is an objection to them in that there is a tendency to



FORM OF EMERY WHEEL AS SOMETIMES USED.

keep a worn roll in longer than is right, because the saddles may be kept up close and in doing this, the greater evil is encountered of running a worn roll too long and this is worse than a loose saddle. Rollers have been fitted to the wearing ends of these adjustable saddles, but they are generally discarded because of their short life due to a small size and the fact that they seem to wear the roll as much as a plain bearing.

Accurate splitting has already been mentioned. The task of measuring thickness in the centre of a hide brings visions of long-jawed calipers and gages with a pointer running over a dial something like the direct reading calipers that appear on the market every so often. None of these. Just a micrometer of the type with broad measuring faces for thin materials and soft stock. Referring to Fig. 7. we see how this well-known tool is used—the hide is doubled at any desired point and a measurement taken over two thicknesses. If there is any doubt as to the truth of the reading, two or three measurements in the vicinity will dispel it.

Varied Uses For Leather

There are many other jobs and machines about a leather plant of interest. Workmen there learn to "strike from where your hand is," which interpreted means to use leather for the purposes that the average machinist would think metal or pasteboard or putty or wood should be used. Thus, in babbitting ordinary bearings, a hole is cut in a piece of scrap leather and it is used over the shaft as a cap instead of pasteboard or putty.

Leather scraps are burned under steam boilers. It requires more air, but when mixed with a small amount of coal it does very well as fuel. One plant saves one-fifth of its fuel bill in this way.

Shaft couplings are constructed with leather—making couplings of the flexible type. This has been the means of some power saving, too, for in many buildings the floors and overheads are none too rigid so that a regular shaft and hanger equipment does not stay in shape very long, with the consequence that it runs hard in a short time. It has been customary to move the regular couplings back an inch or less from the end of the shaft length, slip in a circle of sole leather, and bolt to each flange.

The vats in which the hides are tanned are located on the ground floor. Sometimes in a one-story building and sometimes in a building of more height. The construction of the vats precludes the use of piers or other means of support for floors above, this requiring a different type of construction where land is at a premium. The building that is erected is virtually a shell, having a heavy foundation and substantial side walls surmounted by a roof structure having a high truss. From this truss, rods are dropped to support the floors which are put in below, these floors having no connection with the side walls except as the beams are set in at the ends and for the horizontal tie rods that are applied. (See Fig. 10).

Another structure is the bark grinding mill, usually a building resembling a frontier block house. Supported on four 12 in. x 12 in. posts, with a stone or concrete floor, wagons may drive right under to receive and discharge their loads. But this level-with-the-road floor works havoc with the posts, which are exposed to the elements and rot out at the bottom in a comparatively short time. The management of one plant adopted the scheme shown by Fig. 8 of cutting off the posts a foot and putting them in cast iron shoes. Now the water does not remain about the foot and the posts look good for twenty years

The hides in the vats are mechanically agitated and there is more or less slow-moving shafting and gearing about the vat building. Sometimes the lines are two or three hundred feet long. Spur gear reductions are used between these lines and the motor or line shaft drive. By all precedent, cast (tooth) gears are correct for such drives and they are extensively used. The fact that some of them had to be renewed every four months was accepted as a matter of course. In one case, however, the writer got permission to put in a cut gear and pinion; this ran twenty-nine months before discarding, as against four months, and now they are saving money with cut gears all around.

There is an exception to the wide use of leather in leather plants. Woven belts are quite extensively used. Not only do they wear as well and have the pulling power from the day of installation, but they cost less than leather belts. Belting is a branch by itself and only a small number of the plants make leather belts. It would not pay to make up a few any more than similar maintenance or tool propositions in a manufacturing machine shop.

One machine that saves much hand labor is employed to remove hair and fleshings from the hides. A drum about six inches in diameter and two feet long has a series of helical blades projecting an inch from the surface; the appearance is similar to a herringbone pinion in a turbine reduction set. As this drum revolves at a high rate, the hide is passed over the top somewhat as a board over a jointer head. In time the blades wear and are ground down, calling for renewal. They are calked into place in slots

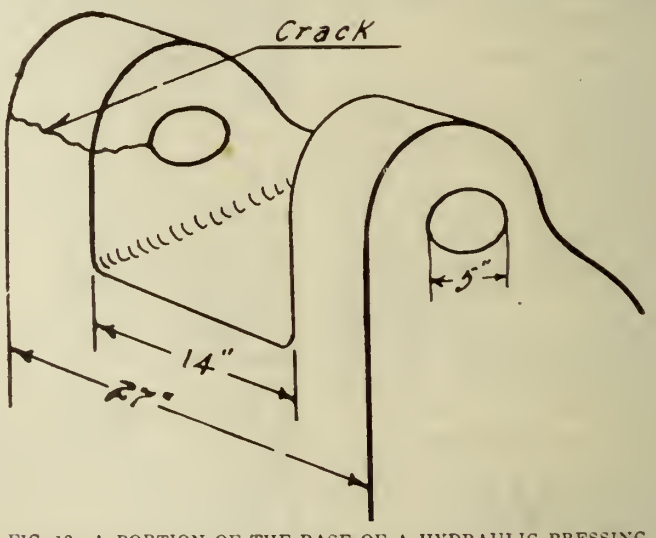


FIG. 12—A PORTION OF THE BASE OF A HYDRAULIC PRESSING MACHINE.

—the shape of the shoes (tapered in, with a small bearing on the concrete) also makes a neat job—one that lends itself to washing down the floor with a hose.

A split bearing in a tannery is never shimmed with pasteboard or metal liners. Leather is used. The variety of thicknesses found in the scrap invites this.

in the drum, using soft iron strips for calking. Fig. 9 gives an idea of this. It is no easy task to fit the ends and calk a set of these spring steel blades.

The knives which are used on the hand-splitting machines have been mentioned. These are about eight feet long and have a thin cutting edge that must be ground with the nicety of a

precision tool; it is hollow ground on both sides. Knife grinders of the familiar reciprocating-table kind are used for this work except in the smaller plants, where some home-made rig is employed or the blades sent out to be re-ground.

Fig. 11 shows a form of wheel used in some plants. A 20-inch pulley of heavy type is selected and has a number of 3-4 inch holes drilled through the rim and countersunk on the inside. A rough form is made and a ring of lead about two inches thick poured around the outside. This is turned up true in the lathe on its own spindle and it becomes the grinding wheel. It is charged with emery when it is ready to use. The emery gets bedded in the lead and makes a quite satisfactory wheel, though not to be compared with a manufactured abrasive wheel. Guides are provided to rest the knives in and bring them against the wheel. This improvision does excellent work.

It is obvious that one of the layers into which the hide is split can have the natural grain on its surface. This one is the outside split. But for many purposes, the outside of cattle hides does not have grain enough to meet the demands required of it. Belting and shoes and travelling bags may have a smooth surface, but purses and auto covers and belts must have a more distinctive finish, which may run all the way up to that imitating the skin of the alligator.

According to the finish, this grain is rolled or pressed in—the processes being known as pebble rolling or embossing. The embossing is done largely on hydraulic operated machines, which bring two flat surfaces together with the leather between them, one of the surfaces being the die for the particular grain being run. Fig. 12 gives an idea of the base of one of these machines. It is a massive steel casting. In 1916 one one of these cracked as shown. It was Thermit welded and put in service, breaking again in a week. This was repeated and it again broke. Then the welders filled the entire hole in making the weld, on the theory of equal heating and contraction of the mass. The hole was bored and the machine is running to-day as sound as ever.

HANDY RULES FOR BELTING

Rules for finding length of crossed belts:—First, find the length of straight belt. Square each the diameter of the large pulley and distance between centres. Add together and extract equare root of sum. Subtract from this the distance between centres. Multiply the remainder by two and add to length of straight belt as previously found. The result will be the length of crossed belt.

As a belt depends entirely on its power of adhesion to the pulleys to perform its function, see to it that its power of adhesion is maintained at the maximum by not overloading, and by the consistent use of suitable belt dressing, sparingly but regularly applied. Do not allow the dressing to clog on the pulleys. As belt slip is such an insidious danger—it makes no noise—and may be going on unsuspected until irretrievable damage has been done to the belt. Begin the application of belt dressing immediately the belt is put into use.

Rules for Finding Length.

When it is not convenient to measure with the tape line the length required, the following rule will be found of service: Add the diameter of two pulleys together, divide the result by two, and multiply the quotient by 3 1-7; add the product to twice the distance between centres of the shaft and you have the length required, substantially. If one pulley is considerably larger than the other, a little extra allowance should be made, because the distance from the centre of the top of one to the centre of the top of the other is a little greater than the exact distance between the centres of the shafts.

To ascertain the number of feet in a roll of belting: Add diameter of roll in Multiply the result by the number of inches to diameter of hole in centre. coils in roll, and then by 132; the three left-hand figures being the number of feet in roll.—*Belts.*

INTERNATIONAL STANDARDIZATION OF WIDTHS ACROSS FLATS ON NUTS AND BOLT HEADS

The Swiss Standards Association has addressed a communication to the national engineering standardizing bodies of the various countries, proposing the international standardization of the widths across flats on nuts and bolt heads.

The proposal covers the range of ¼ in. (6 mm), 3 in. (80 mm), diameter of bolts. The numerical values proposed are a compromise between the United States Standard, the British, or Whitworth, and the metric "Systeme Internationale." The communication states as follows:

"If at this moment the parties concerned were willing to do their best to bring about an agreement, a satisfactory international standard could be attained, while, when nationally individual standards would be introduced into practice, an attempt to reach an agreement could hardly be expected to be successful. We hold it advisable to subject the matter to a referendum of widest possible scope. It seems to us that by generous cooperation we ought to be able to find some system, which could induce France to agree upon, and at the same time form a foundation which would render possible the adoption by America and England.

The V. S. M. Committee of Standards being ardently urged by the Swiss industry, is compelled to decide upon a system of widths across flats in the near future, but doesn't care to do this unless one more attempt to bring about an international agreement in this matter be made by the V. S. M. Bureau of Standards." The communication was addressed to the standardizing bodies of America, Belgium, England, France, Germany, Holland and Sweden.

MAKE USE OF THE STAFF ROUTING LIST

A decided innovation has been started in this issue in the form of a convenient staff routing list. This is placed directly on the front cover, and we strongly advise our readers to make good use of the same.

It is hardly necessary to explain its use, but what we can emphasize is the advantage of using such a list. Your magazines multiplies its usefulness, and does not merely rest on your desk after you have perused its contents. Simply mark the list saying where you want it passed on to, and if in your opinion there is an article of special interest, check it off and refer to the page number. All this takes but a moment, but the benefits derived are surprising.

Note that a place is left on the list to ensure the magazine being returned to the proper party for filing purposes. Use this list and emphasize to the other parties concerned the importance of studying and marking articles of real merit. The success of this venture lies with the readers themselves.

DUPLICATE BELTS

In a color and paint factory there were in service a number of grinding and pulverizing machines. These machines were belt-driven, and because of the excessively hard service to which they were subjected, as well as the unwas frequently experienced with broken favourable working conditions, difficulty belts. The belts often broke open at the joints, when an abnormal stress was produced. As a rule, this resulted in the shutting down of the machine for a half-hour or so while the millwright was sought out and the belt fixed up and put back in service. These breakdowns usually tied up other operations, too.

The millwright finally hit upon the following scheme: He made up duplicate belts for all of the machines that gave trouble, fitted these belts upon the pulleys, and then took them off and hung them in closets adjacent to each machine. Then when the belt in service broke the machine operator had only to go to the closest, get out the duplicate belt and slip it onto the pulleys, involving a tie-up of but a few minutes. The broken belt was promptly fixed up by the millwright, and put back into the spare belt closet for future use.

While this plan ties up a little money, it eliminates delays in connection with the grinding operations, and can well be duplicated in other establishments where troublesome belts are found.—*Factory.*

WELDING AND CUTTING

Lessons on the A.B.C. of Good Welding

This is the Seventh Lesson by an Authority on the Subject — The Remainder of the Series Will Follow

By W. B. Perdue*

ALL the welds described in previous lectures have been made by forward movement of the torch. By this is meant that the progressive motion of the torch is in the same direction as the progressive work on the weld. When the weld is begun at the left and worked to the right it will be seen by reference to Figures 25 and 26 that the torch must necessarily back away from the finished portion of the weld, hence the name "Welding Backward."

This method of welding dates from the birth of the oxy-acetylene industry, and was the first to be used in France with the pioneer blow pipes for high pressure acetylene. That is with acetylene under pressures from 5 to 15 pounds. By using the acetylene under pressures a trifle higher than that of the oxygen, these pioneers eliminated the tendency to flash that is ever present when the heat of the flame is thrown directly backward upon the welding tip. They were not able to secure proper mixtures of the gases or a stabilized flow of same, consequently the process was superseded by the method of "Forward Welding," which has been outlined in previous lectures.

Many of the pioneer French generators were of the low pressure type which necessitated the use of injector type torches. The tendency of these torches to flash upon being brought too close to the metal mitigated against the use of this form of welding, with the result that it was not brought seriously to the attention of the welding public until recent developments in methods for stirring and stabilizing the flow of gases from the torch eliminated the possibilities of the flash and at the same time made it possible to execute a weld of this type without danger of burning out any of the essential elements of the metals welded, or impregnating them with impurities from the welding flame.

For welding heavy sections of steel or steel casting this method of welding will be found to possess many advantages. For welds in other metals the forward welds previously described will generally be found preferable.

Penetration is secured with far less difficulty in "Backward Welding." Consequently the welder who first learns backward welding seldom if ever secures penetration when he finds it necessary to do "Forward Welding." For this reason the student is first required to master "Forward Welding." With very little practice he can then become proficient in "Backward Welding," after which time he is thoroughly competent to use his own discretion as to the means to be employed in handling any complicated piece of work.

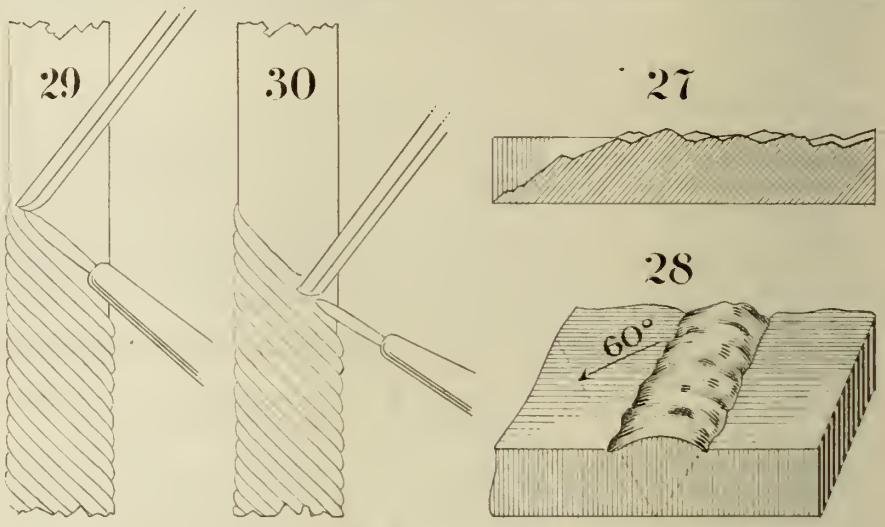


Fig. 27.—Section through centre line of bevel showing appearance of "backward" or "vertical" weld improperly executed.

Fig. 28.—Improperly executed "backward weld." There is very likely to be a thinning of the edges at the point of contact with the bevel.

Fig. 29.—Showing start of fill, working vertical weld from the bottom up.

Fig. 30.—Vertical weld. "The metal is held in place partly by the action of the flame, partly by the manipulation of the rod."

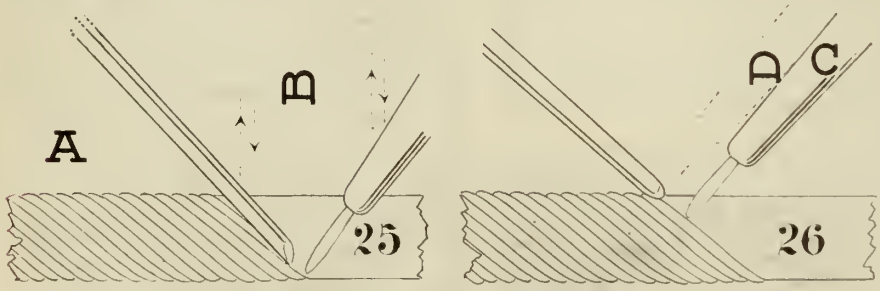


Fig. 25—Welding backward. Showing position of rod and torch at the beginning of a fill and in normal work.

Fig. 26—Welding backward, showing position of rod at finish of ripple and positions of torch to secure finish of same.

These figures also show positions used in working vertical weld from the to pdown (see text).

Position of Rod and Torch

Reference to Figure 3, with the first lecture of this series (our issue of April 22), shows the proper position to be assumed for either forward or backward welding. Figures 25 and 26 are intended to show a cross section of the weld through the centre line of the

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bevel. The position of the torch in Figure 25 is that ordinarily assumed for thin sections; the position "C" in Figure 26 shows the highest point on the fill reached by the torch in welding heavy sections except the "finishing swing" as shown at "D," which serves to give finish to and melt the upper edge of the ripple into one homogeneous mass. Figures 27 and 28 show the rough and irregular appearance that is often obtained by inattention to the proper formation of the ripple or from an attempt to add too much metal at any one time. The side motion imparted to the rod and torch is the same as this illustrated by the small outline below Figure 1 (April 22 issue).

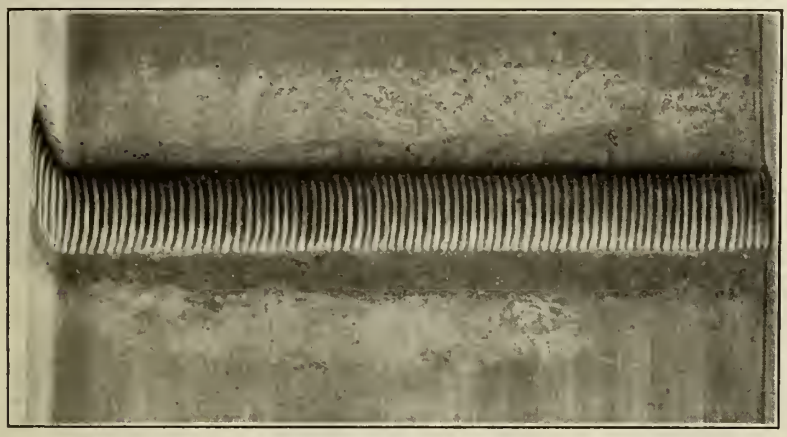

FIG. 32.—CLOSE UP OF VERTICAL WELD. IT IS QUITE IMPORTANT THAT THE RIPPLES EXTEND ALMOST STRAIGHT ACROSS.

The angle of inclination of the torch can be checked up at any time by the operator, but it is quite essential to the smooth appearance of the weld that this angle of inclination remain constant. Holding the torch too near the horizontal will disturb the even regular appearance of the ripple and further tends to melt the rod too rapidly. This, too, may cause oxidation of the added metal by sucking in too great an amount of oxygen from the nearby atmosphere.

In backward welding particular attention must be given the selection of tips of the proper size. The end of the white cone must at all times just lick the metal.

Unless the cone is forced all the way to the bottom of the bevel the flowing together of the edges of the weld may form adhesions at or near the bottom. The size of the tips selected will depend to some extent upon the experience of the operator. Beginners will do well to practice with smaller tips than those used by the more experienced operator, while experts can use much larger sizes to advantage.

Execution of Sound Welds

Sound welds will be quite similar to those made by forward welding, the principal difference being a slight variation in the form of the ripple and the width of the weld. Forward welding requires a bevel of a full 90 degrees, backward welds may be executed with a bevel of 60 degrees; that is with a bevel of 30 degrees on the edge of each of the pieces to be joined.

No channels or depressions which represent a thinning of the edges will be in evidence at the edges of a good weld, neither will there be any lumps, hills or valleys present, or any side lumps formed by an adhesion of the melted metal from the rod on the unmelted edges. In the work of beginners these faults will be found quite common. The reverse side must be similar in appearance to the forward weld with the exception that beads are generally in evidence instead of the better defined ripple. In any case penetration must be thorough and complete in order that there may be no starting points for cracks.

The tendency to hold the torch dead and burn or slick away the metal from the sides of the bevel is greater than with forward welding, but the tendency to form adhesions is lessened. In either case many regrets will be saved the operator who makes frequent test welds and subjects them to bending, shock and etching tests to determine his skill in handling the torch. Such tests should be made even by the experienced operator before undertaking any weld of extreme importance, the failure of which might endanger life or property.

Welding Rod

The symmetry of the weld depends largely upon the motion imparted to the welding rod, as does the elimination of impurities and the grain of the metal within the weld. The motion imparted to the torch should not be rapid, but that of the rod must be as vigorous as can be continuously maintained by the operator. This motion for materials in excess of 1-8 inch should be the same as that indicated for the torch in the small diagram below Figure 1 in the first lecture of this series. For thinner sections the rod is alternately driven to the bottom of the melted pool and lifted to the surface.

It is not necessary at any time to lift the rod from the melted bath or pool of metal in which it is being manipulated.

The choice of a steel rod of the proper grade and size merits some attention. A rod that is too small may cause oxidation of the weld, while one that is too large absorbs too much heat from the melted bath and retards the speed of welding. Either extreme may seriously influence the quality of the work.

A very simple rule to determine the approximate size of rod for any steel weld is to take ⅜ the thickness of the metal and to the result add 1-16 inch. This will work out in all cases except thickness under ⅛ inch for which due allowance must be made. In using this rule whenever fractions of an inch

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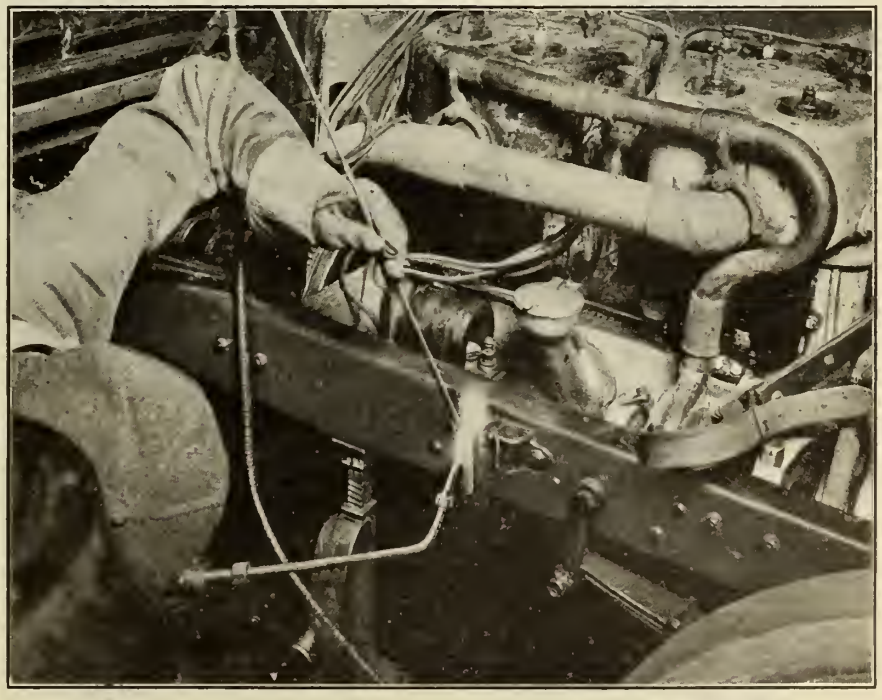


FIG. 31—SHOWING PROPER METHOD AND POSITION FOR EXECUTION OF VERTICAL WELD.

DEVELOPMENTS IN SHOP EQUIPMENT

ELECTRICALLY CONTROLLED

THE Albert Herbert Co., 31 Yonge Street, Toronto, Canada, who are Canadian agents for the Stirk line of planers in Canada, have supplied us with some very interesting information relative to this novel planing machine.

The machine, which is called a "Hiloplane," and is illustrated in Fig. 1, contains a number of interesting features including a reversing motor drive (current to which is supplied through a special generator set which is part of the equipment), magnetic feeds, the introduction of cross planing, the simplicity of setting table stroke on a graduated dial, no table dogs being employed for this purpose, but only in cases where one desires to skip gaps, as is often necessary.

In its mechanical details the box section bed is of unusually substantial proportions. The driving pinions are forged solid with their shafts, as the makers contend that at the speeds at which they run this machine solid pinions are safer in every way. One change of speed for slow speed work is obtainable in the table gearing. The entire absence of belts, and the convenience of quick power traverses in all directions may be noted.

The most striking features, however, are the flexibility and ease of control obtained by the special system of driving and the magnetic feeds. The essential principle of the drive is the Ward-Lennard System of using a special generator to supply current to an individual motor, the control of the latter being principally accomplished by manipulation of the fields of the former. The driving motor (which may be an alternating or direct current motor) is directly coupled to the special generator which in common with the final reversing motor must be a direct current machine, with independently excited fields. Variation in strength of the generator field provides a variable voltage with the corresponding variation of speed in the final motor. This gives an infinite range of speed downwards from a given normal by reducing the generator voltage to zero, although in practice the speeds are never reduced below 25 per cent. of the normal on acount of the reduced torque. The overall range of the final reversing motor is usually increased from 8 to 1 by the variation upwards from the normal, by weakening the motor shunt field, the speed variation being accomplished by adjustment of resistance values in the generator and motor field. It is a simple matter to secure sudden alterations of speed at any part of the stroke and an accelerating switch is fitted on all hiloplanes, which enables cutting speed to be increased after the tool has entered the metal, or table speed increased to return speed, in order that gaps between surfaces may be quickly bridged.

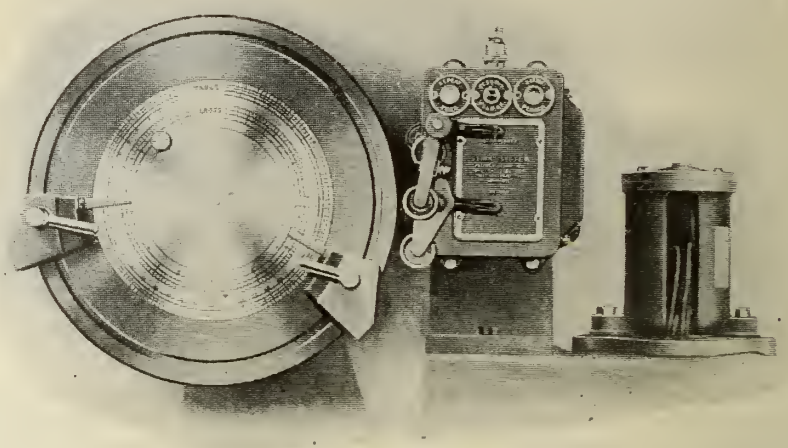


FIG. 2—DETAIL OF MAGNETIC FEED CONTROL.

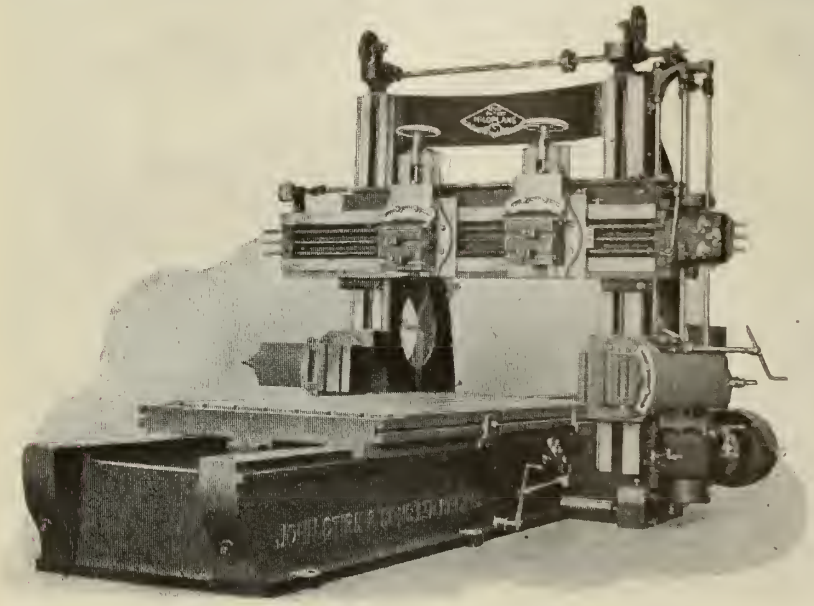


FIG. 1—GENERAL VIEW OF THE HILO-PLANE.

An exceptionally wide range of feeds is obtained by the special magnetic feed control which is operated by solenoid and small separate motor, illustrated in Fig 2. Light feeds are obtained by solenoid control only, broad fields are actuated by the motor controlled by the solenoid working in synchronism with it, the feed obtained being according to the position of the handle in the horizontal slot "a" shown in Fig 3. The motor is only energized for a few seconds at the beginning of the cut and is fitted with an adjustable slipping clutch. The feed motor mentioned is also used for quick power traverses to the heads, which are obtainable in all directions, also for

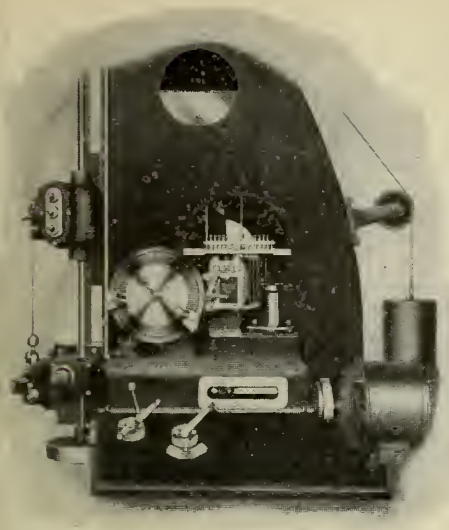


FIG. 3—ILLUSTRATING THE FEED BOX

cross planing, a unique feature very valuable for short bosses on large pieces, and for jig work and vertical planing or slotting.

The control of table stroke, or cross stroke to head for cross planing is exceedingly simple—this is clearly illustrated in Fig 3. The length of stroke is obtained by setting the dogs to the necessary graduations, which are direct reading in feet and inches. The reversal of stroke is obtained by the action of the dogs on the master reversing switch shown in the same illustration. The combination enables a stroke of only 4 ins. to be obtained on a twelve-ton table. This stroke control entirely does away with table dogs and enables the operator to set both ends of the travel accurately from a given point. The table may be started or stopped at the master switch or from stations on either side of the bed; a hanging pear switch is also provided for convenience in setting up—it acts as an inching control; a safety switch is also provided to prevent the table running off the rack.

The simple type of switch gear employed is to be noted. The disk and master switch mentioned in the previous paragraph, and illustrated in Fig. 3, actuate two contractors, which, without any other switch gear whatever, provide the quick return reverse to the table motor. This apparent impossibility is accomplished by the division of the shunt field winding of both generator and final motor into two sections.

In the case of the generator these sections are connected to oppose each other, so that alternative polarity results from the alternative excitation of the two sections.

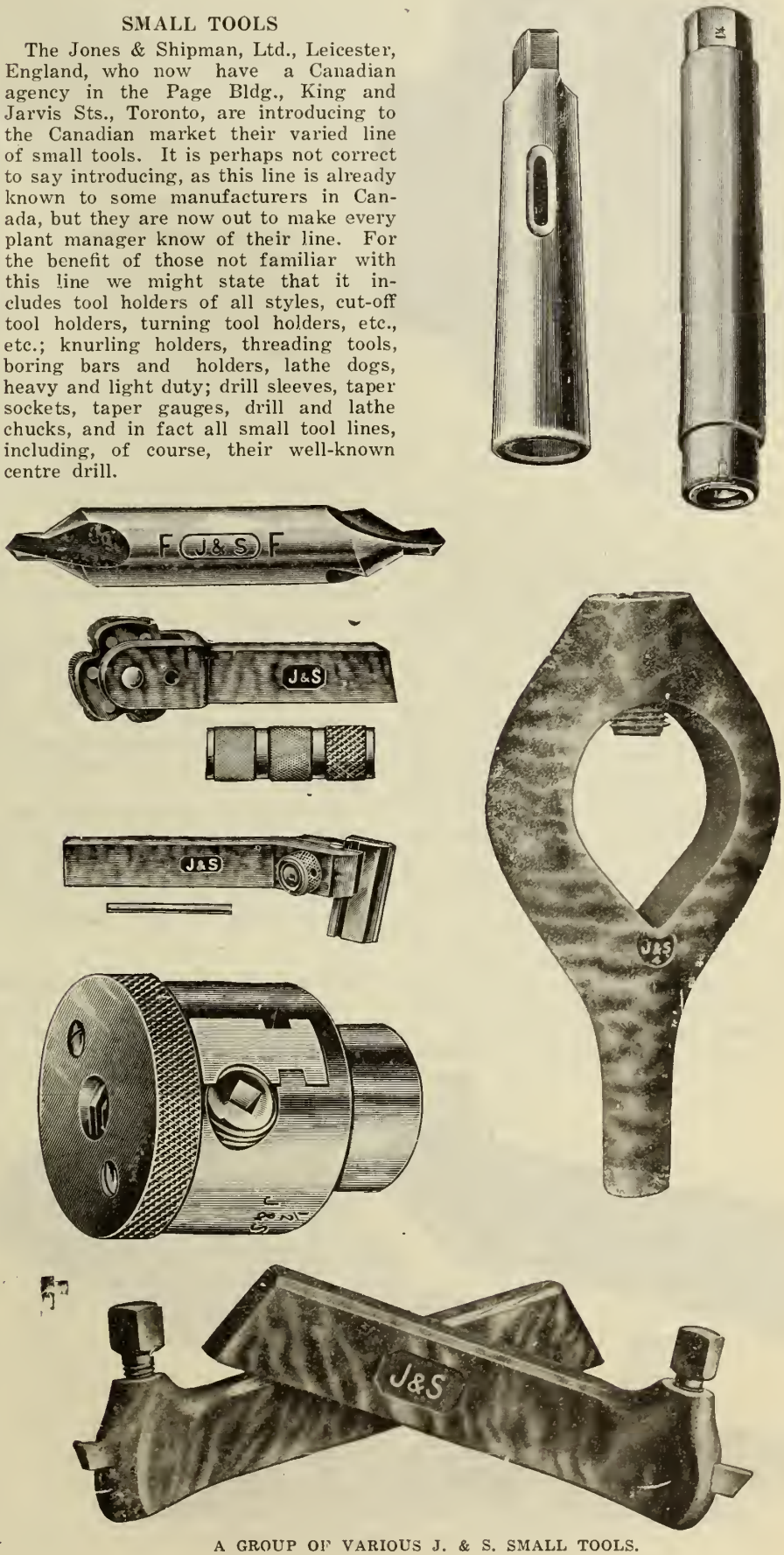
The two sections of the motor field are connected to agree, and one is permanently excited. The second section is excited during the cut stroke only, and a sole cutting speed and a quick return are thereby provided.

The Hiloplane is not made in smaller sizes than five feet by five feet in the housings, but Messrs. J. Stirk & Sons, Limited, Halifax, England, manufacture a very complete line of planer machines, from the smallest size upwards, in standard types with various drives.

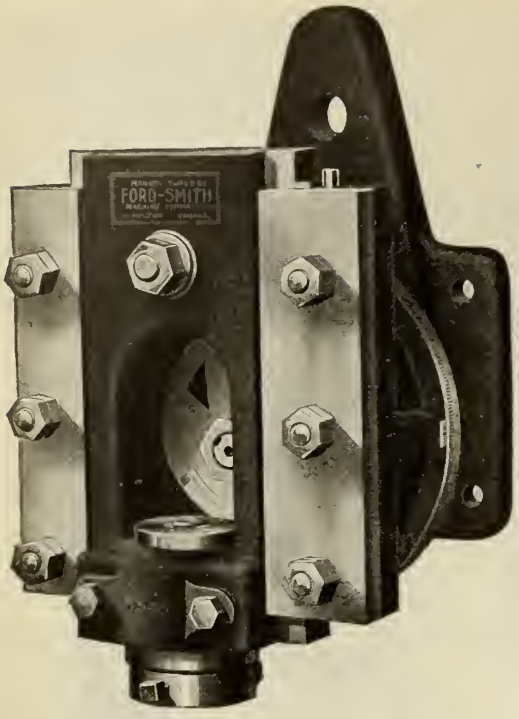
SMALL TOOLS

The Jones & Shipman, Ltd., Leicester, England, who now have a Canadian agency in the Page Bldg., King and Jarvis Sts., Toronto, are introducing to the Canadian market their varied line of small tools. It is perhaps not correct to say introducing, as this line is already known to some manufacturers in Canada, but they are now out to make every plant manager know of their line. For the benefit of those not familiar with this line we might state that it includes tool holders of all styles, cut-off tool holders, turning tool holders, etc., etc.; knurling holders, threading tools, boring bars and holders, lathe dogs, heavy and light duty; drill sleeves, taper sockets, taper gauges, drill and lathe chucks, and in fact all small tool lines, including, of course, their well-known centre drill.

This style centre drill was placed under a very severe test, being placed by comparison with other makes. The result was that their drill completed 359



A GROUP OF VARIOUS J. & S. SMALL TOOLS.



GENERAL VIEW OF SLOTTING ATTACHMENT

holes before breaking against 44 and 153 of other makes. The claim that this concern makes for the long lasting qualities of these drills are as follows: The drill is completely ground all over, and is ground after hardening, which, of course, eliminates all distortion. The tip being ground, also the lip, means that every hole drilled is true to size, smooth and free from ridges. The diameter of the tip is also slightly greater at the point than at the root. The cutting edge of the countersink is at an angle, which eliminates any tendency to chatter, and after hardening every drill is backed off on machines of their own design to absolute exactitude.

Their various tool holders are made from steel drop forgings, and the cutters or tools supplied are made from the finest grade high speed steel. On their knurls, they make a point of generating the teeth on the knurl discs, which ensure not only accuracy, but a true knurl.

Safety setscrews are used on all lathe dogs, and both straight and bent tails are handled. The sleeves and taper sockets are made to absolute standards and are of splendid workmanship throughout.

Every tool passes rigid inspection before being sent out to the trade, and, as stated to our representative, all tools are guaranteed to be correct.

They also make a new two-jawed chuck, which is deserving of close attention, and in a later issue we will go more deeply into the individual merits of their respective lines.

MILLER ATTACHMENTS

The Ford-Smith Machine Co., Hamilton, Canada, are now manufacturing a full line of miller attachments in addition to their regular line of grinders and millers. Any of the usual style attachments can be supplied, and two of these lines are illustrated herewith.

Fig. 1 shows a clothing attachment which has a 3½ in. maximum stroke. All parts are of sufficient strength to withstand heavy duty, and the machine work put into this attachment is up to the usual Ford-Smith standard.

The Universal milling attachment illustrated at Fig. 2 has a wide range and covers all general requirements of such an attachment.

The slotting attachment receives its motion by means of a special nose sleeve which enters the main spindle. This drives a disc, on which is a tee slot. The connecting rod of the slotter ram is fastened to this disc, and, of course, the length of stroke can be changed in an instant.

The universal attachment is driven by gearing, which, of course, first receives its motion from the miller spindle. Anyone interested in either of these fixtures or other miller attachments can get additional information from the makers.

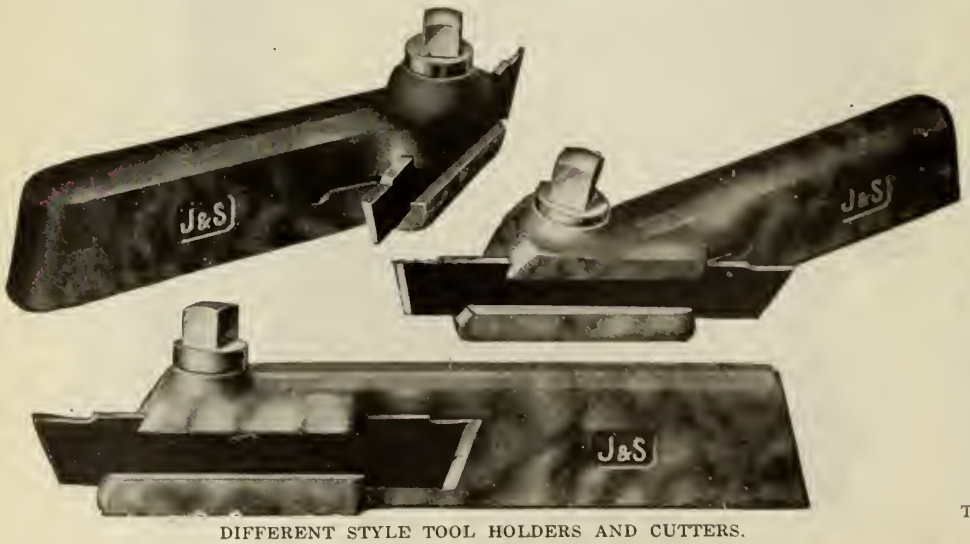
HYDRAULIC PRODUCTION PRESSES

The Eastern Production Co., Detroit, Mich., manufacturers of hydraulic machinery, have developed a full hydraulic horizontal press for sizing the ends of axle and pinion tubes used in motor car construction. The sizing of these tubes is necessary for pressing into housings and flanges on either side. The time required for the sizing of the two ends of an axle tube and within a limit of .001 of an inch in diameter and removing from the machine, is thirty seconds.

Up to the present time the method of sizing the two ends of an axle tube is by grinding or turning. By this method the sizing is left entirely to human element, resulting in a loss by reason of turning or grinding under size from 5 to 20 per cent. The machine which this company has developed receives the tube in its receiver, presses it into a die, both ends at the same time, and removing it, therefore the diameter of the tube is fixed for the size of the die and is easily held within fixed limits with no scrap.

In addition to this the machine is used for reclaiming of tubes which have been turned or ground under size. The operation of this machine is by hydraulic pressure developed by a 3-cylinder hydraulic pump. The ram is driven with a speed of 1½ ins. per second and is returned by hydraulic pressure with the speed of 3 ins. per second. Sizing dies can be replaced readily and the machine carries a built-in motor. It is made in 35, 50, 75 and 100-ton capacity.

Among other developments of the Eastern Production Company in production equipment are vertical hydraulic presses from 10 to 2,000 tons, standardized on 20, 35 and 50 tons production basis and horizontal presses standardized on 20, 35, 50, 75, 100 and 200-ton basis; hydro-pneumatic presses of 10, 15, 20 and 30 tons; extra heavy presses for assembling 5-ton truck axles; special broaching machine, 20-ton capacity, 30-inch stroke for 20-inch broaches, used in broaching universal joint yokes and spline gears.



DIFFERENT STYLE TOOL HOLDERS AND CUTTERS.

THIS ILLUSTRATES THE UNIVERSAL MILLING ATTACHMENT.

NEW THINGS IN MACHINE TOOLS

WHIPP CRANK SHAPER

The Whipp Machine Tool Company, of Sidney, Ohio, has brought out an improved type of shaper. Quick and accurate adjustment is provided for the swivel head, by means of an eccentric lock. Micrometer graduation is fitted to the down feed screw. The automatic cross feed may be adjusted while the machine is in motion, likewise the stroke of the ram. The ram has a stroke of 16½ inches. Table has a vertical travel of 13 inches and a horizontal movement of 20 inches. Vertical feed of tool head, 6 inches. Table dimensions, 10 x 16 inches top surface, by 12 inches deep.

INSERTED LATHE CENTRE

The Federal Steel Company of Detroit, Mich., is placing on the market a special inserted centre for use on lathes, milling machines and grinders. The small inserted portion is made of high-speed steel, the shank is made of carbon steel, and the fit is made with a Morse standard taper.

DOUBLE-SPINDLE GRINDING MACHINE

A grinding machine that is intended for the finishing of both sides of parallel pieces has been developed by the Badger Tool Company, of Beloit, Wis. The disc wheels are 20 inches in diameter, and are carried on spindles 2 3-16 inches in diameter. Special facilities are provided for preventing the grit from getting under the sliding head. The sliding head is equipped with positive micrometer stops. The machine can be supplied for either belt or motor drive.

SCREW PRESS

The Manhattan Machine and Tool Works of Grand Rapids, Mich., are now manufacturing a special screw press intended for the testing of dies and other experiental work. The punch head is supported on four posts and is operated by means of a central screw that carries a large ratchet wheel, operated by a pawl that is fitted to a lever fulcrumed to one of the corner posts. This gives a much more powerful drive than where the screw is operated direct.

SPECIAL SCREWDRIVER

The Ackland Specialty Company of Springfield, Mass., have placed on the market a screw-driver and attachment for the specific purpose of removing stubborn screws that have become rusted in position. The screw-driver is operated by means of a ratchet wrench and pressure is applied by means of a lever which is fulcrumed on a chain that is placed in a convenient position. The ratchet wrench is double ended, one end fitting the Ackland socket and the other adapted for the standard sockets.

PRODUCTION DRILLING MACHINE

A drilling machine that has been designed for quantity production has just been placed on the market by the Minster Machine Company of Minster, Ohio. The power is transmitted through hardened stub-tooth gears. Two sets of speed change, and one set of feed transposing gears are fitted to the machine. Provision is made for the disengagement of the feed when the desired depth is attained. Spindle is fitted with a ball-thrust bearing. The machine is primarily intended to be belt driven, but may be fitted with a motor if desired.

SAFETY PRESS GUARD

The D. & M. Guard Company of Rochester, N.Y., has recently designed a guard for power presses that provide three distinct guards that are arranged to swing independently and in proper time with each operation of the press. One of these guards is operated by means of the foot treadle, swinging across the front of the die; the second one has the same movement but is operated by the downward motion of the ram. The third "safety" prevents the feeding of the press from the side. The bridge carrying the three guards is hinged and fastened by means of a pin and padlock.

BAR STRAIGHTENING MACHINE

The Whitney Metal Tool Company of Rockford, Ill., are now manufacturing a straightening machine that can be placed on the bench or a machine for handling shafts that require to be straightened before working. The pressure head that carries the screw is fitted to a slide and may be located in any position along its length. A pair of V blocks are provided, and to the side of these is fitted a set of disc rollers on which the shaft is revolved when determining its accuracy. When pressure is applied the wheels depress so that the shaft rests upon the vee's in the block.

MULTIPLE-SPINDLE PROFILING MACHINE

The Automatic Machine Company of Bridgeport, Conn., has recently placed on the market a special machine of the multiple type, for the rapid profiling of irregular contours. The machine can be designed with any desired number of spindles and the construction modified to suit almost any requirements. The spindles are driven by means of helical gearing, the gear on the main driving shaft being long enough to engage with all the gears on the different spindles. The lateral movement of the spindle heads is obtained by means of a cam fitted to one end of the machine; the table movement is derived from another cam located at the rear of the machine. The combined motion of these two cams provides the path of the cutter, and these cams may be made to suit any desired contour within the range of the machine. The two cam shafts are driven by worm gearing and timed to act in unison, the drive being obtained from the spindle drive shafts, so that overload on the cutters will not affect the movement in a horizontal direction. A timed clutch is provided to control the feed, so that the feeding of the cutters will always stop at the point from which they were started. The head carrying the spindles may be raised or lowered, and a micrometer adjustment is fitted for accurate setting. The spindle design is of special construction for taking up the wear in the bearings.

ADJUSTABLE LIMIT GAGE

The John M. Rogers Works of Gloucester City, N.J., are now making a special line of snap gages. The malleable iron frames are designed for strength and rigidity and are well seasoned before machining to guard against the danger of warping or twisting. The anvils are made of alloy steel, hardened, ground and lapped, and designed so that they will not turn in the frame. The anvils may be set to any required dimension within the range of the gage, and sealed after locking, to avoid the possibility of tampering. They are made in sizes up to 8½ inches.

CENTRELESS GRINDING MACHINE

An improved type of centreless grinding machine has just been brought out by the F. C. Sanford Manufacturing Company of Bridgeport, Conn. The grinding wheel, which is 20 inches in diameter with 4 inch face, is carried on a high-carbon heat-treated 3¼ in. steel shaft. The machine is intended for grinding cylindrical work from 3-16 inch to 6 inches in diameter, with lengths up to 20 inches. When large quantities of work are to be produced it is intended that several of these machines will be installed so that the work can be passed from one machine to another, each taking off a certain amount of the stock, to avoid the necessity of sizing adjustment, which would be required if only one machine were used.

VERTICAL DRILLING MACHINE

The Hoosier Drilling Machine Company of Goshen, Ind., has added a new type of 20-in. vertical drilling machine to their standard lines. Several sizes are made to meet the varying requirements of the trade. The larger sizes are fitted with back gear drive and power feed, and are especially designed for heavy service. Ball thrust bearings are fitted to the spindle, which is counterbalanced by a weight in the column. The machine has eight changes of speed, four with and four without the back gear. The graduated spindle sleeve is provided with an automatic stop. The centre hole of the table is bored in alignment with the drill spindle.

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The Fuel Problem

AN item in the news from Montreal discloses the fact that a shortage of fuel is causing great inconvenience there. Montreal uses large quantities of soft coal, which in the years before the war was shipped up the St. Lawrence in ample quantities to supply the needs and furnish a substantial reserve. In those days the methods of using coal which have largely contributed to the present shortage were very much in evidence, not only in that particular district, but all over the country where coal was used. During the strenuous days of the war a great cry for conservation was raised, and our Government came very nearly achieving something in the direction of teaching fuel users better methods.

With the passing of the high productive period of the war, the Government enthusiasm waned, and little more was heard of conservation from an official source. The mounting cost of coal and the difficulty of getting it is causing interest in this question again. The necessity for education of the men who are responsible for the proper burning of coal is as great as ever.

It is as true now as it was five years ago that the average efficiency of the steam plants in Canada would not reach the 50% mark. In some places it is feasible to use oil fuel, and the owner then comforts himself with the thought that he is getting good combustion efficiency. Perhaps he is, but it is just as easy to burn oil inefficiently as it is coal.

From the point of view of economy, and also the conservation of natural resources, it is time that a really comprehensive effort was made to make the problems of combustion better understood among the rank and file of power plant operators. It would well repay a group of manufacturers in a district to pool together and get a combustion expert into the district to personally visit each plant and set them in the right way. The saving that can be made in a steam plant by the exercise of a little care with no expense at all for instruments is enormous. We speak of the average plant, not of course of large installations where the best of scientific methods are in force. The average power house operator is anxious to do the best by the plant, and it is up to the owner of the plant to give him every facility.

If half the energy that is devoted to other forms of propaganda were to be put into this question of fuel efficiency, it would not be long before the country would be getting along with half its present consumption of coal. What is needed is a concerted effort, and representative bodies of manufacturers and engineers should get together and devise a programme of education that would cover the country. The question of expense need not deter them, because they will get it back a hundred fold. It will be a long long time before we can do without coal or oil fuel in this climate, and it will be a considerable time before the hydro-electric power entirely supplants steam, if it ever does. The more general use of the internal combustion engine will no doubt relieve the situation to some extent, and the installation of more economical steam engines is a factor in the right direction. The greatest source of waste is still the boiler furnace. and that is the place where the remedial measures should be applied in the first instance.

In the British Market

FOR the most part Canadian goods are well thought of in the Old Country markets. Britain has been for some time, and continues to be, our best customer when it comes to selling. In 1919 Canada sold to Old Country buyers $528,000,000 worth of goods, or 43 per cent. of the total amount of our sales.

Formerly the bulk of our trade to Britain was in raw materials or farm produce, but more and more we have been sending in the finished material, and it is getting a good reception in the British market. One firm recently went to a number of the larger stores in Britain to find out how the Canadian goods were received. In groceries, provisions, flour, rolled oats, bacon, cheese and salmon it was found that the Canadian article was considered as the standard of the trade. Strange as it may seem, our spaghetti and macaroni are competing with the article made in Italy for the London trade. It was hard to get a British dealer to admit that Canada, or any other country for that matter, could make jams to equal the Old Country product. Canned fruits were severely criticized in many particulars, although Canadian apples are acknowledged as being the best reaching the market.

Canadian made garden utensils, tools and garden furniture sell well and are popular. The Britisher is wedded to white enamelware, and in that essential the Canadian product, which is often finished with a grey or brown speckle, is lacking. They consider our tinware rather clumsy, but oil stoves compete with anything sent in from American makers. The Canadian kitchen range is perhaps a little too heavy and large for the British requirement.

For electrical equipment there seemed to be a real opening for Canadian-made goods. Only a few lines appeared in the stores visited, but these had sold well against all competition. It must be remembered that there are many voltages met with in Britain, and electrical goods going in there should be of the universal type. Woodenware, kitchen cabinets, fibreware, etc., from the Dominion are acknowledged to be the best reaching the British buyer.

In spite of all that was said during the early stages of the war about Canadian-made shoes, there is a good sale for the Canadian article.

One thing that the Canadian exporter must bear in mind—no matter whether his product is great or small, metal, leather or wood—or anything else—he can offend the British market by a poor shipment, and his poor stuff can prejudice the minds of British buyers against anything and everything that comes from Canada. There is a great big responsibility attached to each Canadian seeking to enter the British or any other market abroad. The customer may form his idea of all Canadian goods from the quality, or lack of it, that is put into any one shipment.

The Week in Review

F. M. RIGGS, vice-president of the Desmond-Stephan Co., Urbana, Ohio, was in Toronto during the week. He had with him an interesting collection of diamonds for the trueing of abrasive wheels. Stones, even for this purpose, are expensive at present. They are uncuttable diamonds, and nothing gets past now that can be utilized for a cut stone. The increased earnings of a great many people during and since the war has caused them to become buyers of diamonds, which has driven the prices to new levels. It used to be quite common to find a cuttable stone in a shipment of supposedly uncuttable ones, but such an event now is a rarity.

* * *

The new Australian tariff, which is to become operative at the start of 1921, gives Canadian exporters who have been selling in that market something to think about. The Australian Government is putting on a real tariff, fixing the price at which articles shall be sold to the home trade and fixing the rate that shall be paid to the men engaged in the industry. Canadian implement makers have built up a good trade with Australia, but they will find it a hard matter to get through the tariff wall, which is about a forty per cent. structure, and do a profitable business. Castings are allowed in for 10 per cent., apparently with the idea of getting some outside firms to come over and start business by doing their assembling there. Canadian firms have not yet announced how they will meet the new conditions surrounding Australian trade.

* * *

The closing of the finishing departments of the Steel Company of Canada is an unfortunate occurrence for Canadian industry, as well as for the company. A steel mill, all through, is of necessity a continuous operation, and a break is a hard thing to overcome. Going back to first causes it is quite true to say that the Steel Co. of Canada is closed to-day because a gang of outlaw switchmen decided to paralyze traffic on United States lines, and succeeded to a degree that the authorities do not care to recognize or admit. The coal supply from U. S. mines was cut off from the Hamilton plant, and a steel mill can no more run without coal than a blast furnace can operate without ore. The strike of United States, outlaw or recognized, are to all intents and purposes strikes against Canadian industry if they touch lines for which we depend on United States for our supply.

* * *

The fact that their men went on strike a few months ago has not made any difference in the shop bonus and service bonus plans of the McKinnon Industries at St. Catharines. In the natural course of events it might have been thought there would be a tendency on the part of the company to retrench in this line of work following the strike. "In spite of the strike, we consider it good business," was the way one of the company officials stated the case to this paper. The company claim that many of their men went out through pressure from their unions, fearing that if they stayed they might lose their membership.

* * *

After all, a personality counts for a lot. One large Canadian firm of implement makers have several men on the roads of United States keeping cars moving in the direction of the plant in Toronto. "One of our men in an old railroader, a big chap who knows how to meet men and talk to them. He can get more cars moving in a shorter time than all our representatives put together." That is the company's estimate of this man. And it's the wise company that watches out for these men and develops them. The man who has magnetism and personality, if properly treated, can be made a wonderful asset in the organization. On the other hand, if he is ignored or snubbed he can become a dangerous man. He can attract men and influence them, and the company that is not on the alert for this ability has not learned the first lesson in real organization work and team play.

* * *

The fact that the steel companies and some of the other large melters are not buying scrap now may cause the prices to drop on such lines as heavy melting steel, machinery scrap, etc. If you can afford to do so, it might be better to hold material, for a recovery is almost certain to come in one way or another. An improvement in the coal and coke situation will carry with it a call for several lines of scrap material, especially of the iron and steel kinds, and prices will be stronger.

* * *

Writing to this paper from Glasgow, Scotland, James Johnstone & Son, iron and steel merchants, 212A St. Vincent St., remark on the low prices quoted in Canadian scrap metal trade. A comparison shows the following:

	Canada	Scotland
Heavy melting	$18.00	£11/10
Rails	18.00	£11
Malleable scrap	25.00	£12
No. 1 machine cast iron	33.00	£13
Steel axles	20.00	£15

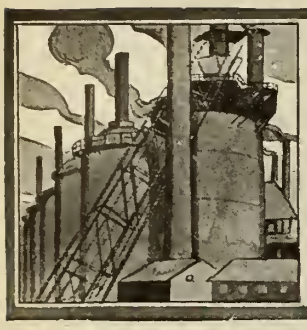
Export duties on iron and steel have been fixed by a Luxembourg Grand Ducal Decree as follows, all duties are per metric ton:—Pig iron, 40f.; ingots, bars, billets, shapes, wires, plates, sheets, &c., 60f.; scrap, drillings, turnings, &c., of iron and steel, 25f.; iron ore, mill and other scale, 1f. The duties were to be levied as from May 1st, and may be revised every month.

The electrification which has been adopted for the Paulista Railway, a line of about 28 route and 76 track miles, in the State of Sao Paulo, is to be worked on the 3,000-volt continuous current system, with overhead contact lines and geared locomotives. The arrangements will be very similar to those of the Chicago. Milwaukee and St. Paul line in America. The electrical supply for the railway is to be obtained from the Sao Paulo Light and Power Company. This company obtains most of its energy from hydraulic stations, and will provide the railway with a three-phase, 60-cycle, 88,000 volt supply.

Ravenhilt in Punch

HIS OWN BUSINESS.

Uncle Sam—"If I weren't so preoccupied with Ireland I might be tempted to give myself a mandate for this."



MARKET DEVELOPMENTS

Just 12 Weeks Coming from Pittsburgh

Some Shipments Are Arriving Now that Have Had a Long Wait to Get Through—Scrap Market Sags When the Large Buyers Drop Out—Machine Tools Are Quiet.

THERE has been a quiet period during the week in machine tool circles, and the same is true of several kindred lines. There is nothing unusual about a dull period at this season, and a revival of machine tool buying is looked for as soon as there is something more definite in regard to the securing of material.

There is little, if any, improvement in the manner in which shipments are coming across the line. Some warehouses have been fortunate in getting shipments through, but in one case a car had been on the road for twelve weeks from the Pittsburgh district. Canadian firms in increasing numbers are sending their own men across the line in an attempt to get cars moving in their direction, and some of them are meeting with pretty fair success in this work.

It was thought that there might be some revision in the prices of small tools, particularly drills, but Canadian makers find that they are paying a price for their high speed steel that keeps them from coming to lower levels. The idea of a cut would be to keep on a level with prices that are being quoted on Old Country material, although some firms claim the latter will have to come to higher levels, which will practically equal the Canadian price.

The scrap metal market, with the steel companies and other large melters out of the market, is in for a dull season, and dealers say that prices will likely be marked down on such lines as heavy melting steel, cast scrap, etc. The prices paid for cast scrap in Scotland yards now is away above the prices here, and reports have it that United States interests have been shipping there to take advantage of the high prices that are offered.

Dealers selling motors report that, with the shortage of power in the Niagara district, there has come quite a falling off in the sale of electrical equipment, while in other sections, where power is available in larger quantities, the sale of motors is very brisk.

UNSETTLED CONDITIONS PREVENT A LARGER TRADE IN MONTREAL FIELD

Special to CANADIAN MACHINERY.

MONTREAL, July 1.—The market is bearing up under the continued difficulty that features the transportation of materials at the present time. It cannot be said that that any pronounced improvement has developed in connection with delivery, although some jobbers claim that there has been a slight betterment in getting commodities through from the States. The threatening conditions that hover round the steel and railroad activities do not favor a speedy return to normal, and many dealers here fear that further disturbances in the States will be reflected in this district, and perhaps have a serious effect upon many lines of Canadian activity. Already the supply of soft coal has fallen off considerably, and many manufacturing plants have suspended operations, while others are contemplating shutting down or curtailing operations as a means of conserving fuel now on hand. Machine tool movement has shown a slight easing off, the demand being lighter and the delivery uncertain. Good business is still reported in small tools and accessories, with prices well maintained. The metal situation, while not active, shows improved signs of settlement. Demand is comparatively light but fair business is reported. Old materials are moving slowly, with accumulation of yard supplies increasing.

Local Supplies May be Affected

"The gathering strike clouds in the States may again set us back to where we were six months ago. Should the trouble assume any magnitude the present situation, which is far from being satisfactory, would become increasingly acute, and we here in Canada would be confronted with difficulties that could only be relieved by early adjustment of American labor troubles." This statement by a local dealer is some indication of the situation that may be created by drastic action of steel and railroad employees in the States. The coal conditions here in Canada are none too promising, and reduced American supplies would seriously affect Canadian industrial operations. Increasing quantities of Nova Scotia coal have been diverted for bunker purposes, so that industrial supplies from these fields have shown a marked falling off.

"Our mills in the States," continued the dealer, "have been showing slight increases in tonnage output, and receipts at this end have been better, but while endeavoring to meet the requirements of our customers we are not over anxious to carry heavy warehouse supplies, as much of the stuff coming through just now carries a premium, and this would not be a profitable factor on large stock accumulation. At present we are in a position to place the material in the hands of waiting consumers, but this condition may not aways prevail. Further disorganization of the steel industry, and railroad inactivity, would tend to reopen a wound that was beginning to show signs of healthy convalescence." The sheet and light plate demand exceeds the supply coming in and dealers frequently find it a difficult matter to satisfy the needs of customers, as shipments coming in are, invariably, allotted so as to accommodate several of those constantly crying for material. The sizes in general demand are the hardest to get. Tubes are coming in slowly, but the demand is lighter.

Slight Improvement in Metals

The quiet condition of the metal market, which has been practically feature-

less for many weeks, has shown slight improvement, and dealers believe that the situation will take on a firmer tone shortly. Prices have been lower than those quoted but the firming tendency gives strength to the possibility of maintaining quotations. Tin is the only metal to show weakness and local dealers are asking the average price of 62 cents per pound.

Activity in scrap continues to be far from satisfactory and trade expectations do not favor any marked change unless it be for additional duliness. "Extremely quiet, with little hope of early change," said one dealer. "We were in the hopes that the worst was over, but the possibilities of trouble in American steel districts have not given a hopeful outlook for the disposal of scrap." All lines are listless and what little movement is going favors machinery cast.

JUNE HAS BEEN VERY GOOD MONTH

Warehouses Have Had a Good Trade—No Improvement in the Railroad Situation

TORONTO.—Occasionally an importer gets a deluge of cars from points across the line, but the occasions are not frequent. Improvement in the traffic situation may have taken place in theory, but in actual practice, as far as this district is concerned, it is not felt.

Dealers in machine tools agree that it is not unusual to have a quiet period at this time of year, and they are experiencing that now. The railroads are taking on some material now, but that is pretty well split between Canadian makers, and the dealers do not draw much from it.

Some of the dealers look to see a revival of machine tool buying in the early fall. They point out that by that time it ought to be possible to secure material for the shops to work with, and if the prospects of a good crop materialize, there should be enough backing in the country to warrant going on with several undertakings that are for the present tied up.

The power situation—or rather the power shortage—is having its effect on industrial life. In the Niagara belt dealers report that the sale of motors has dropped off very considerably, although in other parts, where power is to be had the sale is very satisfactory.

The shortage of coal and the need of making the most out of a power or heating plant is making the call for tubes more insistent, and there it ends, for it is almost impossible to get through a shipment of boiler tubes.

The business being done in small tools is smaller in volume, according to a summing up of reports from several sources. There was some talk of a change being made in the relative prices of high speed and carbon drills, but on going over the figures the makers found that they were paying such a price for their high speed steel to make the drills that it would be impossible to make any drop in the selling prices.

POINTS IN WEEK'S MARKETING NOTES

Coal companies have a preference now in getting cars up to a full 100 per cent of the mines rating.

Pittsburgh bankers do not want to see call prices go any higher as many of their clients are in business where they cannot pay excessive material charges.

Both Bessemer and basic pig iron have advanced during the past week, although it was expected that there would be a recession in these prices.

The steel mills in Ontario are largely out of the market for scrap material, and a slump in prices would not cause any surprise.

Some shipments of sheet came to Toronto this week that were placed on the cars at Pittsburgh twelve weeks ago.

The shortage of power in this district is having the effect of slowing down the sale of motors.

Importers fail to see any improvement in the matter of getting machine tools from American points.

Shipments Come in Spots

One Toronto jobber got through a dozen cars in about two days during the week, so many in fact that they could not be handled. But that is the exception and not the rule. Delayed arrivals are still the order of the market. Some of the material—mostly sheets—that arrived in the above lot had been on the road for 12 weeks. Fortunately there was no loss either way, to the jobber or consumer, as the price arranged was to be the price at the time of delivery.

There is still necessity to appeal direct to Ottawa for rulings regarding the operation of the new tariff, as there are a number of cases where a special finding has to be made before there is anything like a precedent to go by. One line that causes trouble is where the boiler tubes (bent) have to be imported for a certain type of boiler. Local collectors hold that these are manufactured and therefore subject to duty, while Ottawa thinks that they are, as far as the use is concerned, simply boiler tubes and therefore entitled to come in free.

Warehouses are winding up their month, and contrary to expectations it has been, in most cases, a good one. It had been thought that with the trouble in getting shipments, a falling-iff would be noticed in a good many lines. It may be that the tonnage is less in many places, for the high price keeps the value of the business from going very far down.

Very little relief is to be had for the Canadian manufacturer, even from the Canadian mills. The shutting down of the finishing department of one mill, even for a short time, takes away material that is badly needed. Complaint is also made by some agricultural firms in this country that the material they are receiving has not the uniformity that characterized the shipments some months ago. Bars, for instance, do not always cut in units of two-foot lengths, and as a result there are more than usual short ends left over for the scrap pile. Firms needing special steels and alloys are finding it hard to get these, more so than the usual run of mill stuff.

Scrap Metals Are Quiet

The recovery of the scrap metal market in United States, which is spoken of as a possibility, may help conditions here, but there is nothing much else in sight that will do this. Dealers frankly say that they look for a drop in the prices now quoted.

The big melters that are usually taking on material are out of it for the present. One mill is down for the present and another is well supplied for some time to come. So it may be that heavy melting, agricultural scrap, and perhaps wrought iron will come down from their rather lofty positions. The dealer from whom Canadian Machinery gets prices each week frankly states that the schedule quoted is nominal, and that he will not guarantee to take on unlimited amounts at these figures. Buying in many cases, would be necessary to keep up shipments against contracts

The reds and yellows are also dull. The consumers in Canada cannot take on half of the material that is stacked up in the yards now. The change that is taking place in British sterling may make a change in the scrap export business soon.

HIGH PRICES FOR SCRAP IN GLASGOW

Rumored That U.S. is Seeking to Sell in That Market at Attractive Figures

James Johnstone & Son, 212A St. Vincent Street, Glasgow, writing to Canadian Machinery under date of June 16, draws attention to the high prices being paid in Scotland:

"We are obliged for the June number of your paper just received. One thing that surprises us is the low prices of scrap material ruling with you. It may interest you to know the following prices are what Scotch steel and iron masters are paying delivered into their works:

Heavy steel melting scrap, £11 10s. per ton; scrap iron rails, £12; scrap steel rails, £11; heavy malleable iron scrap, £12; No. 1 machinery cast iron scrap, £13; heavy steel turnings, £9 12s. 6d.; clean cast iron borings, £9 7s. 6d.; wrought iron railway axles, £18; steel railway axles, £15.

PITTSBURGH REPORTS CONDITIONS AS UNSETTLED AND PRICES UNCERTAIN

Special to CANADIAN MACHINERY.

PITTSBURGH, July 1.—Transportation conditions as affecting the shipment of pig iron and finished steel products have not improved during the past week or two, and on a precise showing would probably be seen to have grown a shade worse. Supplies of raw materials, however, appear to have been kept up, whereby production is not decreased. The rate of output is indeed quite high considering the general financial and industrial situation, which is one of doubt and uncertainty rather than of full activity and confidence.

Coal Movement Improving

Effective Monday of last week the Interstate Commerce Commission issued an order requiring that full preference be given the coal mines in the matter of car supplies, up to 100 per cent. of mine ratings. The previous rule had been for preference up to 50 per cent. Already there is a materially heavier movement of coal as a result of the order. Quite typical of the fault-finding spirit so generally prevalent, which is perhaps the main retarding influence now to real progress and prosperity, complaints regarding the coal car order are made in various quarters, and newspaper space is generously given to the complaints. For instance, the Connellsville coke operators complain that the order is going to take cars away from them, with the intimation that nothing could be worse than to restrict the movement of Connellsville coke. Now coke is used mainly for making and melting pig iron and the by-product ovens have been very short of coal, so that a better coal movement will help them. As to the relative importance, last year the Connellsville region produced 10,000,000 tons of coke and the by-product ovens 25,000,000 tons. After pig iron has been made, the steel mills need coal, and the better coal movement will help the steel mills also. Nevertheless, what one sees in the average daily or trade paper is not that the steel mills are going to get more coal, which they need badly, but that their car supplies for shipping steel may be decreased a trifle. Even then, however, it is improbable that any such thing will occur. Pittsburgh bankers, who are interested in seeing all the wheels of industry move freely, have been expressing grave apprehensions over the coal market situation, Pittsburgh coal having brought $10 per net ton at mine, a price some industries cannot afford to pay so that they are forced to close. If the industries cannot run there is no use making steel or shipping it.

American Federation of Labor

By reason of the action taken at the Montreal convention of the Federation of Labor it is thought in the iron and steel industry that no attempt will be made by the Federation to call a strike in the industry in the near future. The Federation directed that the committee which handled the strike of last September be disbanded, its field workers be called in by July 1, and its funds turned over to the Federation's executive committee. A meeting of the heads of the international unions is to be held in Washington, to appoint a new committee and lay plans for a fresh general campaign to organize the industry. No doubt the Federation will attempt to profit by the experience of the last strike, which had too much of the "red" element in it. Doubtless the Federation management did not like this, but it was not strong enough to curb the Fitzpatrick-Foster element that dominated the committee now disbanded, Fitzpatrick and Foster themselves having resigned several months ago.

Any activity of the Federation will be entirely apart from the Amalgamated Association, which broke with the union sheet and tin plate mills as detailed in last issue, and which will have a strike this summer unless there is a last-hour recession from the impossible demands it made upon the mills.

Coke and Pig Iron

Connellsville coke for spot shipment has advanced further, being now fully $16 for furnace and $16 to $17 for foundry. Many consumers will not pay anything like such prices, preferring to curtail operations, but the offerings are so limited that everything is absorbed by those who are willing to pay practically any price asked. Production in the Connellsville and Lower Connellsville region is about 70 per cent. of the rate in Ma before the rail strike and the consequent traffic congestion.

Before the traffic difficulties became pressing a moderate amount of furnace coke had been put under contract for the second half of the year, at what then seemed to be very high prices, but prices lately asked are still higher, and the furnaces are placed in a particularly awkward position because they are called upon to buy their coke for the half year and they have sold only a part of their output, perhaps less than half, for the six-month period, while the market is too dull now to sell the remainder, and no one knows whether pig iron is going to advance or decline on the next buying movement. The coke operators say it is going to advance. Some business was done, as noted in previous reports, on a 4-to-1 ratio basis, which would make the coke cost $11, if basic pig iron stays at its present level of $44, valley, but would help the furnace in case pig iron declined. The lowest flat price quoted seems to $12, and furnaces do not care to risk paying that price.

While the pig iron situation generally is quiet and the balance of probability seems to be that before the end of the year iron will decline rather than advance, the bare fact is that Bessemer and basic have advanced in the past week. The only market to quote is the prompt market and deliveries are so scant that higher prices are obtainable. Two lots of 2,000 tons each of Bessemer and basic have been sold, for early delivery, establishing the market at advanced prices, $44 for Bessemer, or a $1 advance, and $44 for basic, a 50c advance, while foundry iron remains at its old price of $45, and strong at the figure, all prices here mentioned being f. o. b. valley furnaces.

Unfinished Steel

The billet and sheet bar market presents an easier tone, though prices can hardly be quotable definitely at lower levels than formerly There was a sale a few days ago of over 5,000 tons of sheet bars at $75, the old price, but it seems the buyer was influenced by ulterior motives. Reports have it that prospects of idleness at some of the sheet and tin mills, hitherto union. led to the offering of some sheet bars by these mills for resale, at between $65 and $70. Then there was a sale of a few thousand tons of small billets at $67.50, lower than the price lately regarded as the market in the absence of definite sales.

Prices on finished steel products for early shipment continue to soften, but the offerings in most cases are very light. Sheets can hardly be obtained at all. Plates, however, are more readily obtainable for reasonably prompt shipment, and 3.50c can be done, if not 3.25c, while a couple of months ago prompt plates were bringing 4c readily, and up to 4.50c in a few cases.

MAY SELL THE ROAD FOR SCRAP

Railway in British Columbia May Come to Its Last End in Scrap Yard

Toronto.—The Spokane and British Columbia Railroad, in the State of Washington, constituting the principal asset of the bankrupt Dominion Permanent Loan Company, may be sold for scrap, it was announced. The loan company recently failed with heavy liabilities to depositors and shareholders after payments of more than $2,000,000 in dividends from the capital, according to the liquidator.

Chas. A. Strelinger Co., who recently established their Canadian headquarters at Windsor, Ont., have made some considerable addition to the floor space of their warerooms and are now enabled to make effective display of their machinery, tools, and shop supplies. "Our parent house in Detroit has a 36-year start on us," said Mr. Doherty, the Canadian manager, "but watch us grow."

NEW MACHINE HAS BEEN SHOWN AT THE BUILDING TRADES EXHIBITION

THE following information has been furnished by the British Trade Commissioner at Toronto, based on notes forwarded by the British Government's Department of Overseas Trade, London:—

Builders & Contractors' Plant, Ltd., 17 Victoria Street, London, S.W.1, exhibited a new portable hoist at the Building Trade Exhibition which would appear to have created a great deal of interest. The frame consists of angle-iron guides, and these are attached to the scaffold or brick-work. The carriage is raised to the top by means of a cable and will take either a barrow or other conveyance. At the head is the revolving apparatus by means of which the carriage is turned inwards and the barrow with its contents wheeled away.

This is operated by means of a geared friction winch which weighs in itself 330 lb. The whole apparatus weighs only 650 lb. The overall space required for the winch being 3 ft. by 3 ft. 6 in., it can be erected between two houses or in the middle of a block, and the material on arrival at top, fed in any direction. The rails are adjustable to any height. The winch can be driven by either a belt drive or a combined electric motor or petrol engine, and the power required to raise the load at a speed of 200 ft. per minute is only 3 h.p.

A larger size on similar lines for use on large buildings is also shown.

Clayton and Shuttleworth, Ltd.—At the nineteenth annual meeting, the chairman, in referring to the new programme of extension, said that favorable arrangements had been made with the Government for the erection of the Abbey Works and the Clayton Forge. Both were constructed primarily for war interests, but they had proved to be admirably suitable for normal purposes, and were amongst the finest works of their kind for the manufacture of rolling stock and dropped forgings, for both of which there was a great demand. As these works were brought into full production their output would be very large. At the Abbey Works they were now constructing Pullman cars, the very highest class of railway work. The demands for the Clayton steam wagon, introduced in 1912, had been so great that it required the provision of special manufacturing facilities. The Titanic Works were being prepared for that purpose, and they hope soon to have the largest and best equipped works in the country for the exclusive manufacture of steam and electric commercial motors.

FAVOR PHYSICIAN ON THE BOARD NOW

Hinted That Some Doctors Have Been in the Habit of "Working" the Board

The Toronto "Globe" says: "Considerable controversy is going on in political circles over the vacancy on the Workmen's Compensation Board. A claim is advanaced on behalf of labor that the post should be filled by one who is identified with the Labor Government. The employers would like to have a direct representative on the board. The 'Globe' understands that one member of the board at least is in favor of appointing a physician. The reason given for this is that the board is often the victim, if not of fraud, at at rate of connivance on the part of physicians in misrepresentation. It sometimes happens that a doctor is attending a poor patient and finds it difficult to collect his bills. Through an accident the patient comes under the jurisdiction of the Workmen's Compensation Act, and the case is exploited by the attending physician to include a part, if not all, of his uncollected account. It is claimed that a physician sitting directly on the board could offset this to a greater extent than is possible by the medical referee. The 'Globe's' informant stated that the board's experience was that those entitled to compensation invariably were honest, and it was not from the laboring class that this difficulty arose, but there were cases where it was apparent that some physicians had attempted to 'work' the board, and it is to overcome this that a physician has been suggested to fill the vacancy."

U.S. SCRAP METAL

The scrap market at U. S. points is showing a better trend, though buying has been light. Conditions are generally weak. Transportation facilities for both fuel and material are greatly determining the market conditions. Further complications were caused by the embargo placed by the Government on the use of open cars for conveying scrap which became effective June 16. This measure was adopted in order to make efforts to restore the fuel supply to as near normal as possible. A consumer in the Buffalo district is understeod to have secured 10,000 tons of heavy melting steel recently at a reported price of $26. For the most part the tendency of prices is to remain set, although there have been indications of a revision upwards in the dealers' price lists.

PIG IRON TRADE

There is a tendency for basic pig iron to be scarce, which causes certain fluctuation in market prices. One sale is reported as high as $44.70 valley, but the market can be actually quoted at $43.50 to $44.

Two large foreign orders have been placed over the last half and general indications of the market tend to show that the last quarter should be a good buying period. Basic users not covered for the last half and now desiring to place orders are unable to do so in the Chicago district, and have been forced to order from Detroit firms at slightly higher rates.

On the whole conditions are not normal generally at the steel plants in the Chicago district, due to lack of coke and difficulty in procuring coal owing to transportation conditions. Dealers and selling agencies hold that the last two weeks have been exceptionally quiet. There is a certain timidity about buying, due to the scarcity of coke, and the general attitude adopted by the banks discouraging outlay on anything but absolute essentials. Transportation conditions are still the most prominent factor in determining the policies of both producers and buyers.

PRIZES FOR AEROPLANES

The progress of aircraft design and construction in Great Britain is being stimulated by the offer of valuable prizes by the Air Ministry. Three prizes will be given in each of the following classes: Small-type aeroplanes for six passengers; large-type aeroplanes for seven or more; and amphibious seaplanes for two passengers. In all cases the accommodation is to be exclusive of the crew. The prizes for the large-type aeroplanes are approximately $100,000, $40,000, and $20,000; and those for the small-type seaplanes and aeroplanes are $50,000, $20,000, and $10,000. The competition is open to British subjects for machines designed and manufactured anywhere within the British Empire. Each competing machine will be subjected to exhaustive tests drawn up in consultation with the Society of British Aircraft Constructors and designed to ensure all-round excellence in the successful machines. This competition is expected to have a very marked effect on the development of civil aviation.

A Gloomy Picture.—City Clerk Kent, of Hamilton, who returned from a trip to the mines, where he made an effort to secure a civic coal supply, gave a gloomy picture of the coal situation. He urges citizens to get what coal they can as soon as possible as he fears a great shortage this winted, and thinks it not improbable that many may go cold. Labor troubles and car shortage are the causes for the sub-normal supply. He knew of an instance where a maanufacturer paid $11 a ton for soft coal at the mine, and after he had closed the deal the coal was sold to another for $11 50 per ton.

"It is reported that the United States firms have sold a very large quantity of melting steel scrap for delivery c.i.f. Glasgow."

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$42 40
Lake Superior, charcoal, Chicago	57 00
Standard low phos., Philadelphia	50 00
Bessemer, Pittsburgh	43 00
Basic, Valley furnace	42 90
Toronto price:—	
Silicon, 2.25% to 2.75%	52 00
No. 2 Foundry, 1.75 to 2.25%	50 00

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	$ 5 50
Steel bars, base, Toronto	5 50
Iron bars, base, Montreal	5 50
Steel bars, base, Montreal	5 50
Reinforcing bars, base	5 00
Steel hoops	7 00
Norway iron	11 00
Tire steel	5 75
Spring steel	10 00
Band steel, No. 10 gauge and 3-16 in. base	6 00
Chequered floor plate, 3-16 in.	8 40
Chequered floor plate, ¼ in.	8 00
Bessemer rails, heavy, at mill	....
Steel bars, Pittsburgh	3 00-4 00
Tank plates, Pittsburgh	4 00
Structural shapes, Pittsburgh	3 00
Steel hoops, Pittsburgh	3 50-3 75
F.O.B., Toronto Warehouse	
Small shapes	4 25
F.O.B. Chicago Warehouse	
Steel bars	3 62
Structural shapes	3 72
Plates	3 67 to 5 50
Small shapes under 3"	3 62
	C.L. L.C.L.

FREIGHT RATES

Per 100 Pounds.

Pittsburgh to Following Points		
Montreal	33	45
St. John, N.B.	41½	55
Halifax	49	64½
Toronto	27	39
Guelph	27	39
London	27	39
Windsor	27	39
Winnipeg	89½	135

METALS

	Gross. Montreal	Toronto
Lake copper	$25 00	$24 00
Electro copper	24 50	24 00
Castings, copper	24 00	24 00
Tin	66 00	65 00
Spelter	12 00	12 00
Lead	11 50	11 00
Antimony	14 50	14 00
Aluminum	34 00	36 00

Prices per 100 lbs.

PLATES

Plates, 3-16 in.	$ 7 25	$ 7 25
Plates, ¼ up	6 50	6 50

PIPE—WROUGHT

Price List No. 44—April, 1920.

STANDARD BUTTWELD S/C

	Steel Black	Steel Galv.	Gen. Wrot. Iron Black	Gen. Wrot. Iron Galv.
⅛ in.	$6 50	$ 8 50	....	....
¼ in.	5 13	7 26	$ 5 43	$ 7 56
⅜ in.	5 13	7 26	5 43	7 56
½ in.	6 84	8 42	7 27	8 84
¾ in.	8 45	10 58	9 03	11 16
1 in.	12 50	15 64	13 35	16 49
1¼ in.	16 91	21 16	18 06	22 31
1½ in.	20 21	25 30	21 59	26 68
2 in.	27 20	34 04	29 05	35 89
2½ in.	43 00	53 82	....	....
3 in.	56 23	70 38	....	....
3½ in.	71 30	88 32	....	....
4 in.	84 48	104 64	....	....

STANDARD LAPWELD S/C

	Steel Black	Steel Galv.	Gen. Wrot. Iron Black	Gen. Wrot. Iron Galv.
2 in.	$30 90	$37 74	$34 60	$41 44
2½ in.	45 34	56 16	51 19	62 01
3 in.	59 29	73 44	66 94	81 09
3½ in.	73 14	90 16	82 34	99 36
4 in.	86 66	106 82	97 56	117 72
4½ in.	0 98	1 23	1 24	1 49
5 in.	1 15	1 44	1 44	1 73
6½ in.	1 49	1 86	1 87	2 25
7 in.	1 94	2 43	2 42	2 90
8-L in.	2 04	2 55	2 54	3 05
8 in.	2 35	2 94	2 92	3 51
9 in.	2 81	3 52	3 50	4 21
10-L in.	2 61	3 26	3 25	3 90
10 in.	3 36	4 20	4 18	5 03

Prices—Ontario, Quebec and Maritime Provinces

WROUGHT NIPPLES

4" and under, 60%.

4½" and larger, 50%.

4" and under, running thread, 30%.

Standard couplings, 4-in. and under, 30%.

Do., 4½-in. and larger, 10%.

OLD MATERIAL

Dealers' Average Buying Prices.

	Per 100 Pounds. Montreal	Toronto
Copper, light	$15 00	$14 00
Copper, crucible	18 00	18 00
Copper, heavy	18 00	18 00
Copper wire	18 00	18 00
No. 1 machine composition	16 00	17 00
New brass cuttings	11 00	11 75
Red brass cuttings	14 00	15 75
Yellow brass turnings	8 50	9 50
Light brass	7 00	7 00
Medium brass	8 00	7 75
Scrap zinc	6 50	6 00
Heavy lead	7 50	7 75
Tea lead	4 50	5 00
Aluminum	19 00	20 00
	Per Ton	Gross
Heavy melting steel	18 00	18 00
Boiler plate	15 50	15 00
Axles (wrought iron)	22 00	20 00
Rails (scrap)	18 00	18 00
Malleable scrap	25 00	25 00
No. 1 machine east iron	32 00	33 00
Pipe, wrought	12 00	12 00
Car wheel	26 00	26 00
Steel axles	22 00	20 00
Mach. shop turnings	11 00	11 00
Stove plate	26 50	25 00
Cast boring	12 00	12 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, ⅜-in. and less	10
Carriage bolts, 7-16 and up	Net
Coach and lag screws	25
Stove bolts	55
Wrought washers	45
Elevator bolts	Net
Machine bolts, 7/16 and over	Net
Machine bolts, ⅜-in. and less	15
Blank bolts	Net
Bolt ends	Net
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	net
Machine screws, o. and fil. hd., brass	net
Nuts, square, blank	add $2 00
Nuts, square, tapped	add 2 25
Nuts, hex., blank	add 2 25
Nuts, hex., tapped	add 2 50
Copper rivets and burrs, list less	15
Burrs only, list plus	25
Iron rivets and burrs	40 and 5
Boiler rivets, base ¾" and larger	$8 50
Structural rivets, as above	8 40
Wood screws, O. & R., bright	75
Wood screws, flat, bright	77½
Wood screws, flat, brass	55
Wood screws, O. & R., brass	55½
Wood screws, flat, bronze	50
Wood screws, O. & R., bronze	47½

MILLED PRODUCTS

(Prices on unbroken packages)

	Per Cent
Set screws	25 and 5
Sq. and hex. hd. cap screws	22½
Rd. and fil. hd. cap screws	plus 17½
Flat but. hd. cap screws	plus 30
Fin. and semi-fin. nuts up to 1-in.	20
Fin. and Semi-fin. nuts, over 1 in., up to 1½-in.	10
Fin. and Semi-fin. nuts over 1½ in., up to 2-in.	Net
Studs	15
Taper pins	40
Coupling bolts	Net
Planer head bolts, without fillet, list	10
Planer head bolts, with fillet, list plus 10 and	net
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	net
Collar screws	list plus 20, 30
Thumb screws	40
Thumb nuts	75
Patch bolts	add 20
Cold pressed nuts to 1½ in.	add $1 00
Cold pressed nuts over 1½ in.	add 2 00

BILLETS

	Per gross t.
Bessemer billets	$60 00
Open-hearth billets	60 00
O.H. sheet bars	76 00
Forging billets	56 00-75 00
Wire rods	52 00-70 00

Government prices.

F.O.B. Pittsburgh.

NAILS AND SPIKES

Wire nails	$5 70
Cut nails	5 85
Miscellaneous wire nails	60%
Spikes, ⅜ in. and larger	$7 50
Spikes, ¼ and 5-16 in.	8 00

ROPE AND PACKINGS

Drilling cables, Manila	0 39
Plumbers' oakum, per lb.	0 10¼
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 35½
British Manila rope	0 28
New Zealand hemp	0 28
Transmission rope, Manila	0 47
Cotton rope, ¼-in. and up	0 88

POLISHED DRILL ROD

Discount off list, Montreal and Toronto ..... net

LeBLOND
HEAVY DUTY
Universal Millers

Are not only Tool Room Machines, but as a manufacturing proposition appeal to the careful buyer.

Their long life insures ample returns for the investment made.

May we explain to you their many advantages and the convenience of their control.

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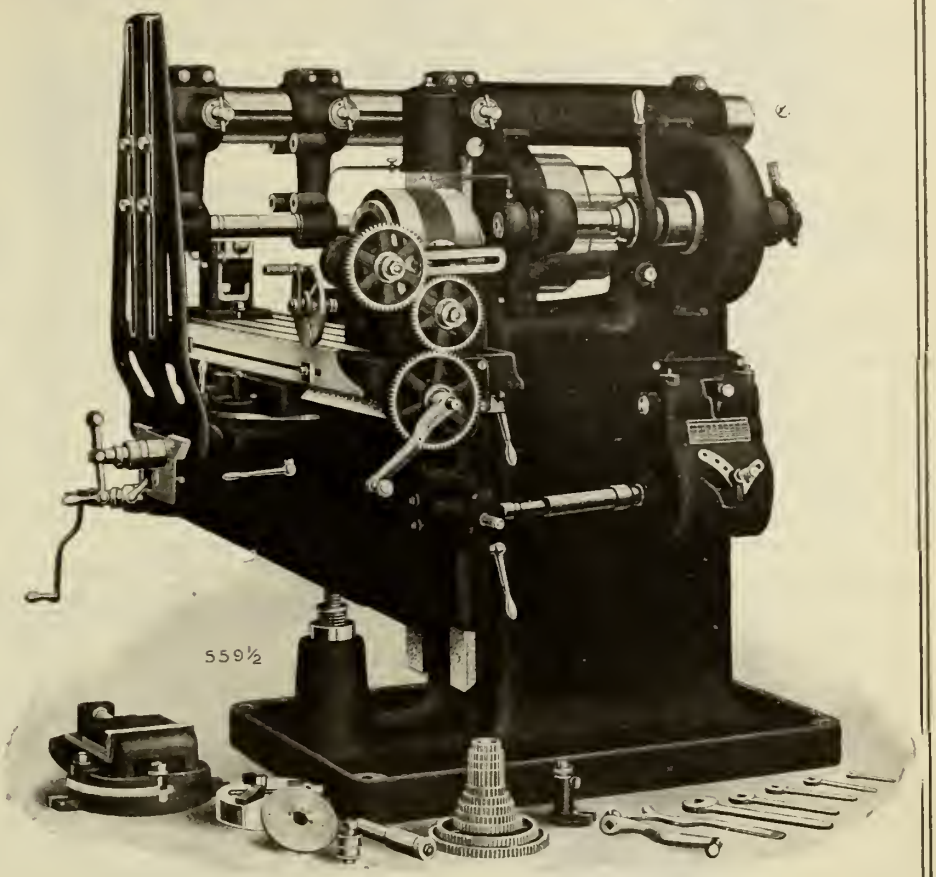


SAVING IN BELT TRANSMISSION

At a foremen's meeting the other evening, one of the questions discussed was, "Why do we lose so much time in getting the full product from a machine with a new belt?"

One man asked: "Has it anything to do with the way the belt hugs the pulley?" The reply came quickly from two or three: "The trouble is the belt was not properly stretched before it was put in place."

The next man who rose, said: "All my belts jump when the belt hooks go over either the receiving or driving pulley."

Finally the manager said: "Well, let us take this up as we did the other power problems. We will have the engineering department take full charge of all the belts that are put on new in two or three rooms, for the next two weeks, and then hear their report."

When the tests were made, and the report read, the following facts were brought out:

First: All the belts, even those as narrow as 1¼ inch, showed the least trouble when stretched on the floor in the roll before being measured for the length required. This was done by securing the ends of the belt by nails at one end, the other being put in the regular clamps and drawn up a little every day before cutting to length.

Second: All the belts of whatever width that were used showed a loss in power when they were put together, either with lacing, or any other style of belt hook. Those that were cemented, with no extra thickness at the joint, showed regular transmission, no lost motion on machine or shaft, and the production very soon, after the new belt was put on the machine, came up to full product.

The tests showed such favorable results that the following rules were adopted after the points had been thoroughly discussed:

Rule 1.—All belts shall be given out only in lengths required for applying to the drive, and only after same have been subjected to a regular process of stretching, the roll being secured to the floor at one end, and the clamps applied to the other, the amount taken up being determined by tests on the exact width of the belt being kept, one inch not being reduced by the pull to three-quarters, and so forth.

Rule 2.—Any roll of belting, so stretched, that shows uneven width shall be laid to one side, and shown to the purchasing agent, to be taken up with the firm that supplied the belting.

Rule 3.—The putting on of the belts, after the order is received from the foreman of the department, shall be turned over to the belt man, who will apply the same.

Rule 4.—All the rooms will have, as standard the amount of belting used in the last twelve months, and will be credited with all the saving made by the above rules for the next two months. This to be divided at the end of each two months' period, giving 75 per cent. as the bonus to the wages in the room, and the balance as saving on the corporation overhead account.—*Belts.*

Many industrial research associations have been formed in Great Britain and are working in conjunction with the Department of Scientific and Industrial Research. The expenses of the research are met partly by the industries concerned and partly from State funds. Co-operative work of this kind has not, however, discouraged private enterprise in research. Many firms are extending their research laboratories and prizes are being offered for success in special directions. Sir Robert Hadfield, for example, has deposited £200 with the Institution of Mechanical Engineers to be awarded as a prize for a new and accurate method of measuring the hardness of metals. Present methods are not very satisfactory, especially with very hard metals.

A paper entitled "Blowholes, Porosity and Unsoundness in Aluminium Alloy Castings," and issued by the United States Bureau of Mines, discusses the magnitude of the light alloy industry, gases in aluminium, solidification of metals, analogy with steel, effects of various processes in casting, melting, moulding, etc., as well as the metallography and radiography of the subject. The author is Mr. R. J. Anderson of the Bureau's branch at Pittsburgh.

MISCELLANEOUS

Solder, strictly	$ 0 40
Solder, guaranteed	0 43
Babbitt metals	18 to 70
Soldering coppers, lb.	0 62
Lead wool, per lb.	0 16
Putty, 100-lb. drums	8 30
White lead, pure, cwt.	20 00
Red dry lead, 100-lb. kegs, per cwt.	16 50
Glue, English	0 40
Tarred slater's paper, roll	1 30
Gasoline, per gal., bulk	0 35
Benzine, per gal., bulk	0 35
Pure turp., single bbls., gal.	3 60
Linseed oil, raw, single bbls.	3 00
Linseed oil, boiled, single bbls.	3 03
Sandpaper, B. & A.	List plus 43
Emery cloth	List plus 37½
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin, "D," per lb.	0 14
Borax crystal and granular	0 14
Wood alcohol, per gal.	2 70
Whiting, plain, per 100 lbs.	2 75

CARBON DRILLS AND REAMERS

S.S. drills, wire sizes	32½
Can. carbon cutters, plus	20
Standard drills, all sizes	32½
3-fluted drills, plus	10
Jobbers' and letter sizes	32½
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	50
Sleeves	50
Taper pin reamers	25 off
Drills and countersinks	net
Bridge reamers	50
Centre reamers	10
Chucking reamers	net
Hand reamers	10
High speed drills, list plus	20 to 40
Can. high speed cutters, net to plus	10
American	plus 40

COLD ROLLED STEEL

[At warehouse]

Rounds and squares	$7 base
Hexagons and flats	$7.75 base

IRON PIPE FITTINGS

	Black	Galv.
Class A	60	75
Class B	27	37
Class C	18	27

Cast iron fittings, 5%; malleable bushings, 22½%; cast bushings, 22½%; unions, 37½%; plugs, 20% off list.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$ 8 50	$ 9 50
Sheets, Blue ann., No. 10	8 50	9 00
Canada plates, dull, 52 sheets	8 50	10 00
Can. plates, all bright	8 60	9 00
Apollo brand, 10¾ oz. galvanized	....	....
Queen's Head, 28 B.W.G.	11 00	....
Fleur-de-Lis, 28 B.W.G.	10 50	....
Gorbal's Best, No. 28	....	....
Colborne Crown, No. 28.	....	....
Premier, No. 28, U.S.	11 50	10 50
Premier, 10¾-oz.	11 50	10 90
Zinc sheets	16 50	20 00

PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13.00; 5-16, $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.20; ¾ in., $9.30; ⅝ in., $9.50; 1 in., $9.10; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $13.00; 5-16 in., $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.50; ¾ in., $9.30.

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

BOILER TUBES.

Size.	Seamless	Lapwelded
1 in.	$27 00	$.....
1¼ in.	29 50	.....
1½ in.	31 50	29 50
1¾ in.	31 50	30 00
2 in.	35 00	30 00
2¼ in.	35 00	29 00
2½ in.	42 00	37 00
3 in.	50 00	48 00
3¼ in.	.. ..	48 50
3½ in.	63 00	51 50
4 in.	85 00	65 50

Prices per 100 ft., Montreal and Toronto

OILS AND COMPOUNDS.

Castor oil, per lb.	..
Royalite, per gal., bulk	24½
Palacine	27½
Machine oil, per gal.	43½
Black oil, per gal.	18½
Cylinder oil, Capital	82
Cylinder oil, Acme	70
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	$2 60
Union thread cutting oil, antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil, bbls., net	13½

BELTING—No 1 OAK TANNED

Extra heavy, single and double	10%
Standard	10%
Cut leather lacing, No. 1	2 75
Leather in side	2 40

TAPES

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	$4 60
Polishing wheels, bull-neck	2 00
Emery in kegs, Turkish	09
Pumice, ground	06
Emery glue	30
Tripoli composition	09
Crocus composition	12
Emery composition	10
Rouge, silver	60
Rouge, powder, nickel	45

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	.08½
Grits, 80 and finer	.6

BRASS—Warehouse Price

Brass rods, base ½ in. to 1 in. rod	0 34
Brass sheets, 24 gauge and heavier, base	$0 42
Brass tubing, seamless	0 46
Copper tubing, seamless	0 48

WASTE

XXX Extra	24	Atlas	20
Peerless	22½	X Empire	19½
Grand	22½	Ideal	19
Superior	22½	X Press	17½
X L C R	21		

Colored

Lion	17	Popular	13
Standard	15	Keen	11
No. 1	15		

Wool Packing

Arrow	35	Anvil	22
Axle	28	Anchor	17

Washed Wipers

Select White	20	Dark colored	09
Mixed colored	10		

This list subject to trade discount for quantity.

RUBBER BELTING

Standard ... 10% Best grades... 15%

ANODES

Nickel	.58 to .65
Copper	.38 to .45
Tin	.70 to .70
Zinc	.18 to .18

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	$42 50	$43 00
Copper wire, list plus 10..		
Plain sheets, 14 oz., 14x60 in.	46 00	44 00
Copper sheet, tinned, 14x60, 14 oz.	48 00	48 00
Copper sheet, planished, 16 oz. base	46 00	45 00
Braziers', in sheets, 6 x 4 base	45 00	44 00

LEAD SHEETS

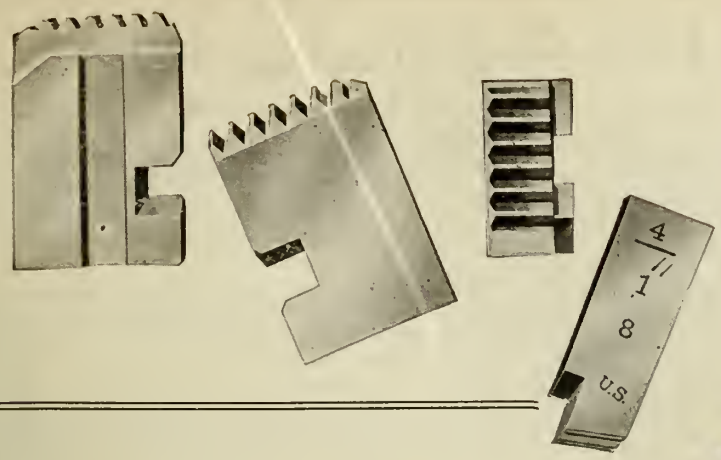
	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$10 75	$14 50
Sheets, 3½ lbs. sq. ft.	10 50	14 00
Sheets, 4 to 6 lbs. sq. ft.	10 25	13 50

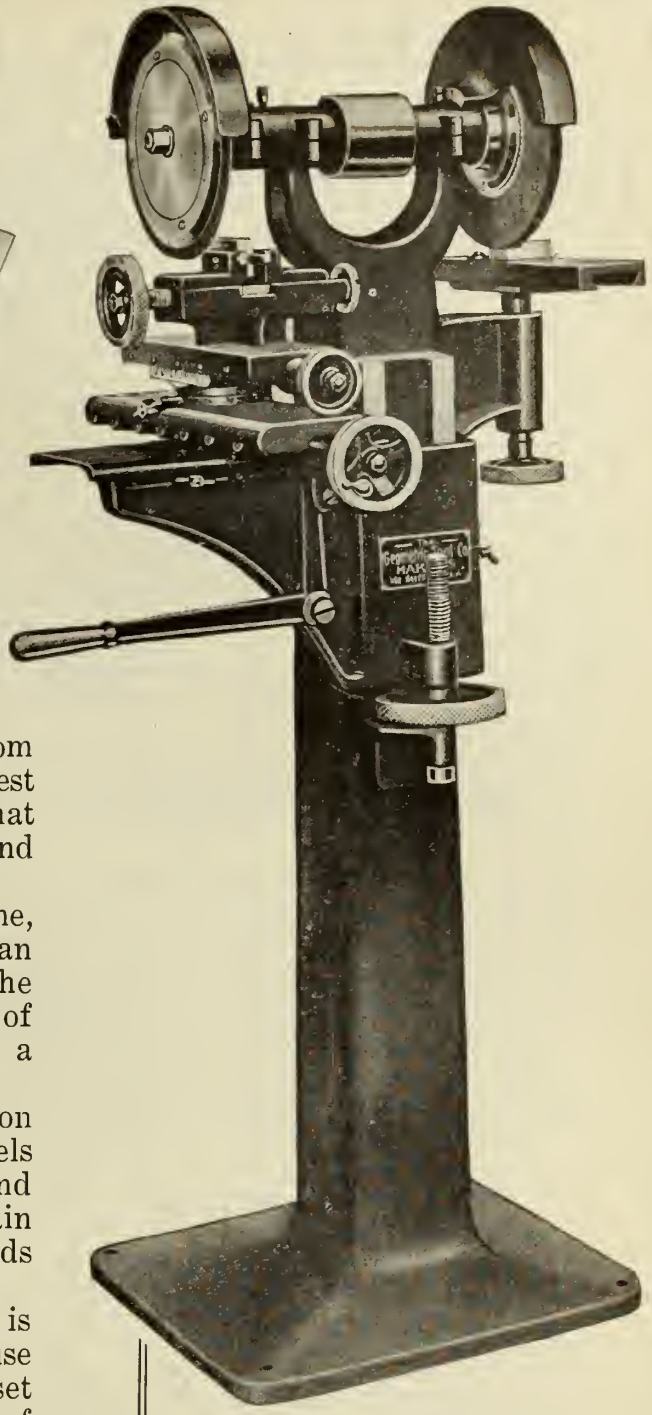
Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS

Acid, boracic	$ .23
Acid, hydrochloric	.03¼
Acid, nitric	.10
Acid, sulphuric	.03¼
Ammonia, aqua	.15
Ammonium, carbonate	.20
Ammonium, chloride	.22
Ammonium hydrosulphuret	.75
Ammonium sulphate	.30
Arsenic, white	.14
Copper, carbonate, annhy.	.41
Copper, sulphate	.16
Cobalt, sulphate	.20
Iron perchloride	.62
Lead acetate	.30
Nickel ammonium sulphate	.08
Nickel carbonate	.32
Nickel sulphate	.19
Potassium sulphide (substitute)	.42
Silver chloride (per oz.)	1.25
Silver nitrate (per oz.)	1.20
Sodium bisulphate	.11
Sodium carbonate crystals	.06
Sodium cyanide, 127-130%	.38
Sodium hyposulphite per 100 lbs	8.00
Sodium phosphate	.18
Tin chloride	1.00
Zinc chloride, C.P.	.30
Zinc sulphate	.08

Prices per lb. unless otherwise stated





Sharp Chasers Cut Clean Threads

Accurate, uniform threads result only from dies which are maintained in the highest state of cutting efficiency. This means that chasers must be kept sharp, and ground uniformly.

Even if just touched up from time to time, the chasers respond splendidly, with clean threads. And with this machine — the Geometric Chaser Grinder—the matter of keeping threading tools up to scratch is a comparatively simple matter.

Various makes of chasers can be ground on this adaptable machine. The two wheels permit the easy grinding of both milled and tapped chasers. In addition, the plain wheel lends itself readily to various kinds of tool grinding.

Uniform grinding of a set of chasers is purely a mechanical matter through the use of adjustments which can be accurately set to govern the grinding of an entire set of chasers.

The Catalogue describing this machine is a mine of information on chaser grinding. Write for it.

THE GEOMETRIC TOOL COMPANY

NEW HAVEN CONNECTICUT

Canadian Agents: Williams & Wilson, Ltd., Montreal; The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg, and St. John, N.B.; The Canadian Fairbanks-Morse Co., Ltd., Manitoba, Saskatchewan, Alberta.

If interested tear out this page and place with letters to be answered

Production of Pig Iron and Steel in 1919

THE total production of pig iron in Canada in 1919 excluding the production of ferro-alloys was 917,346 short tons (819,059 gross tons), having a value of $24,536,432 as compared with a total production in 1918 of 1,195,551 short tons (1,06,456 gross tons) valued at $33,495,171 showing a falling off of 278,205 tons, or 23 per cent. Of the 1919 total 910,089 tons were made in blast furnaces and 7,266 tons (subject to revision) were made in electric furnaces from scrap metal, chiefly shell turnings. In 1918 the blast furnace production was 1,163,510 tons and the electric furnace production from scrap steel was 32,031 tons.

The production of blast furnace pig iron in Nova Scotia in 1919 was 285,087 tons as against 415,870 tons in 1919 and with the exception of 1914 was the smallest production in that province since 1905. In Ontario the production of blast furnace pig iron was 624,993 tons, as against 747,650 tons in 1918. Although less by 16 per cent. than in the previous year, the 1919 production in Ontario was exceeded in only four previous years.

Less than one quarter as much pig iron was made from electric furnaces from scrap steel as in the previous year the output being derived from six furnace plants in 1919 as compared with ten plants operated in 1918.

By grades the 1919 production included: Basic, 580,426 tons; Bessemer, 7,-637 tons; foundry and malleable, etc., 322,017 tons; low phosphorous iron (electric furnace), 7,266 tons. The 1918 production included: Basic, 966,409 tons; Bessemer, 15,415 tons; foundry and malleable, etc., 181,696 tons; low phosphorous iron (electric furnace), 32,031, tons.

The blast furnace plants operated included those of the Dominion Iron and Steel Company at Sydney, N.S.; The Nova Scotia Steel and Coal Company at North Sydney; The Standard Iron Company at Deseronto, Ont.; The Steel Company of Canada at Hamilton, Ont.; The Canadian Furnace Company at Port Colborne, Ont.; The Algoma Steel Corporation, Ltd., at Sault Ste. Marie, Ont.; The Midland Iron and Steel Company at Midland, Ont., and the Parry Sound Iron Company, Ltd., at Parry Sound, Ont.

Electric furnaces were operated for the production of pig iron from scrap at Hull and Shawinigan Falls in Quebec, at Belleville and Welland in Ontario, and at Vancouver, British Columbia.

The production of ferro-alloys in Canada in 1919 including ferro-silicon, silico spiegel, spiegeleisen and ferro-phosphorus, all with the exception of the speigeleisen being made in electric furnaces, was about 48,579 tons valued at $1,998,779. In 1918 the production was 44,704 tons valued at $4,731,521. Over one-half the tonnage made in 1919 was speigeleisen made by Algoma Steel Corporation for the company's own use.

The exports of pig iron during 1919 were 63,605 tons valued at $1,820,260, or an average of $28.62 per ton and of ferro-alloys 22,449 tons valued at $1,-229,341, or an average of $54.76 per ton. The exports of pig iron included 57,845 tons to the United States; 783 tons to Chili; 7 tons to Japan, and 4,970 tons to other countries. The ferro-alloy exports included 2,564 tons to United Kingdom; 15,371 tons to United States; 4,514 tons to other countries.

The imports during 1919 included 35,-800 tons of pig iron valued at $1,022,871, or an average of $28.80 per ton, and 16,-221 tons of ferro-alloys, valued at $901,-678, or an average of $55.58 per ton, making a total import of pig iron and ferro-alloys of 52,021 tons valued at $1,924,549. The United States trade records show exports to Canada during 1919 of pig iron and ferro-alloys amounting to 33,751 gross tons (37,801 short tons), valued at $1,052,103.

Steel

The total production of steel ingots and direct steel castings in 1919 subject to possible slight revision, was 1,031,329 short tons (920,814 long tons), of which 904,349 tons were ingots and 39,980 tons direct steel castings.

The total production in 1918 was 1,-873,708 short tons (1,672,946 long tons), of which 1,800,171 tons were ingots and 73,537 tons were castings.

The 1919 production included: Open-hearth steel, 1,008,540 tons; electric steel, 15,167 tons; crucible and converter steels, 7,322 tons. The 1918 production included: Open-hearth steel, 1,746,334 tons; electric steel, 119,130 tons; crucible and converter steels, 8,244 tons.

The total production of electric fur- of which 1,800,171 tons were ingots and in 1916, 19,639 tons.

The total production of pig iron, ferro-alloy and steel in electric furnaces was about 43,540 tons in 1919 as compared with 191,869 tons in 1918 and 101,031 tons in 1917.

The exports of steel during 1919, as per Customs Department records included billets, blooms and ingots 28,087 tons valued at $1,731,529, or an average of $61.65 per ton; bars and rods, 52,191 tons valued at $3,394,894, or an average of $65.05 per ton; steel rails, 30,737 tons valued at $1,297,836, or an average of $42.22 per ton; wire and wire nails valued at $5,745,773; structural steel, 5,515 tons valued at $465,989, or an average of $84.49 per ton; scrap iron and steel, 245,214 tons valued at $3,779,179, or an average of $15.41 per ton, together with a large quantity of manufactured iron and steel goods.

The production of rolled iron and steel products in 1919 included: Steel rails, 316,304 short tons; plates and sheets, 25,408 short tons; wire rods, 153,723 short tons and structural shapes, 29,295 short tons, and a large tonnage of iron and steel bars, rods, etc., for which returns are not yet complete. The total production in 1919 of finished rolled products was 1,146,610 short tons, which included steel rails, 162,747 tons; wire rods, 154,789 tons; merchant bars and rods and structural shapes, 415,017 tons; plates and sheets, 26,413 tons; rolled blooms and billets for forging purposes and rolled blooms, billets, or slabs sold for export, 395,644 tons.

CONSOLIDATION OF DROP-FORGING PLANTS HAS BEEN ANNOUNCED

ON April 2nd the stockholders of J. H. Williams & Co., manufacturers of drop-forgings and drop-forged tools at Brooklyn and Buffalo, N.Y., and of the Whitman & Barnes Manufacturing Co., makers of twist drills, reamers, wrenches and drop-forgings at Akron, Chicago and St. Catharines, Ontario, ratified the agreement providing for the consolidation of the wrench and drop-forging plants and business of Whitman & Barnes at Chicago and St. Catharines with J. H. Williams and Co. The Whitman & Barnes Manufacturing Co. retain their twist drill and reamer business and will continue, as an entirely separate organization and on an extended scale, the manufacture of these tools at Akron, Ohio.

History of the Company

J. H. Williams & Co., makers of drop-forgings and drop-forged tools, was one of the first to enter this field commercially. The business was founded in Flushing, L.I., as a partnership in 1882 by James H. Williams and Matthew Diamond under the style of Williams & Diamond, later Williams & Brock. It located in Brooklyn in 1884, assumed its present name in 1887 and was incorporated in New York State in 1895.

The Brooklyn Works employ about 750 persons, occupy two adjoining square blocks of the city property, including the street between, which is closed, and contain about 197,000 sq. ft. of floor space. In 1914 the Buffalo Works, an entirely new plant, began operation; they now employ over 1,000 persons and comprise 47 acres, with about 233,000 sq. ft. of floor space.

The Whitman & Barnes Manufacturing Co. was founded as a partnership in 1846 by Augustus Whitman and Al-

Aikenhead's

Wahlstrom Chuck

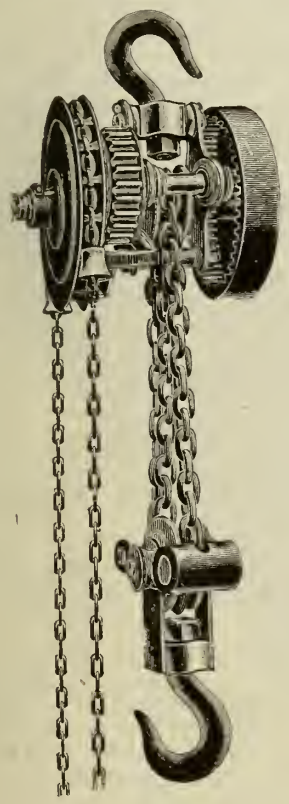
Grips the entire Shank. Never slips.

Automatic and instantaneous in action. There's no time lost in waste motion with the Wahlstrom Chuck. It makes every minute and every motion profitable, will increase output 50 per cent. and actually improve the work.

The operator can make any change of tools in **two seconds** without stopping the spindle and simply by grasping the loose shell of the chuck.

You may use No. 1, 2 and 3 M. T. Shank Tools whether they have a shank tang or not—**The Wahlstrom grips by the entire shank.** Never slips! The cam action is such that the harder the tools take hold in the work, the harder the jaws grip the shank. The grip is smooth, uniform and positive.

Whalstroms are made in two styles—one for straight shank tools, the other for M. T. shank tools—and they are both automatic. BUY THEM AT AIKENHEAD'S.



"Simplex 2-Speed Hoist"

A Valuable Addition to any Shop

As a time and labor-saver this "Simplex" 2-Speed Hoist is a valuable addition to any shop. It handles the largest machines and castings with ease and dispatch and greatly reduces the labor costs for fitting and erection.

It operates at two speeds. Small loads are lifted at twice the speed of larger loads. The chains are properly guided so as to eliminate any tendency to jump the sprocket or stick in the guides.

Made in 12 sizes. Blocks with capacities up to 1,600 lbs. handled by one man. With blocks of capacities up to 40,000 lbs., two men can lift full load.

Write for literature or better still order a hoist for trial, if it doesn't save you valuable time and money, send it back.

Aikenhead's

AIKENHEAD HARDWARE LIMITED
17 Temperance St., TORONTO, ONT.

"Everything in tools" is our slogan, give us a trial on your next order. You'll find the Quality, Service, and Price right. Write or wire. Immediate deliveries.

If interested tear out this page and place with letters to be answered

fred G. Page under the title, Page, Whitman & Co. In 1868 the Akron factory was built, and, in 1877, the business was combined with that of George Barnes & Co. of Syracuse, N.Y., the enlarged concern assuming its present name—The Whitman & Barnes Mfg. Co. The St. Catharines plant was acquired in 1882 and eleven years later the Chicago works were built. They now consist of 45 acres of land, with 320,000 sq. ft. of floor space, and are connected by private trackage with four railroads. They employ about 800 people.

The St. Catharines works, manufacturing special drop-forgings to order and standard lines of drop-forged wrenches, pipe wrenches, adjustable wrenches of various styles, pliers, hammers, hatchets, swedges, etc., are located on the Welland Canal and obtain power therefrom. They occupy about 2½ acres, with floor space of 35,000 sq. ft. The company owns some 6 acres of additional property, which may be utilized in the near future for the erection of larger and improved facilities to care for the Canadian trade.

Through this consolidation of the four plants—Brooklyn, Buffalo, Chicago and St. Catharines—the ultimate geographical ideal for the service of customers has been attained.

Relations With Employees

The company has been particularly fortunate in its relations with its men. Operating throughout its history on the principle of the highest wages in the industry for the most efficient work, supplemented (but not substituted) by expenses liberally incurred to provide the best possible working conditions, it has succeeded in establishing a relation of mutual confidence that has frequently been the subject of comment in the industrial and social press—in 1912 this was the cause of an unsolicited visit from Theodore Roosevelt, followed by a special article by him in "The Outlook" on the subject.

The Brooklyn factory, in 1893, had the distinction of being the first factory in this country to provide shower baths for its workmen, and again, in 1914, of leading its industry in the establishment of separate pension and life insurance systems for the direct benefit of its employees, and, of course, for the indirect benefit and satisfaction of its stockholders.

The sales for the first five months of 1920 indicate that this will be the largest year in the company's history. All of the factories are far behind their orders in spite of increased production, and permanent night shifts have been organized to help meet the demands of the trade.

Management

The business will continue to be operated by those who have been continuously identified heretofore with the business of J. H. Williams & Co. and with the Chicago and St. Catharines plants of the Whitman & Barnes Manufacturing Co., the organization being as follows:

President and managing director, J. Harvey Williams.

Vice-president, A. D. Armitage.

Secretary and treasurer, W. A. Watson.

Controller, R. S. Baldwin.

General sales manager, F. W. Trabold.

Eastern Dist. sales mgr., A. S. Maxwell.

Western Dist. sales mgr., W. E. Rowell.

Buffalo Dist. sales mgr., J. C. Cotter.

Detroit Dist. sales agent, A. M. Thompson.

Publicity manager, Hugh Aikman.

General works manager, Capt. W. N. McMunn.

Chief engineer, Willard Doud.

Supt. Brooklyn division, R. J. Smith.

Supt. Buffalo division, T. F. Du Puy.

Supt. Chicago division, Barney Nelson.

Gen'l purchasing agent, J. C. Scanlon.

Gen'l traffic manager, J. B. Payne.

Canadian manager, W. J. Elliott.

—Marcus in New York "Times."

WHEN YOU WAVE A RED FLAG, LOOK OUT FOR THE BULL.

BIG CONTRACT WITH THE SOVIET

Montreal Firm Admits That More Than $5,000,000 is Involved

New York.—F. W. Boyer and W. W. Sloan, of the firm of Boyer, Sloan & Co., Montreal, are at present in New York. In conversation with the Canadian Press they confirmed the report that they had signed a contract with Ludwig C. A. K. Martens, chief of the Russian Soviet Bureau here, to trade with Soviet Russia.

Messrs. Boyer and Sloan refused to give the amount involved in the contract but intimated that it was in excess of $5,000,000. They said that until the details of the deal had been fully worked out they would not be in a position to go into particulars.

MUST DEVELOP OUR RESOURCES

Canada Cannot Continue to Look for Coal From United States Mines

Ottawa.—That Canada need not look to the United States for its future supply of coal, and that the present shortage serves as a good lesson for the Dominion to develop its own resources was the gist of an interview given by H. A. Harrington, fuel controller for the Province of Ontario.

Mr. Harrington was very reticent when questioned as to the probabilities of the United States supplying Canada's need during the coming winter. He stated the strong probabilities were that the United States would need all of her own output, especially the anthracite coal. There was all kinds of coal in the Dominion, but the people of the Dominion were not "digging" for it. Rather they were depending on the people to the South. They had to learn to be independent and "dig" for themselves.

If interested tear out this page and place with letters to be answered

Some General Principles of Tool Hardening

There Are Over Two Hundred Metallurgical Factors That Influence the Efficiency of a High Speed Cutting Tool—The Main Principles to Observe Are Stated Herein.

By MAJOR A. E. BELLIS

IT has recently been determined that there are over two hundred metallurgical factors (or variables) that influence the efficiency of a high speed cutting tool. This means that there are two hundred reasons why a tool may not give performance up to standard, and two hundred possible excuses when a tool fails. Let us, however, regard this fact as a challenge to systematically attack the problem of tool failures in order to find the best means of controlling these two hundred variables.

The fact that there are so many variables that affect the successful hardening of a tool accounts for the many traditions and secret processes of the hardening room. One of the early processes in the manufacture of the steel may be the real cause of failure of a tool, but if the hardener used a slightly different means of heating or quenching than usual he cannot help feeling that this is connected with his result. He therefore superstitiously avoids this means ever after, if the result is unsatisfactory, or clings to it if result is good. This fact also explains the reasons why the shop man can generally locate and correct troubles more quickly than the laboratory theorist. There are so many little details that the hardener is familiar with that influence results, that he seems to "sense" a cause of variation in results that any one not so familiar with his process would take a long time to discover. The fact that there are so many factors involved in successful hardening also explains why there is always a "come back" on a rejection. The "defendant," by emphasizing some other variables, can generally prove an "alibi" or show a way of making use of material not up to the letter of the specification. From a purely theoretical standpoint, in order to study the effect of any one of these two hundred variables on the hardened tool, we would have to make all the others constant. An algebraic equation expressing this would contain two hundred factors (the letters of eight alphabets would be required for symbols) and in order to study the effect of varying one, all of the others would have to be kept constant.

The Vital Principal

This theoretical conception is very useful, for it leads at once to the vital principle of success in all tool steel work. This can be expressed in one word, uniformity. The practical means of controlling results from the foundry, through rolling, annealing, forging, and hardening, is to maintain uniformity. Uniformity of composition and uniformity of heat treatment will solve most tool steel problems.

Consideration of the practical problem of controlling these two hundred variables, leads to an appreciation of the secret of the tool hardener's skill. While he directly controls some of the factors affecting results, he has it in his power to compensate to some degree for the shortcomings of all the others who have had a hand in the manufacture of the tool. He directly controls some variables and indirectly a great many others. In order to advance in his profession he has to consider and weigh all of them. Stated more concretely, the hardening room can often make successful tools from improperly manufactured material. During the rush of war production about ten per cent. of material tested by the writer could have been theoretically rejected. Actual rejections were less than one per cent. After the resulting gain was much greater than the value of the material saved because a loss of actual rifles produced could never be made up. Without, in any way, sacrificing quality, a great saving and increase in production was made by getting everything possible out of the steel in the heat treating department. The saving in quality and quantity was incomparably greater than the cost of good heat treatment work.

The Study of Failures

The systematic study of failures should begin with the melting of the steel, but as we are more interested in the failures that show up in, or after, hardening, we will start at the wrong end first. When the shop complains of bad stock or poor tools the hardening room has a chance to show its efficiency, to show its spirit of co-operation with other units of the organization, and to show its ability in conducting a quick, systematic and thorough investigation. An inefficient organization frantically starts making changes; more treatments, methods and conditions are changed in half an hour than can be corrected in weeks. Probably only one little variable needs correction. The systematic location of this is the real job. How it is carried out is the real test of the efficiency of the department. The trouble may not be in the hardening room at all, and, and here is where the personality of the head of the department is important. He should be given enough authority to be able to absolutely stop production if serious trouble occurs until the cause is found, because this is always cheaper than random experimenting and continued failures. Too much emphasis cannot be put on finding what factor has changed, what has gone wrong, before making any changes of treatment or methods.

There are a few quick tests that are invaluable and should be made at once when trouble occurs. Assuming that the method and treatment are the best for the work and have been properly carried out, quick information can be obtained from tests of composition, fracture and hardness. With a little experience and under uniform conditions the spark test is a quick guide for composition. If a carbon steel or a "semi" high speed has been mixed with the high speed the spark test will show it at once. An estimate of the carbon content can be made from the spark by comparison with known standards. A metallographic test can give a quick estimate of carbon content, or more exact information can be obtained in fifteen minutes or half an hour from the combustion method of carbon analysis. These three methods can be used to check each other.

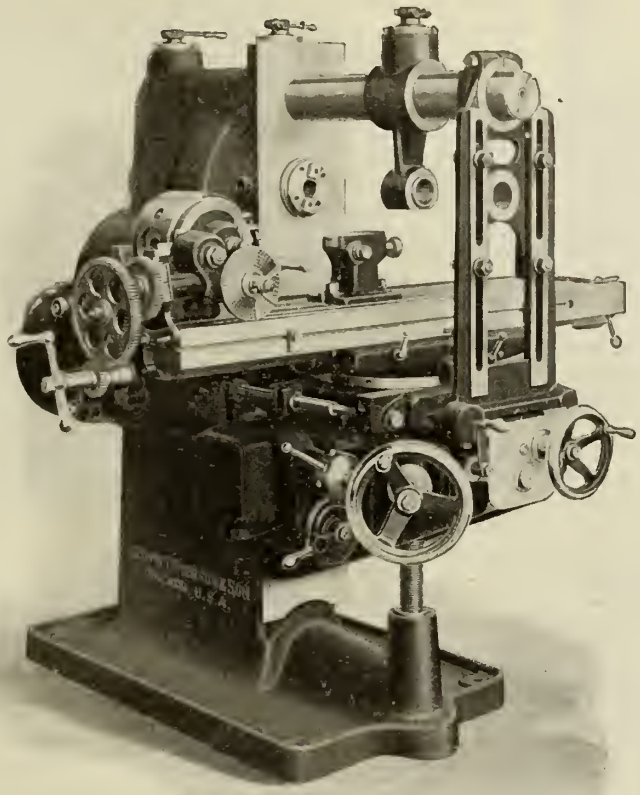
The most valuable quick test is that of fracture. It is surprising how little advantage is taken of this most rapid and direct source of information. If the habit is formed of observing fractures, it is surprising how much information can be gleaned regarding the properties of steels and their variations with treatment and how thorough a check can be quickly made by means of simply breaking one piece from a lot. More information can be obtained by fracturing after hardening than after tempering. This test can be made quantitative though less speedy by using an impact machine of standard make such as the Charpy or Izod type. After a little experience an excellent check can be made of the two hundred variables that have influenced the structure of a piece of steel by comparing its fracture with standard pieces.

These quick tests should always be supplemented by more complete and thorough investigations, for, though the worst cause of trouble may have been found in these quick tests, there are no doubt contributory causes of failure that can be more easily found and more effectively corrected while interest is aroused over the serious failures.

Establish Performance Standards

In order to establish standards of performance it is necessary to periodically make work tests to destruction. Unless a test is carried to the limit to show how a piece fails, it is of very little real value. In connection with such tests, variation should be tried out to establish the heat treating ranges that give satisfactory results with a particular steel. It is often surprising to

*Presented before the American Steel Treaters' Society.



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The Ryerson-Conradson Milling Machines embody features of design which make them particularly suitable for modern shops where speed, accuracy and strength are required. A few of the most prominent features of this miller are: The herringbone gear drive to spindle; elimination of all clutches in the forward as well as the reverse spindle drive; one lever controlling forward and reverse rapid traverse and feed of table, saddle and knee, and a noticeable reduction of the many levers required for spindle and feed changes, as found in standard millers.

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find the great increase in performance resulting from a slightly tougher piece produced by a higher drawing heat, or the better wearing qualities from a lower draw. Instead of depending upon the opinion of a shop foreman, the heat treating can be scientifically placed on a basis of established facts. In connection with routine performance tests, it is well to carry out trials of recommended new steels under these same conditions. Unless a new steel shows an exceptional and consistent improvement it should not be adopted, because its adoption will immediately introduce a number of variables into the heat treatment of the part. Thus, the decision for adoption of new steels should rest with the man responsible for heat treating, and not with a purchasing agent who has no means of understanding the effect of such a change.

An example of the improvement in a tool from carefully studied performance tests is that of the drills used on rifle barrels. It used to be customary to grind a drill after each barrel. The barrel is 24 inches long, of heat treated .55 carbon steel, and is drilled at a feed of 1 inch per minute. By standardizing the best steel (not high speed) and best treatment, it was possible to produce a drill that without grinding would go through 34 barrels, 78 feet of heat treated barrel steel.

Careful work tests always pay richly in increased tool life and increased production. Often a lower grade steel properly treated, will give as good or better performance than a higher grade or higher priced one. The steel salesman "cure all" is a higher priced alloy, but this is frequently carried too far. Thousands of fine finished cuts, as reaming, splinting and drilling, that could be performed much more efficiently and economically with carbon or a "semi high-speed" steel, are being performed with high speed steel simply because of a steel salesman's recommendations unverified by proper work test.

A Laboratory Analysis Pays

It pays to have a laboratory analysis made to check the composition of each lot of steel, not only for the direct information to guide the heat treatment, but for the insurance value that results from the psychological effect on the steel maker. Errors of composition directly affect the physical properties, critical range, fatigue, and corrosion resisting properties and are easily avoided by proper chemical test.

Failures occurring from errors of casting or working are not so easily avoided. Too high casting temperature leads to ingotism, banding and segregation, while too low a casting temperature results in "cold shuts," "pipes" and "blow holes." Foreign matter can be included by the casting operation with resulting slag inclusions or seams. Metallographic tests will usually show these defects.

Working or rolling at improper temperature can result in laps, decarburization, and strains leading to distortion troubles. All of these points should be borne in mind before concluding that the "wrong hardening temperature" was the only cause of failure. The signs of overheating are so obvious and familiar that they are often considered as entirely accounting for a failure that was affected primarily by other causes.

The means of carrying out the heat treating operations determine largely the degree to which the desired uniformity can be maintained in hardening, tempering, quenching or annealing. This is why the subject of equipment is such a vital and interesting one.

There has been so much good development work in recent years in this line, and such excellent papers have already been presented to you on the subject, that the writer hesitates to touch upon it, but one or two guiding principles can be stated, though particular problems are always making exceptions to these. For heating for hardening the open fire is the poorest method possible. This outgrowth of the old blacksmith's forge is incapable of control with any tolerable degree of uniformity. Much better results can be obtained with the lead bath. The writer has successfully used salt baths of special composition and low melting point more satisfactory than lead. Where uniformity of heating, temperature control, and furnace atmosphere regulation are desired, a well designed gas system can give better results than any other fuel. Where a large volume of packed work is being treated, oil is no doubt the cheaper fuel. A well-designed annealing or pack carbonizing furnace should have a continuously heated chamber with directly connected cooling chamber for the sake of fuel economy. The dimensions of the pots for pack work are important, the least dimension of the pot determining the heating time, so that a narrow pot of the same capacity heats very much more quickly than a wider one.

The writer has found illuminating gas a satisfactory carbonizing material for case hardening to two or three-tenths of an inch depth. The economy in its use results from the saving in not having to handle or heat pots or packing material. Much more heat is required for these materials than for the actual pieces being treated in the ordinary pack hardening method.

In order to maintain the proper uniform conditions for quenching, it is necessary to have large enough quenching tanks and circulating system, a large, rapidly circulating and well-cooled supply of the very cheapest mineral oil is more satisfactory than any specially prepared oil used in too small amount. When a water quench is used it is economical to run water into quenching tank in great enough volume to maintain a uniform temperature. Applying the principle of uniformity to the use of brine, it should be remembered that for a given temperature a saturated solution always has the same strength, and uniformity can be attained by keeping the temperature constant and an excess of salt in the tank.

Enough has been said to show that a thoughtful application of the principle of "uniformity" will result in a high standard of production in all tool hardening work.

THE SMALLEST WIRELESS RECEIVER

A late British wireless invention is a portable wireless telegraph receiver. The whole apparatus—receiving coil, tuning condenser, two valve detectors, accumulator dry battery, transformers and reaction soil—goes into a box which is only fourteen inches long, thirteen inches broad, and five inches deep. The cover of the box lifts off its hinges and forms a base with a pivot on which the receiver can be rotated so as to get the strongest signals according to the direction in which the waves are coming. A compass card on the cover enables the receiver to be set in the correct position for receiving from certain stations. With this little appliance, which weighs only 20 lbs., signals can be read in Great Britain from the largest stations in France and Germany as well as in England, without any additional wires. The signals, which are read in a telephone, are clearly audible in a reasonably quiet room.

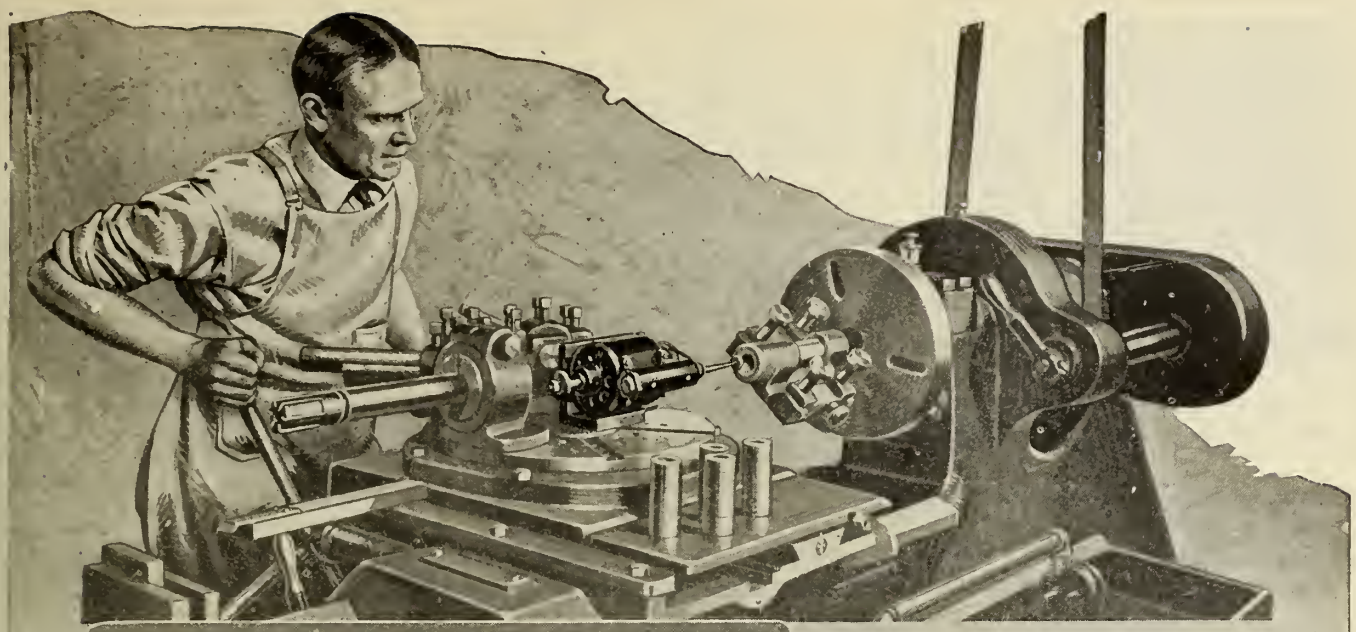
STANDARDIZATION OF SHAFTING

The American Engineering Standards Committee has invited the American Society of Mechanical Engineers to act as sponsor for the standardization of shafting. The Society has already done a considerable amount of work on a set of standard diameters for transmission and machinery shafting. It is proposed that the work, which will be carried out by a sectional committee working under the rules of procedure of the A. E. S. C., shall be broadened to include the standardization of the method of determining what riameters of transmission shafting should be used for given loads, the dimensions of shafting keys and keyways, and the setting of dimensional tolerances.

STANDARDIZATION OF PIPE FLANGES AND FITTINGS

The American Society of Mechanical Engineers has been requested by the American Engineering Standards Committee to assume sponsorship in the standardization of pipe flanges and fittings. In 1914, the Society issued a report covering a schedule of pipe flanges and fittings, for diameters from 1 in. to 100 ins. for 125 lbs. pressure, and also a schedule for extra heavy pipe, covering a range from 1 in. to 48 in. diameter, and for 250 lbs. pressure. In 1918, a supplementary report was published for working pressures of 50, 800, 1,200, and 3,000 lbs.

While the work has not been active during the last year, it is now proposed that it be continued, the Society being formally recognized as sponsor, under the rules of procedure of the A. E. S. C.



GRINDING HARDENED BEARINGS IN PLACE

STARTING and finishing this job with one set-up—from machining the casting to grinding the hardened bearing in place—is a good illustration of the **DUMORE** grinder on production. This method positively aligns each bearing with the rest of the machining, by tempering. And the danger of chatter-marks, taper or bell-mouth is eliminated because the **DUMORE** grinder is perfectly balanced throughout and gives correct cutting speeds to even small emery wheels. Limits of .0001″ are easily maintained.

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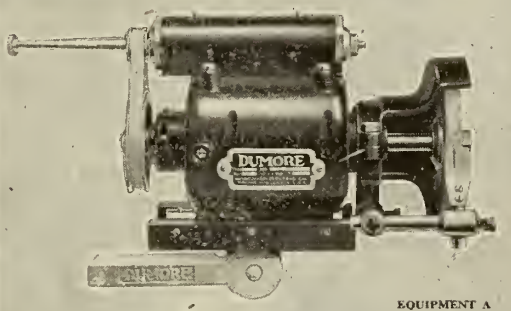
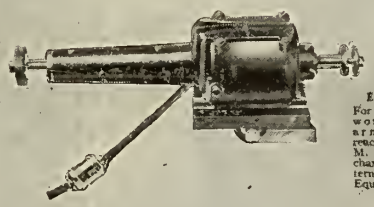
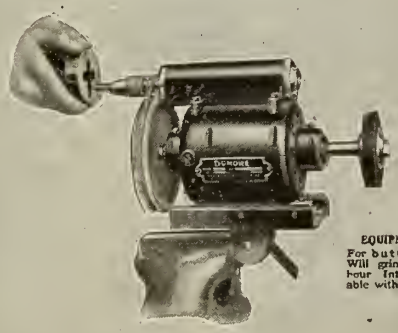


EQUIPMENT A
For general tool room use. Includes High Speed Internal Spindle A with reach of 3 inches. 30,000 R.P.M. Comes fully equipped. Weighs 17¹ pounds.



EQUIPMENT B
For deep internal work. Extension arm has 10-inch reach. 10,000 R.P.M. Arm interchangeable with internal spindle on Equipment A.



EQUIPMENT C
For button dies Will grind 20 an hour Interchangeable with A and B

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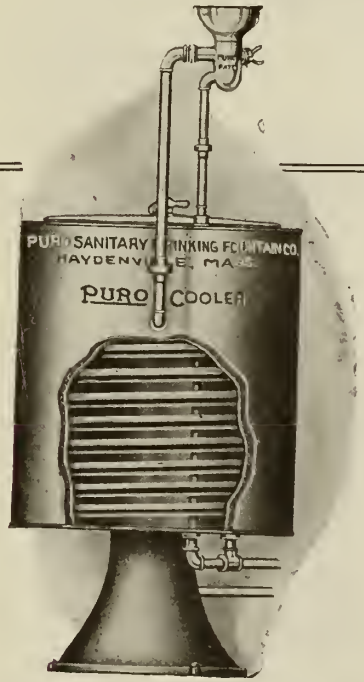

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A. B. C. OF WELDING

Continued from page 34

less than 1-16 inch occur they are dropped as their addition might cause the selection of too large a filler.

Vertical Welds—How Executed

Vertical welds in steel may be worked either from the bottom up or from the top down. Figure 31 shows the proper position of operator, rod and torch in either case. Vertical welds in cast iron are possible only by working from the bottom up. Even then they are not recommended except in cases of extreme emergency. Similarly malleable iron or other metals may be welded with bronze if the necessary caution is employed.

Figures 29 and 30 are intended to show the position of fills through a cross section from the centre of the bevel. The position in Figure 29 is that assumed at the beginning of the fill. As the edges and sides are brought to fusion the metal is held in place partly by the action of the flame, partly by the manipulation of the rod, and in even greater measure by its own tenacity and the peculiar tendency of the heated metal to cling to any supporting surface.

Choosing a tip of the correct size enables the operator to keep the metal under proper control, so that with very little practice he should be able to support the fill in the manner shown in Figure 31, and to execute a ripple as uniform and regular as in horizontal work.

In working a vertical weld forward the individual fills are worked backward. The metal is brought to fusion at the bottom of the bevel, the rod plunged in and added continuously by vigorously working it across the weld in the manner shown in Figure 1 with the first lecture of this series. The torch is moved slowly across and backs up slowly as fusion is obtained with the preceding fill, the sides and the welding rod.

It is quite important that the ripples extend almost straight across the weld, as a pronounced curve tends to spill the melted metal out from the centre of the curve at the bottom. When the bottom of the ripple is reached the weld can be reinforced as much as is desired, bearing in mind that too great a reinforcement is apt to produce too much stiffness of the parts and thus invite fracture. Other ripples are formed by repetition of this process. The properly executed weld will be similar in appearance to the close-up photographic illustration in Figure 32. If improperly executed it is quite likely to assume the appearance shown in Figures 27 and 28.

By turning Figures 25 and 26 on the side so that the letters B and D are right way up we get an illustration of the centre line of the bevel in working a vertical weld from the top down. The beginning is made with the torch and rod in the position D. Figure 26, and the positions shown at C and at B (Figure 25), taken as the fill progresses. The motion of the rod and torch across the weld is the same as in working from the bottom up.

The operator who is sufficiently careful to secure proper fusion, and observes that none of the melted metal precedes the welding flame may at times find this method of welding a great advantage.

TRADE GOSSIP

Making New Line.—"The Wilt Twist Drill Company of Canada, Limited, Walkerville, Ontario, are now manufacturing a complete line of specially designed Ford reamers, catalogues of which are now ready for distribution and will be furnished on request."

Hamilton Has New Industry.—The Peterson Core Oil and Manufacturing Co. have occupied their new factory at the foot of Harmony Avenue. The new factory will be able to supply the local foundries with supplies that they formerly had to go out of town to procure. The products of the new company will include core oil, high-grade parting and sea coal.

Industry Extends at Cobourg.—The ammunition plant formerly occupied by the Cohoes Steel Co., Ltd., is to be taken over by the Bird, Archer Co., of New York, who have been operating a plant for the last three years manufacturing boiler compound. The plant will be in operation about July 1 and will be devoted to the manaufacture of high-speed cast steel tools and foundry chemicals.

Coal Shortage in Montreal.—There is a dire lack of soft coal in Montreal and district, and production in some cases has been curtailed 50 per cent. The Canada Cement Co. is a case in point, they having been compelled to close down two of their mills. Coal merchants have notified customers that only 50 per cent. of their orders can be filled, and it is expected that the Government will be approached for aid if the situation does not improve soon.

Sells Invention to Steel Industry.—Frank B. McKune, of 179 Herkimer St., Hamilton, superintendent of the open-hearth furnaces of the Steel Co. of Canada has just returned from the United States where he has been disposing of the U. S. rights of his invention for feeding open hearth furnaces with by-product gas. The invention is in use at the Steel Co.'s plant in Hamilton, and it is understood that Mr. McKune received a large sum for the United States rights to it.

Steel Plant Closed Down.—The Steel Company of Canada, at Hamilton, has announced that its plant will have to stand idle for a short time owing to coal and fuel oil shortage. The close-down at this time means considerable to the company as many orders are on hand to be filled. Every effort will be made to secure a supply of fuel, but it is feared the plant may have to lie idle for a couple of weeks. In the neighborhood of 2,500 employees will be affected. This is the first occasion in many years upon which the company has found it necessary to close down its plant.

Must Pay Two Per Cent.—A definite and final ruling has been received by the

The Publisher's Page

TORONTO JULY 1st 1920

Improving Our Service

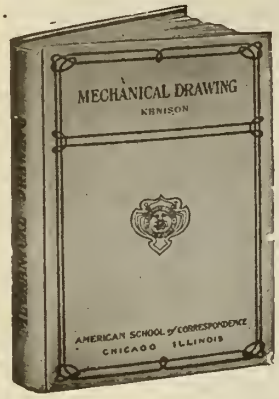
THE Directors of the Canadian Press Association decided in 1919 that the MacLean Publishing Company was the largest newspaper organization in Canada and must therefore pay the highest annual fee to the Association. The Montreal "Star," with its two big weeklies, comes second, but the "Star" group had been doing business for 18 years before the MacLean Company began. While we have not the details upon which the Press Association based their decision, we understand they figured that the MacLean Company had a larger advertising revenue. This is not the case. Lord Atholstan's properties probably carry a third more business, use more paper and have a greater total circulation. The MacLean papers on the other hand get more revenue from circulation; have to pay perhaps three times as much in salaries and wages and show considerably less profit.

Good service to readers first and advertisers next has been the cardinal principle upon which the MacLean Company has been built. In doing this, every man, woman and junior apprentice on our staff has had a share. We have tried to gather about us and train the best experts in the country. Here is an example of what we are doing:

In the recent annual examinations of the Toronto Technical School, session 1919-20, in the Typography branch—that is the department where they learn how to set type—only 27 boys out of the whole city passed, of whom 10, or nearly 38 per cent., were boys of our own composing room, while in two out of the three classes, MacLean boys stood at the head.

Several of our papers are the best of their class in the world, but we are still far from satisfied with the service we are giving. As we can afford it, as the country grows, as our business grows, the service will be improved. We ask our readers to take these Technical School results as an evidence of our efforts to serve them better and better, for by giving a superior training to these boys we are laying the foundation for the still better work we hope to do in the future.

Readers can help us to give them a better service by sending in—direct to the President, Vice-President, or General Manager—criticisms and suggestions.



Clearance Sale of High Grade Technical Books

FOR several years we have maintained a Technical Book Department, handling high-class books published by various well known publishers. For various reasons we have now decided to discontinue our Book Dept. and in order to clear out what stock we have on hand we offer the following books at prices considerably lower than the regular selling price. Each item represents high quality at bargain prices. These books will not last long—first come, first served.

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secretary of the Canadian Manufacturers' Association at Montreal regarding the 2 per cent. sales tax on material sold by the manufacturer to the consumer or retailer to the effect that all railway companies, power companies, steamship lines and public utility corporations are ruled by the Department of Inland Revenue to be consumers, and must, therefore, be charged by the manufacturer the two per cent. sales tax on each invoice. This ruling has been given officially by George B. Taylor, Assistant Deputy Minister of Inland Revenue. The impression had gone abroad that a one per cent. tax only applied, but this is in error, and the department desires manufacturers to be governed thereby.

MARINE

Toronto.—The new racing hydroplane Miss Toronto II, built by F. C. Ericson & Co. for a local syndicate, was successfully launched recently. The little vessel is 22 feet long, and has a motor of 450 h.p. installed, which the builders expect to drive her at 72 miles per hour. The Miss Toronto II was sent to Burlington, Mass., to take part in her first race.

Toronto. — Some interesting figures anent Toronto Harbor were given in the Federal Heuse recently. There are four and a half miles of docks in the present scheme. The depth of water will be 24 feet. 2,033 vessels, aggregating 1,408,-465 tons, arrived during the fiscal year ending March 31st. The vessel, leaving were 1,940, their tonnage being 1,193,-318. The Dominion Government has spent $3,303,384 on the harbor since the inception of the plan.

Genoa.—The absence of any delegation from the United States called forth strong protests at the meeting of the International Seamen's Conference when the question of regulating conditions of inland navigation came up. Mr. Thomas Robb, secretary of the Shipping Federation of Montreal, who represents the employers, said: "In behalf of Canadian shipping interests I protest strongly against any recommendation being made by this conference without hearing from our friends from the United States. It is a very serious thing to make recommendations concerning such a large inland sea without both parties being present. Regulations on these lakes are not international, each country adopting its own regulations."

Tenders will be received until 12 noon on July 13, 1920, for the construction of alterations and additions over the boiler room of the Printing Bureau at Ottawa. R. C. Desrochers, Secretary of the Dept. of Public Works.

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Japanning and Varnishing Ovens heated by Gas, Electricity, Steam or Coal. Kernchen Siphonage Ventilators, Bakers' Ovens, trucks, casters, etc. Write for Booklet.
Brantford Oven & Rack Co. Ltd.
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MACHINERY SUPPLIERS
MANUFACTURERS REQUIRING MACHINERY can with advantage obtain speedy delivery, through our Surplus Plant and Machinery Dept., constituted some years ago for the handling of Surplus Plant, of Boiler Works, Ship Yards, Engineering Works, etc. New or Good Used Plant as required. Please send enquiries. Pillatt & Co., Ltd., Stapleford Iron Works, Nr. Nottingham, England.

BETTS
HEAVY DUTY MACHINE TOOLS
Planers, Engine and Axle Lathes, Slotters, Boring and Turning Mills, Horizontal Boring and Drilling Machines.
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No. 4 Press 10 to 12 tons.
Write for complete information on Atlas Arbor Presses. All sizes for all purposes.
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Canadian Representatives:
Chas. A. Strelinger Co., Windsor, Ont.

Classified Opportunities

POSITION WANTED

MECHANIC AND SALESMAN, AGED 35, would take European engagement for year or more. Understand metric system, French, English and Scandinavian. Prefer automotive work. Box 688, Canadian Machinery. (c1m)

OPEN FOR ENGAGEMENT AS WORKS MANAger or general superintendent. Engineer with experience on mechanical, metallurgical, experimental and development work, toolmaking and design, production work. 15 years in executive positions. Box 691, Canadian Machinery. (c1m)

AGENCIES WANTED

QUALIFIED ELECTRICAL AND MECHANIcal sales engineer. Technical graduate having travelled and made connections in South America, France, Belgium, India, China, would like to represent Canadian manufacturing and export house. Box 694, Canadian Machinery.

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SALESMAN FOR MACHINE TOOLS SUPplies. Must be a high grade man of engineering knowledge, and good address; for such there are excellent prospects. Address giving full particulars in confidence. Jas. Buckley Co., St. Nicholas Bldg., Montreal. (ctfm)

American firm doing business in Canada contemplate manufacturing in Canada and wish to engage a young man with organizing and sales ability to act as Canadian manager. Some travelling would have to be done, and the basis of remuneration would be a fair salary and share in the profits. Apply with full information to Box 695, Canadian Machinery. (c2m)

COLD ROLLED STEEL

We have available for prompt shipment sizes from 1 3/16" to 3".

DRILL ROD

Immediate shipment. Sizes from 9/16" to No. 54.

Charles P. Archibald & Co.
Machinery and Supplies
285 Beaver Hall Hill MONTREAL

FOR SALE

FROG AND SWITCH PLANER, SIZE 36" x 36" x 18', overhauled and first-class. Heavy. One Head on Rail, weight 35,000 lbs. Apply "Winnipeg," c/o Canadian Machinery. (c1m)

CLEARANCE LINE—GENUINE "SLOCOMBE" Drills are offered at a sacrifice, sizes "C," "E," "F," and "G." Wholesalers and dealers will find it of interest to communicate their requirements to Box No. 692, Canadian Machinery. (ctfm)

FOR SALE—STEAM VULCANIZING KETTLE in good condition. Height, 3' 6", diameter 3' 2". Swing hinge, screwed-on top. Will hold three 37 x 5 tires. Box 693, Canadian Machinery. (c1m)

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Perfected rotary engine valve, simple design, free from defects common in rotary valves. Patented Feb. 20, 1917. Can be inspected at and purchased from H. W. Petrie Limited, Toronto.

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FOR SALE—TWO-STOREY BRICK BUILDING, 8,400 ft. floor space, suitable for manufacturing purposes; located Niagara Falls. For immediate possession apply Mortimer & Co., Niagara Falls, Ont. (c2m)

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Enclosed liquid fuel combustion apparatus capable of generating intense heat in pipes and confined passages for heating parts of internal combustion engine and for other uses; spark ignited; blower operated. Patented April 3, 1917. Can be inspected at and for sale by H. W. Petrie Limited, Toronto.

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MACHINE WORK WANTED FOR LATHES, shapers, milling machine and planer, etc. Hourly or contract basis. Prompt delivery. W. H. Sumbling Machinery Co., Toronto. (ctfm)

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SMALL POWER PRESS SUITABLE FOR trimming light forgings. Apply Wheeler Needle Works, Paris, Ont. (c3m)

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TORONTO PATTERN WORKS, 65 JARVIS Street, Toronto. Patterns in wood and metal for all kinds of machinery. (ctfm)

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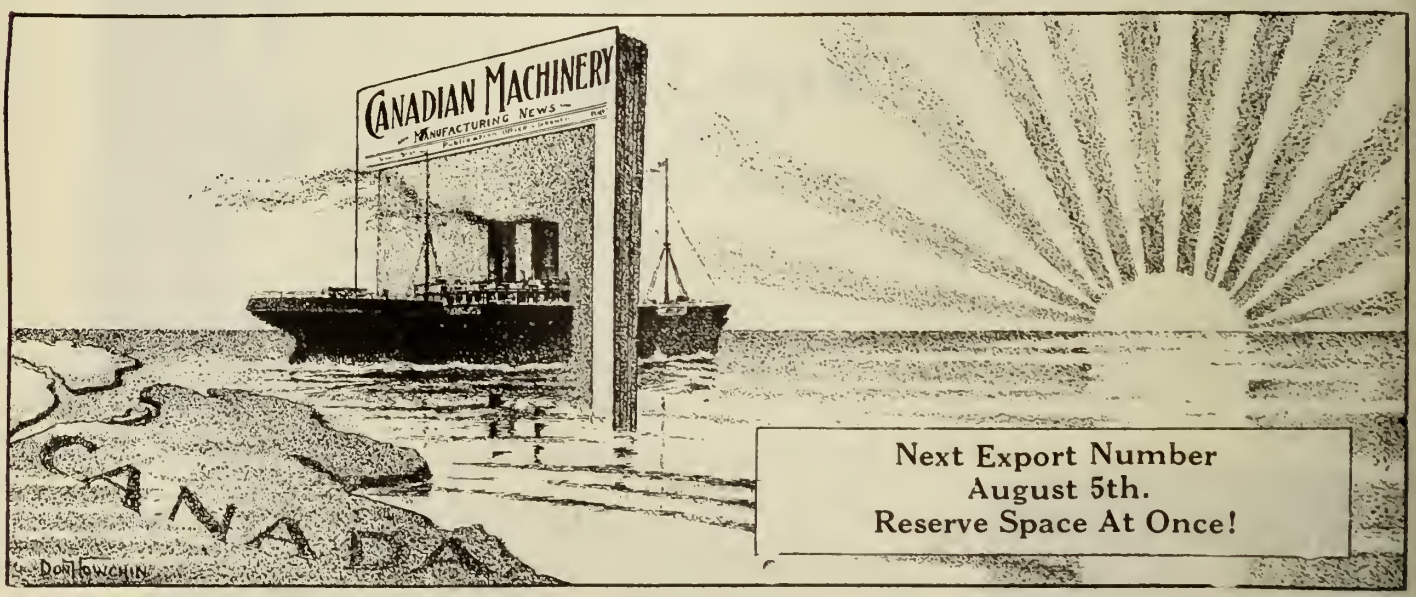
KINDLY MENTION THIS PAPER



If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

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36" x 12' LeBlond D.B.G.—Q.C. Geared, Engine Lathe.
32" x 12' Niles D.B.G.—Q.C. Geared, Engine Lathe. Extra Heavy. (2).
36" x 12' McDougall Semi—Q.C. Engine Lathe.
24" x 44" x 20' Bertram Gap Lathe, with 5" raising blocks. Plain C.G., solid spindle, S.B.G.
24" x 44" x 20' Bertram Gape Lathe, with 5" raising blocks. Plain C.G., solid spindle, S.B.G.
24" x 44" x 12' Gap Lathe (solid spindle).
24" x 10' Semi-Q.C. Hamilton Engine Lthe.
22" x 14' "American" double friction B.G.—Q.C. Geared Engine Lathe (10 ft. between centres).
22" x 10' Davenport D.B.G. Standard Engine Lathe. Extra Heavy.
22" x 8' American all-geared head Engine Lathe. Q.C. Geared.
22" x 8' American D.B.G.—Q.C. Geared Engine Lathe. (2).
18" x 8' Giddings & Lewis D.B.G.—Semi-Q.C. Geared Engine Lathe (with auto. feed stops). (3).
18" x 8' Davis D.B.G., Semi-Q.C. Geared Engine Lathe. (2).
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54" x 54" x 8' London Machine Tool Co. Planer (3 heads).
25" x 25" x 7' Putnam Planer.
20" x 20" x 5' Putnam Planer.

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5' Cincinnati-Bickford full Universal Radial Drill.
Foote-Burt Heavy Duty Drill.
20" Drill, Hand Wheel and Lever Feed. (2).
20" Drill, Hand Wheel and Lever Feed, friction driven.
14' Henry & Wright plain drill.
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No. 2 Grinder (Disc Type), with two ring wheel chucks, pump, tank and one water hood.
No. 1 Norton Universal Tool and Cutter Grinder.
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GRINDERS (Continued)

Standard Grinder, with centres (cylindrical and surface grinding).
Bench Grinders.

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24" stroke Morton Draw Cut Shaper.
16" Steptoe B.G. Crank Shaper.

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7 x 7 Acme Heave Hack Saw (Oil hydraulic relief).
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42"—3 Drum Sander.
12" Buzz Planer or Jointer.
18" x 8' Light Type Engine Lathe (Suitable for wood pattern lathe).
20" Crescent type Band Saws, our own make. (12 in stock, new).

AIR COMPRESSORS

8" x 8" Chicago Pneumatic, Air Compressor.
8" x 8" Fairbanks-Morse, Air Compressor.

MISCELLANEOUS

No. 5 Foster Friction Geared Head Screw Machine, Lever Cross Slide and power feed to Turret. (2).
50 K.W., D.C., 125 Volt, direct connected Engine Generator set, with switchboard.
4' Gap, Massilon Power Punch.
5" Jaw, Miller Vise, with graduated Swivel Heads.
Scroll or Universal Chucks from 8" up.
5" x 10" Heald Magnetic Chuck.
Above machines are nearly all overhauled or thoroughly rebuilt and in A1 condition.
We have also a number of other machines coming in from time to time.
Send us your inquiry or state what you have to sell.

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Phone Main 3431, 307 St. James Street, MONTREAL

Contractors' and Machine Shop Equipment for Sale

AT PRICES WHICH COMPEL BUYING

MACHINE SHOP EQUIPMENT

PLANER—24" x 24" x 6' Putnam. In very good condition.
OLIVER TOOL ROOM LATHE—16" x 7'—Q.C.G., taper and relieving attachments, with pan. Like new.
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GAP LATHE—24" x 48" x 20' bed, with 5" raising blocks. John Bertram & Sons. Very good condition.
Full line other Lathes, including—C.M.C., Giddings & Lewis, Milwaukee, Barker, 18" x 8' beds. Condition equal to new.
AIR COMPRESSORS—8" x 8" Chicago Pneumatic, also 8" x 8" Fairbanks-Morse. In condition equal to new.
DRILL PRESSES—20" drill with lever and hand feed. Very good condition.

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LOCOMOTIVE CRANE—One 25-ton Ohio, 8 wheel, bucket operating.
STEAM SHOVEL—One No. 0 Thew, ¾ yard, on traction wheels.
STEAM-DRIVEN AIR COMPRESSORS—2,000 cu. ft. capacity. Concrete mixers, 40' batch.
STEEL STORAGE TANKS—Open and closed. All sizes.
LOCOMOTIVE—One 70-ton Mogul type. First-class condition. A real bargain.

STANDARD EQUIPMENT & TOOL CO.

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Write or Write Your Requirements

International Machinery and Supply Company, Limited

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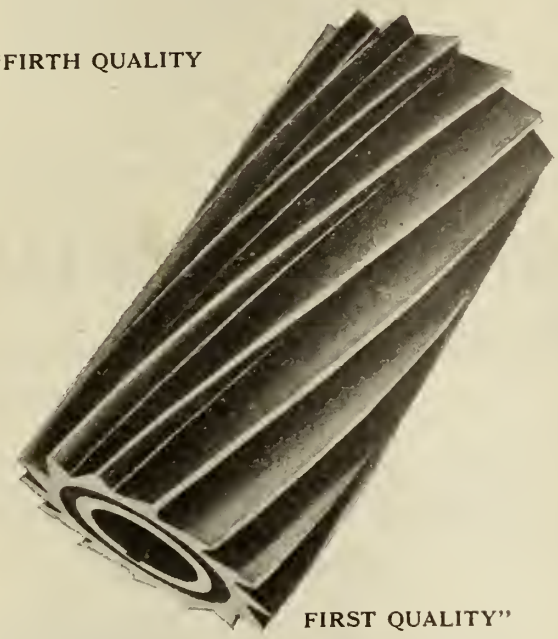
SPEEDICUT

HIGH SPEED STEEL

is the product of Sheffield's Modern Steel Mill. Made of selected materials by steel makers skilled in their craft. A unique and superior steel among high speed steels.

"FIRTH QUALITY



FIRST QUALITY"

SPEEDICUT is unexcelled for the manufacture of Drills, Taps, Reamers, Milling Cutters, Threading Dies, Forming Tools, etc. As well as Lathe, Slotter, Planer, Shaper, Boring Mill and all Machine Shop Tools.

THOS. FIRTH & SONS
LIMITED

SHEFFIELD ENGLAND

Canadian Warehouses:

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449 St. Paul St. W.

TORONTO
79 Adelaide St. W.

JOHN J. COLEMAN, Can. Manager

Hey, Bill! when 'yer goin' t'unload that truck?

"Fred's waiting for a bunch of stuff upstairs and the "Sup's" raising "cain" because it wasn't at the sanding machines an hour ago. I can't move it by hand, and it won't move itself.
"Well, if you've got to have this truck you'll have to unload it yourself; I haven't got time."
"Nothing doin'—that's your job!"

.....

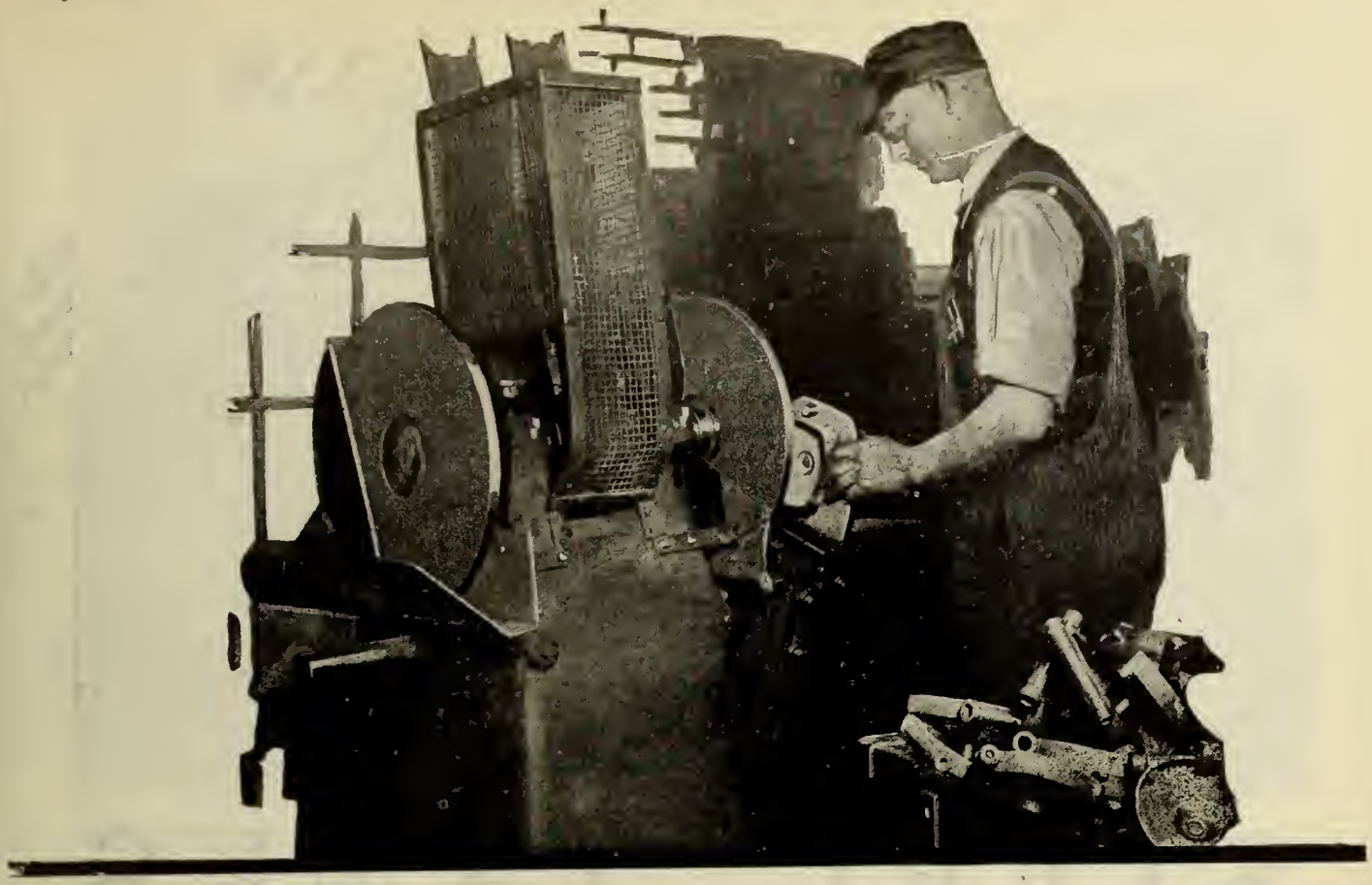
If there's much inter-department trucking in your plant, you know that sort of back talk is no exaggeration.
Result: Time of skilled mechanics and machines wasted, because of the truckman's idea of where his job ends, and because of old-style trucks that have to be unloaded piecemeal, before they can be used again.
Away with it. Install one or two Tranco Trucks and a battery of platforms. With

A TRANCO ELEVATING TRUCK

a man can easily move loads up to 3,000 pounds, dump them without piecemeal unloading, and be free for the next job at once.

The principle of their construction and operation will appeal to all reasonable men. Write now and get full particulars.

THE CHAPMAN DOUBLE BALL BEARING CO. OF CANADA, LTD.
TORONTO ONTARIO



IT DEPENDS UPON THE DISCS YOU USE

THE best disc grinder ever made will not give the production it should—it won't turn out the right quality of work—unless it is equipped with the right sort of discs.

Carborundum and Aloxite Discs are made to make your disc grinder produce. They do more work—better work—because every disc is uniformly coated with the clean, hard, sharp, fast cutting grains of Carborundum or Aloxite

And they are coated in such a free, open way that the grains get a real chance to cut.

Every disc is carefully, painstakingly, accurately made in various weights, in all grits, in all sizes.

Aloxite for steels and malleables.

Carborundum for brass, bronze, cast iron, etc.

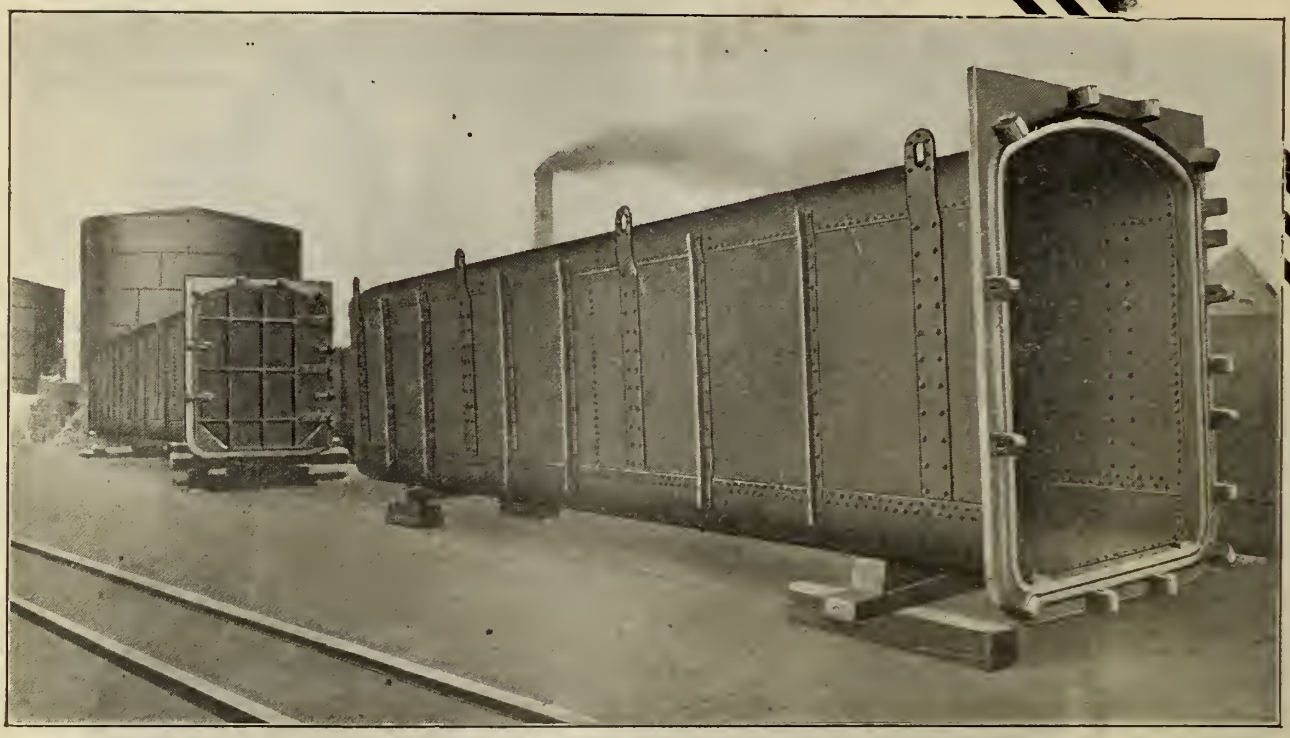
Carborundum and Aloxite Discs

The Discs that Do

The Carborundum Company

Niagara Falls, N. Y.

New York Chicago Boston Philadelphia Cleveland Detroit Cincinnati Pittsburgh Grand Rapids Milwaukee



STEEL TANKS

IF you require a steel storage or pressure tank, consult us. Every tank we make is made to rigid specifications and is guaranteed to give service and satisfaction.

Here are a few of the lines we design and build:

STORAGE TANKS
For Oil Refineries
Oil Distributing Stations
Sugar Refineries
Distilleries
Packing Houses
Soap Works
Chemical Works
Asphalt Plants
Cyanide Installations
Varnish Works

PRESSURE TANKS
Filter Tanks
Air Receivers
Hydro-pneumatic Tanks
Hot Water Tanks
Blow-off Tanks
Steam Jacketed Tanks

BINS AND HOPPERS
For Coal and Ash Handling Systems
Grain Elevators
Mines and Quarries

SMOKE STACKS

BOILER BREECHINGS

RIVETED STEEL PIPE

PENSTOCKS

CAISSONS

TANK WAGONS

Heavy & Light
STEEL
PLATE
CONSTRUCTION
Erected
Anywhere

THE
TORONTO IRON WORKS
LIMITED

Head Office:
Royal Bank Building

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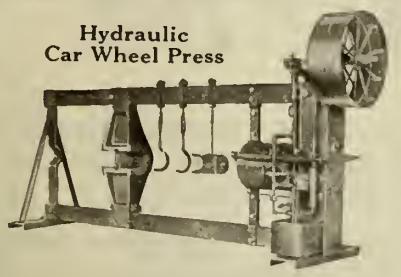
LOURIE HYDRAULIC PRESSES

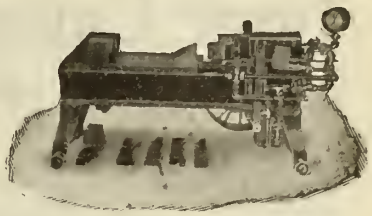
For Every Purpose Requiring Pressure

Hydraulic Car Wheel Press



We manufacture a complete line of presses for bending, straightening, forcing, forming, broaching, welding, baling, and many other purposes.

Hydraulic Bulldozer



Write for Catalogue

LOURIE MANUFACTURING CO.
SPRINGFIELD, ILLINOIS, U.S.A.

FOREIGN REPRESENTATIVES WANTED

FOR "THE COLE RETURN TRAP SYSTEMS"

Splendid opportunities for right parties.

Literature and data upon request.

Geo. W. Cole, Limited

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Open a Bank Account in Canada

The present abnormal exchange situation between Canada and the United States is affecting trade relations between the two countries. Exporters in the United States can meet this by opening Bank Accounts in Canada.

This Bank has 685 Branches, of which 590 are located in Canada from the Atlantic to the Pacific Coast. Write for a complete list of Branches and for terms respecting a Canadian account.

THE ROYAL BANK OF CANADA

Capital and Reserves $35,000,000 Total Resources $582,000,000

Head Office: MONTREAL

If interested, tear out this page and with letters to be answered.

Gear Cutting With the "IFS" Left Out

The Gear Shaper Way

A production manufacturer knows that he will secure good gears IF he has an accurate cutter, an accurate machine and a machine working on the correct principle. The whole question of good gears is resolved in this one little word "IF."

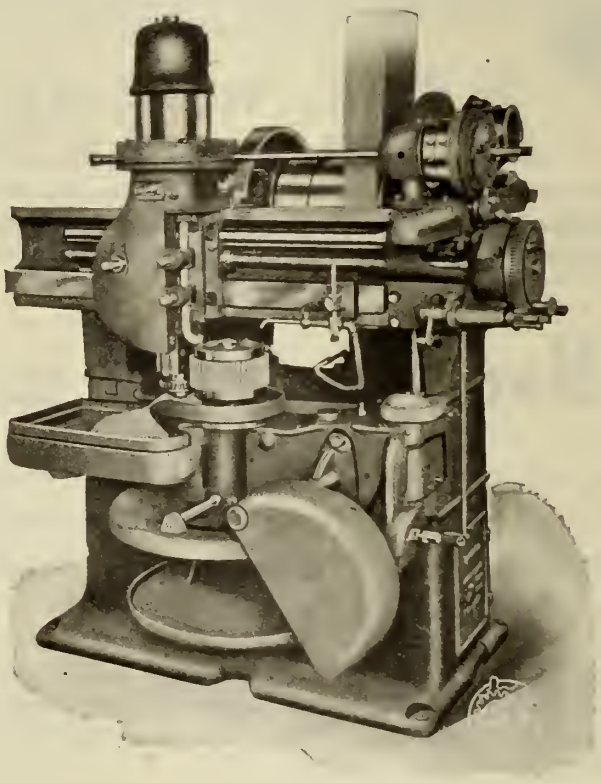
When the Gear Shaper was originally designed, the question of "IF" was taken into consideration and every possible means known to mechanical engineering was employed to eliminate the "IFS" from gear cutting.

That we have been successful in solving the problem is evidenced by the fact that each ensuing year sees a larger number of manufacturers adopting the Gear Shaper method.

How the Gear Shaper has accomplished this is clearly explained in our general catalog "Commercial Gear Cutting," which is a treatise on the subject of: —

Gear Cutting with the "IFS" Left Out.

Send for your copy to-day.



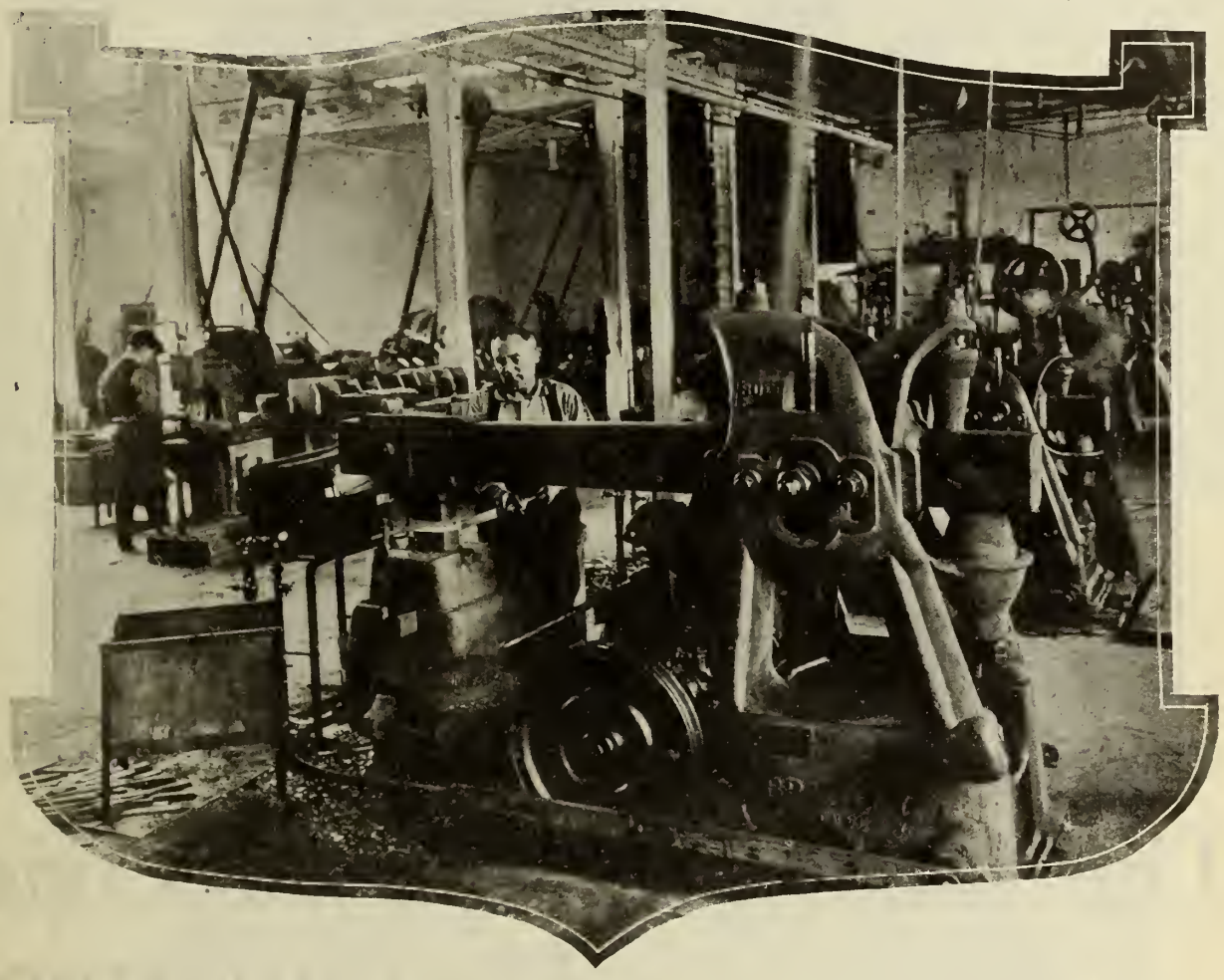
The Fellows Gear Shaper—the machine which has taken the "IFS" out of gear cutting.

The Fellows Gear Shaper Company

Springfield, Vermont, U.S.A.

FOREIGN AGENTS:—Alfred Herbert, Limited, Coventry, England; Société Anonyme Alfred Herbert, Paris, France; Societa Anonima Italiana Alfred Herbert, Milan, Italy; Alfred Herbert, Limited, Yokohama, Japan; Societe Anonyme Alfred Herbert, Barcelona, Spain; Societe Anonyme Belge Alfred Herbert, Brussels, Belgium; Alfred Herbert, Limited, Calcutta, India.

BRADLEY HAMMERS



Pointing Blanks for the Ingersoll File Co.

Here is a good illustration of the Bradley Hammer at work. In pointing blanks for the Ingersoll File Company, Ingersoll, Ontario, they are giving their usual high degree of satisfaction. The above is but one of a battery of similar machines.

Bradley Hammers are strong, simple, and easy to operate.

If it's a hammer job—**"Forge ahead with a Bradley."**

The Bradley line includes Cushioned Helve Hammers, Upright Strap Hammers, Upright Helve Hammers, Compact Hammers.

Full information of the Bradley will be sent upon request.

C. C. Bradley & Son, Inc.

Syracuse, N.Y., U.S.A.

FOREIGN AGENTS: England, Buck & Hickman, Ltd., London; France, Fenwick Freres & Co., Lyons, Rhone; Italy, Fenwick Freres & Co., Turin; Belgium, Fenwick Freres & Co., Liege; Brazil, Fenwick Freres & Co., Rio de Janeiro; Switzerland, Fenwick Freres & Co., Zurich; Portugal, Fenwick & Co., Lisbon; Spain, Fenwick Freres & Co., Barcelona; Alsace-Lorraine, Fenwick Freres & Co., Luxembourg; China, Anderson Meyer & Co., Ltd., Shanghai.

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The New Lincoln Electric Headquarters

ON WEDNESDAY, June 30th, the Lincoln Electric Co. of Canada, Limited, moved their Head Office from the Temple Building—as well as their Welding Plant from the foot of Jarvis Street, over to their new quarters at 136 John Street, Toronto.

With all departments under the one roof, users of Lincoln Electric Welding are assured a most efficient service.

All readers of this publication are cordially invited to call and inspect these new quarters. You will note that the new telephone number for all departments is Adelaide 7200.

"Link Up With Lincoln"

The Lincoln Electric Company of Canada, Limited

136 John Street, TORONTO Phone Adelaide 7200

Also in the Coristine Building, Montreal

RAILROAD WELDING

TRADE MARK ARMCO REG. U.S. PAT. OFF.

AMERICAN INGOT IRON

Welding Rods and Electrodes

"The Guaranteed Welding Iron"

A little more than a year ago, the writer was appointed Supervisor of Welding of the Kansas City Southern Railway and allied lines. Before that time many different kinds of welding wire were being used, some good and some bad, which resulted in numerous welding failures ad lots of trouble. During the past year we have used Armco Rods for both gas and electrical welding, for all boiler and considerable other welding, which is not only giving us entire satisfaction but has reduced our welding trouble and failures to a very low minimum.

G. M. Caswell

Supervisor of Welding K.C.S. Ry.

PAGE STEEL & WIRE CO.

Established 1883 as Page Woven Wire Fence Co.

Makers of ARMCO IRON Welding Rods and Electrical Wire; Wire Mill Products, Plain and Galvanized; Wire of Special Analysis; Wire Fencing for All Purposes; Factory Gates; Ornamental Iron Fence; Machine Guards; Tool and Stock Room Partitions; Architectural Iron.

Plants: Monessen, Pa., and Adrian, Mich.

SALES OFFICES: Grand Central Terminal, New York

Chicago, 208 South LaSalle Street

San Francisco, American Rolling Mill Company of California

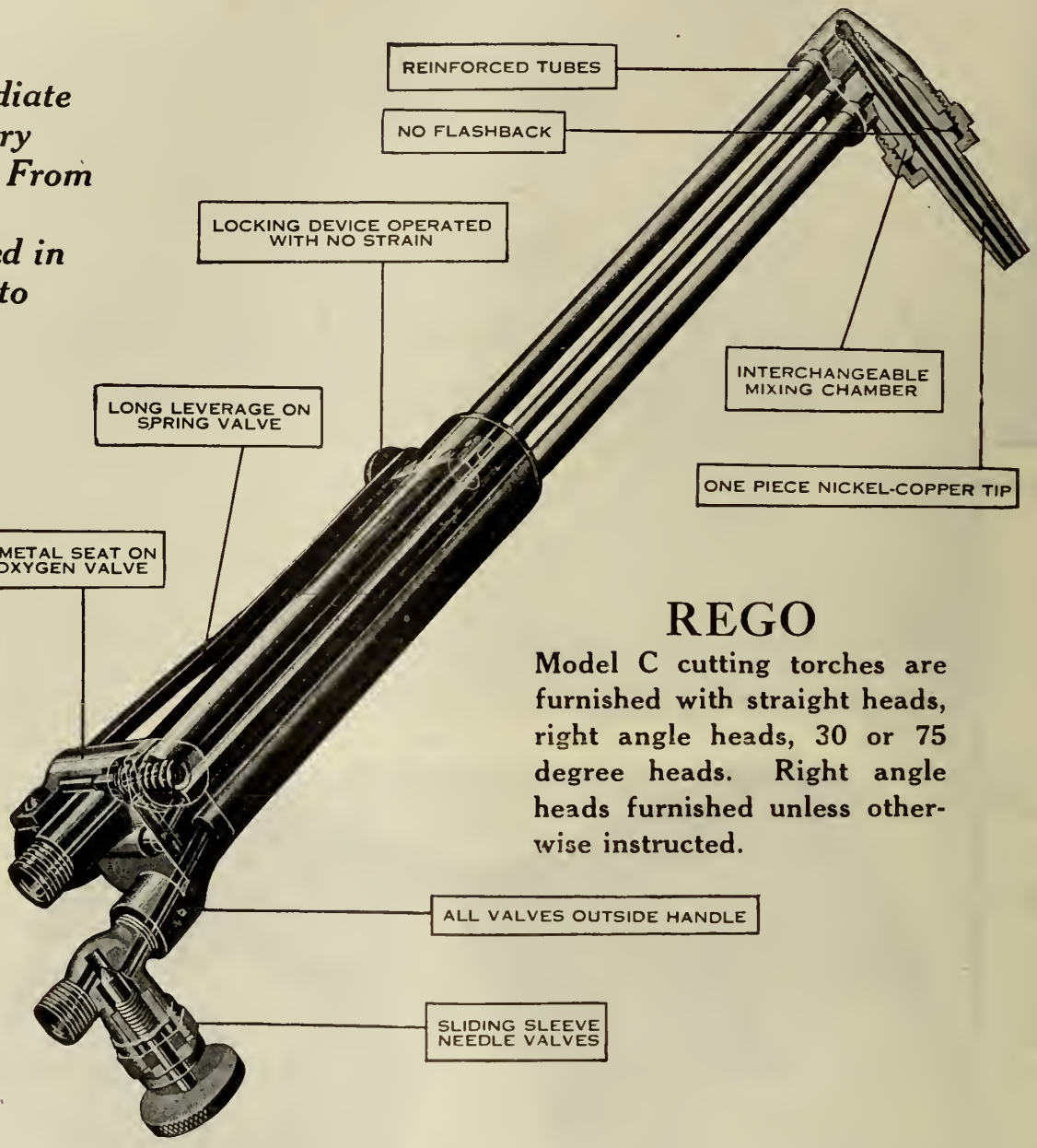
Canadian Distributors, Taylor & Arnold, Ltd., Montreal, Toronto, Winnipeg.

80

The Rego Famous NO-FLASH Torch

Better Cutting and Welding at Lower Cost

Immediate Delivery Made From Stock Carried in Toronto


REINFORCED TUBES
NO FLASHBACK
LOCKING DEVICE OPERATED WITH NO STRAIN
INTERCHANGEABLE MIXING CHAMBER
LONG LEVERAGE ON SPRING VALVE
ONE PIECE NICKEL-COPPER TIP
METAL TO METAL SEAT ON CUTTING OXYGEN VALVE
ALL VALVES OUTSIDE HANDLE
SLIDING SLEEVE NEEDLE VALVES

REGO

Model C cutting torches are furnished with straight heads, right angle heads, 30 or 75 degree heads. Right angle heads furnished unless otherwise instructed.

The Carter Welding Co. of Toronto, Limited

9-11 Sheppard St., TORONTO, ONTARIO Telephones Adelaide 1524 Adelaide 2341

AGENTS AND SERVICE STATIONS:

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York Street, Hamilton, Ontario

T. D. SUTHERLAND
40 McCrae St., Niagara Falls, Ontario

COMPRESSED GAS CO. LTD.
1530 Hastings Ave., Vancouver, B.C.

OTHER AGENCIES AND SERVICE STATIONS WILL BE ESTABLISHED AT:

St. John, N.B. Halifax, N.S. Montreal, Que. Winnipeg, Man. Calgary, Alta.

If you are interested in Gas Welding and Cutting, either as an employer or employe, send your name and address to *Department H,* for a free copy of AUTOGENOUS WELDING, published quarterly by

DAVIS-BOURNONVILLE COMPANY

NIAGARA FALLS, ONT.

Manufacturers of oxy-acetylene welding and cutting torches, welding and cutting machines, acetylene generators, welding rods, fluxes and accessories.

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WELDING AND CUTTING
DAVIS
APPARATUS
DAVIS-BOURNONVILLE CO.
"MADE IN CANADA"

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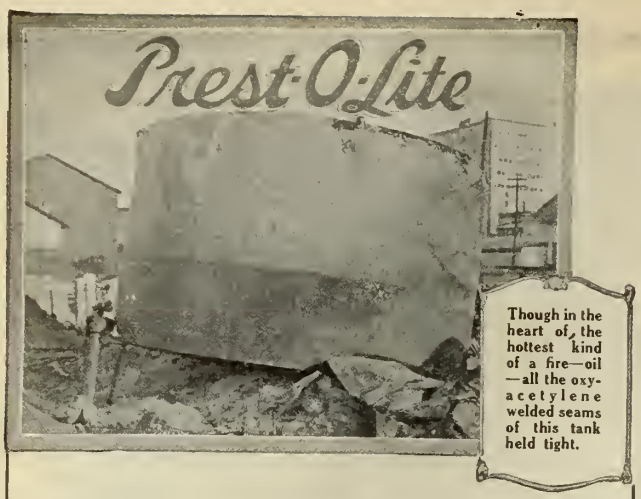


A Tank That Couldn't Be Put Out of Business

In a recent conflagration, this 12,000 gallon oxy-acetylene welded oil tank is practically all that was left of two burned-down business blocks.

Not only did it withstand terrific heat, but also the shocks of dropping five feet and of having roof and floor beams crash upon it.

The ruggedness of this tank is another tribute to

Prest-O-Lite

DISSOLVED ACETYLENE

"The Universal Gas with the Universal Service"

as an important factor in the efficiency of the oxy-acetylene process.

The domed head was bent in, the 5 inch oxy-acetylene welded supply pipe held fast—without a leak—despite the fact that half the weight of the tank hung upon it, even after all the dents were straightened out the welds hold tight.

You will be interested in the Prest-O-Lite Service Plan. Write us about it.

Prest-O-Lite Company of Canada
LIMITED
Dept. C-107 Prest-O-Lite Building
TORONTO

Branches: Montreal Toronto Winnipeg

Plants at: Toronto, Ont. St. Boniface, Man.
Merritton, Ont. Shawinigan Falls, P.Q.

IMPERIAL CARBIDE

For Welding Cutting and Lighting

HIGHEST GAS YIELD
IMPERIAL CARBIDE
MADE IN CANADA

It insures **effectiveness** and **economy** by **invariably** producing acetylene gas of **unusual purity.**

Manufactured by

Union Carbide Co. of Canada, Ltd.

WELLAND, ONTARIO

Large Stocks maintained at convenient distributing centres throughout Canada

OXYGEN

Electrolytic Process

Chemically Pure

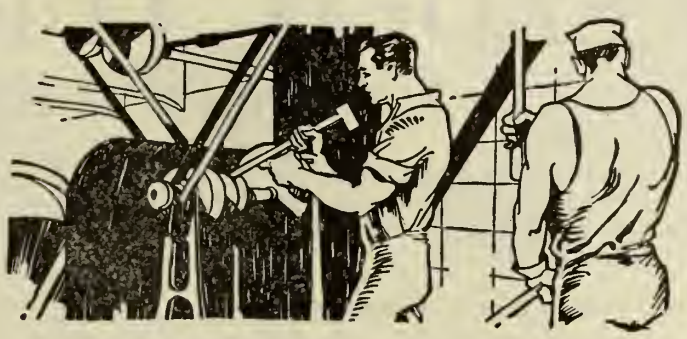
Supplied in 100, 200 or 300 cubic feet cylinders.

PLANTS:

TORONTO—295 Dufferin Street, Telephone P. 7656

MONTREAL—149 Moreau Street, Telephone La Salle 508

NATIONAL ELECTRO PRODUCTS, LIMITED
Head Office : Toronto



THE Dominion Oxygen Company, Ltd., announces the satisfactory progress of its building program.

Work on the Toronto Plant is making excellent headway and a suitable site has been purchased in Montreal where construction work will promptly begin.

Land for the additional plants provided for in the initial plans of the Company is being negotiated for in leading cities.

Meanwhile a practical Service System is undergoing organization and a net-work of suitably located warehouses and service stations will be established.

Pending further announcement the oxygen users of the Dominion are invited to write for detailed information as to the broad scope and liberal policy of the Dominion Oxygen Company, Ltd.

DOMINION OXYGEN COMPANY, Ltd.
Hillcrest Park
Toronto, Canada

D-3

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THE TUBE COMPANY OF CANADA LIMITED

Electric and Oxy-Acetylene
WELDED TUBING
Also BUTT SEAM TUBING

We have a thoroughly equipped plant for Welding by Electric and Oxy-Acetylene processes. Oxy-Acetylene Welded Tubing is recommended for bending purposes; Electric for straight, or slight bends. Butt Seam Tubing is also one of our specialties. Tubing made hot or cold rolled finish.

Our Work Includes Tubing for

Bicycles, Bedsteads, Automobile Parts, Electric Fixtures, Gas Fixtures, etc. Round, Square, Rectangular and Special Shapes in widest range of sizes and gauges. Plant fully equipped for slitting all gauges of stock from sheets or coils.

Let us advise you of the kind of tubing that will best suit your requirements. Inquiries gladly answered.

The Tube Company of Canada LIMITED

233 Dufferin Street, TORONTO, Canada

The New Stirring and Stabilizing Process

Perfectype COMPLETE WELDING and CUTTING Equipment

Safe *Saves Money* *Makes Better Welds*

Regulators *Torches for Every Purpose* *Generators*

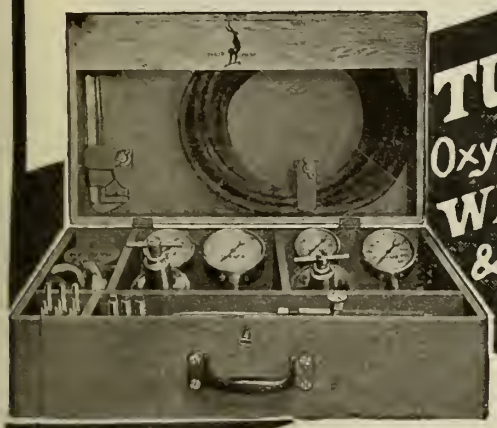
Canadian orders for Perfectype Special Type "A" Cutwelding Torches with 90 degree cutting head and 2 cutting tips, standard angle welding head and 5 welding tips of pure red copper will be delivered, duty and postage prepaid, from nearest jobber at the special price of $65.00.

Will consider inquiries from live dealers and jobbers who care to stock torches in lots of five or more. Territory granted. Inquiries confidential.

Address all orders and correspondence

W. B. PERDUE, 1220 Post Street SAN FRANCISCO, Cal.

For Repairing Broken Machinery or Tools of Medium Size



TURNER Oxy-Acetylene WELDING & CUTTING Equipment

These outfits will soon pay their cost in machine parts or tools reclaimed. The sectional extensions of the torch enable the operator to adjust it to any desired length or angle. The location of valves is such that the flame is controlled by one hand, leaving the other hand free for the work at all times.

For full particulars write

The Turner Brass Works
SYCAMORE, ILLINOIS, U. S. A.

Gray Iron and Semi Steel Castings of all Descriptions

From 5 lbs. up to 4 tons

Foundry capacity, 15 tons per day.

Difficult castings our specialty.

Mixtures regulated by chemical analysis and all castings sandblasted.

Estimates from blue prints submitted promptly.

If desired, we can make patterns to your drawings.

G. W. MacFarlane Engineering, Limited
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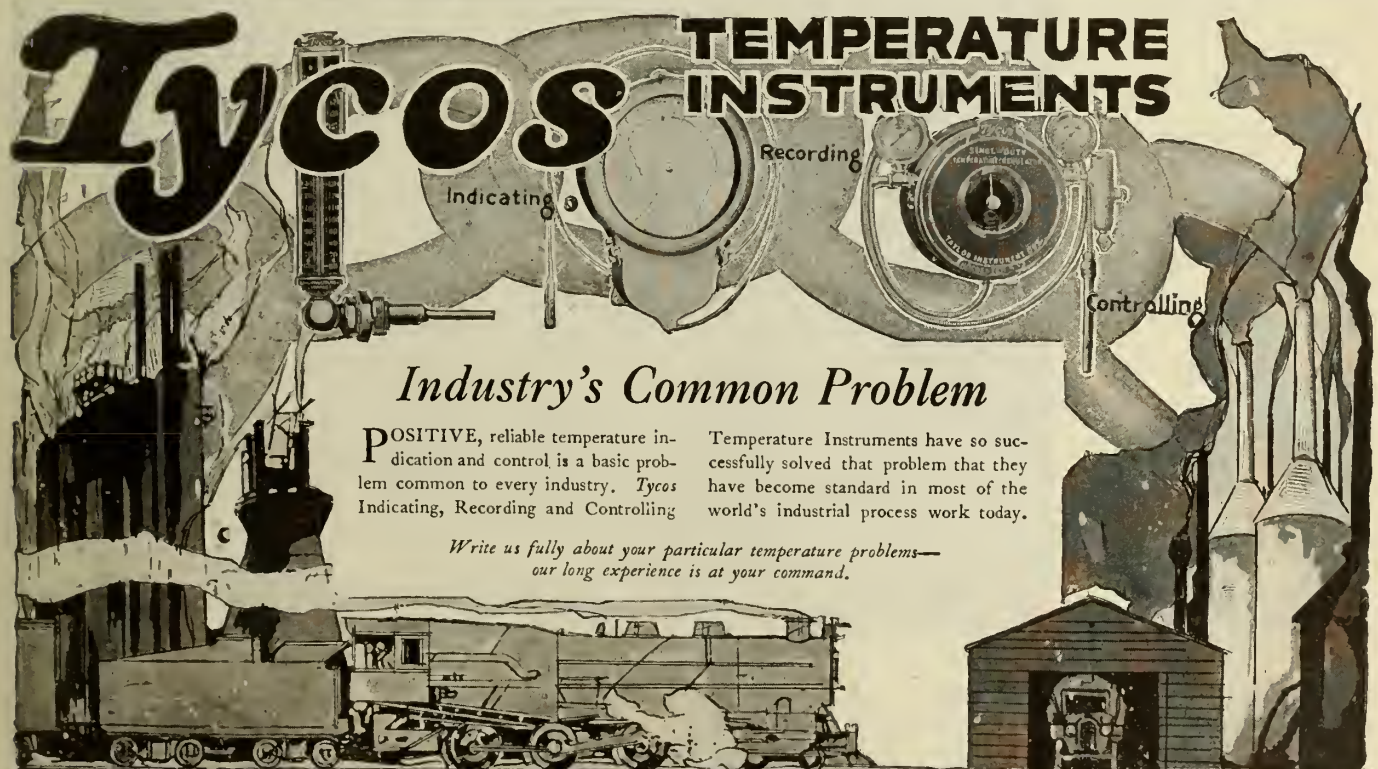
Tycos TEMPERATURE INSTRUMENTS



Industry's Common Problem

POSITIVE, reliable temperature indication and control is a basic problem common to every industry. *Tycos* Indicating, Recording and Controlling Temperature Instruments have so successfully solved that problem that they have become standard in most of the world's industrial process work today.

Write us fully about your particular temperature problems—our long experience is at your command.

Taylor Instrument Companies
ROCHESTER N.Y.
There's a *Tycos* or *Taylor* Thermometer for Every Purpose DD-1

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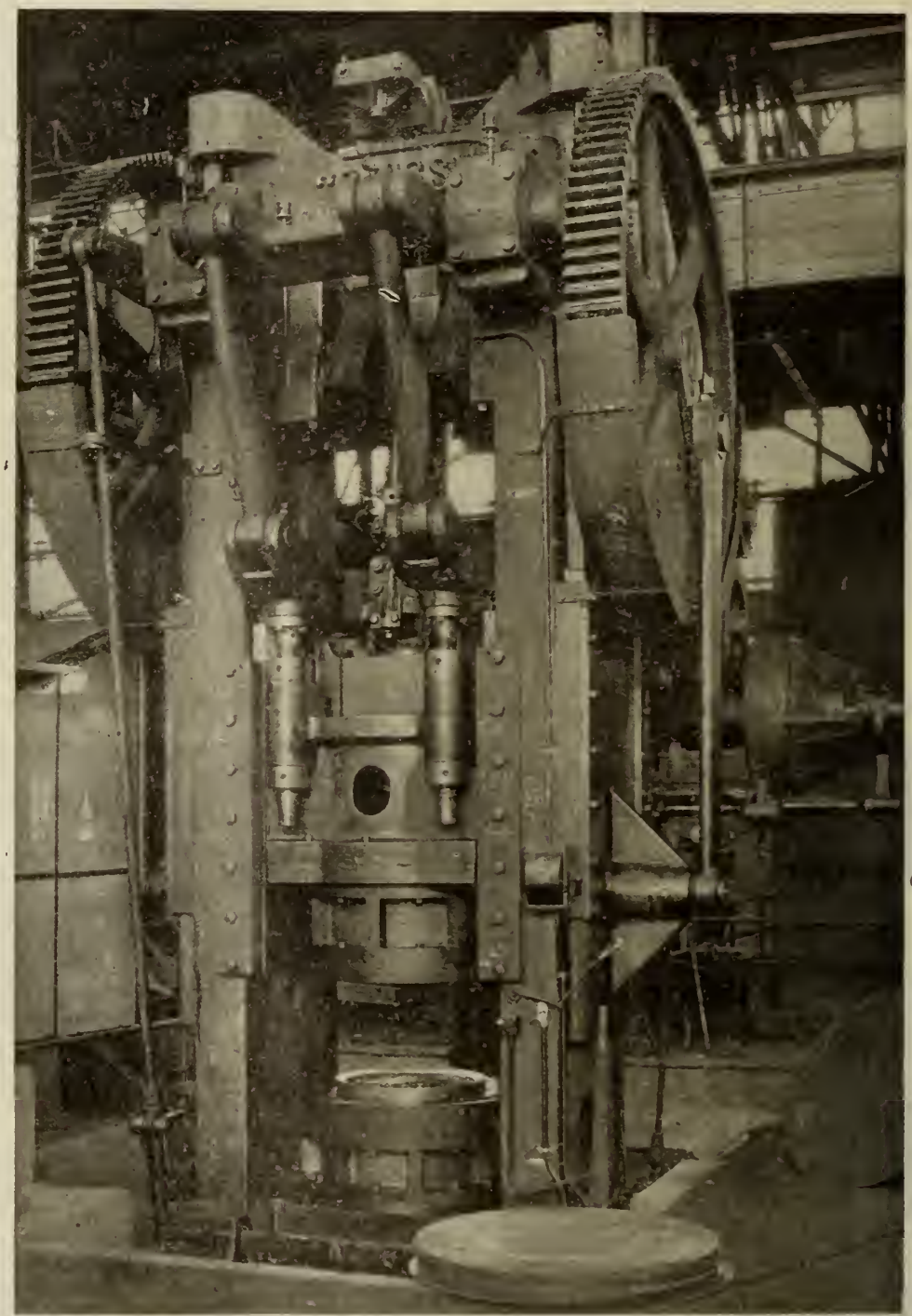
Making "Hydraulic" Steel Barrels

Three of these powerful "Bliss" No. 16 Toggle Draw-Presses (one of the largest sizes of drawing presses) in service in the stamping plant of The Hydraulic Pressed Steel Co., of Cleveland.

The press in the picture is being used for forming barrels from .156 in. Basic Open Hearth Steel blanks 4 ft. in diameter.



BLISS 1857

E. W. Bliss Company

Main-Offices: BROOKLYN, N.Y., U. S. A.
American Factories: BROOKLYN, N.Y. *and* HASTINGS, MICH.

BLISS 1920

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A Triple Performance in the Making of Gear Blanks

You see here a 13-inch hand-forged steel gear blank—a tough job to handle on any other machine—being completely finished in less than 20 minutes by the powerful

3-A Universal Hollow-Hexagon Turret Lathe

While the carriage is making the facing cuts the turret is both turning and boring: saving time and cutting down production costs. A machine without these advantages would make a poor showing on the job in comparison.

For either bar or chuck work the Universal Hollow-Hexagon Turret Lathes mean more profit to you—a profit beyond your reach without such advantages as the turret-and-carriage combination affords through intelligent use.

Send blue prints for definite figures.

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CLEVELAND, OHIO, U. S. A.

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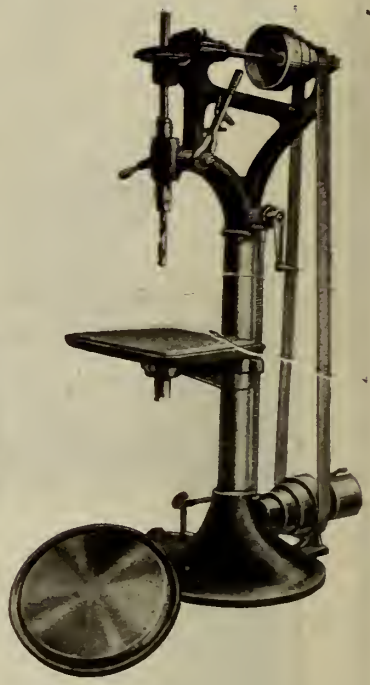
Every machine we manufacture is guaranteed. You take no chances when buying the products of our factory. Every tool is thoroughly tested by an expert before they leave our plant.

NO. 14 PERFECT

A High class drilling machine, speed 2,000 R.P.M. Drills from 0 to ½ in. Looks right—Acts right—Because it's built right.

NO. 18 DRILL

Drills to centre of 10 in. Speed 2,500 R.P.M. Purchase our machines for efficiency, accuracy, durability and ease in handling.



Perfect No. 19 Drill, geared 2 to 1, is driven by a 2-in. belt; has lots of power; handles a drill from 0 to 29/32. You don't appreciate its value until you compare it with other 18x 20-in. drills.

The Perfect 18-in. Lathe—all that it looks to be.

For tool room or machine shop. Capable of delivering the most accurate work at a high rate of speed. A lathe of great power and rigidity. Quick change gear, double back gear, any length you want. You'll be pleased when you put this tool in your shop and so will the man who runs it. Our price is right. We have a reputation for accuracy, fine workmanship and finish and our guarantee stands behind every piece of every machine we manufacture.

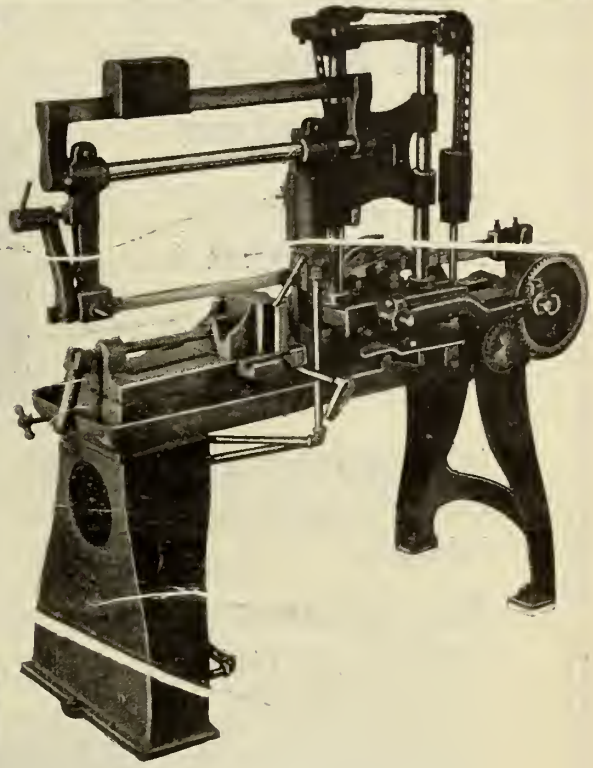
Perfect 12 in. and 14 in. Screw Cutting Lathe with Gap.

Furnished in 6′ or 8′ lengths. Just the lathe for machine shops, experimental shops, technical schools, garages, etc., nice convenient design, small consumption of power, and low price. This tool is in a class by itself. If you want a small lathe, you can't afford to overlook this machine. Ask for catalogue.

PERFECT

Galt, Ontario, Canada

The Perfect Grinders. They've stood the test; the oiling device can't go wrong; the material, workmanship and service is guaranteed. Guards and exhaust hoods furnished on request, and the price is very moderate when compared with others.



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Capacity: 7"x7". Speed: 120 R. P. M. Automatic Lift. Adjustable Frame, Milled Gears. Swivel Vise. Weight 550 lbs.

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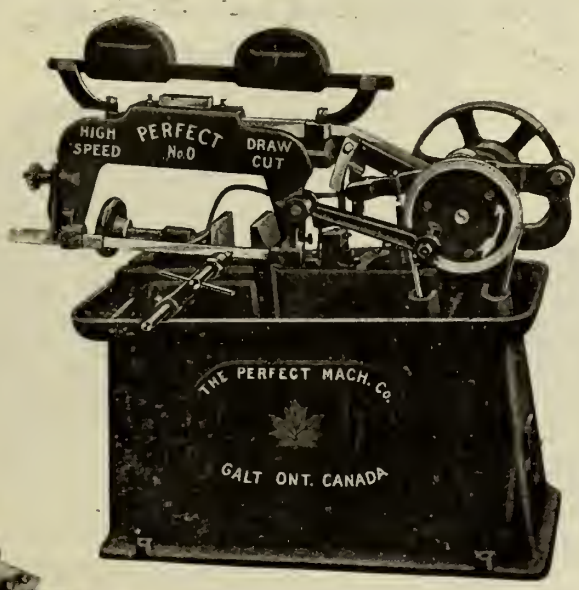
Capacity 0" to 5" or more, on request. Speed: 120 R. P. M. Weight: 600 lbs. It's a perfect Machine.



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Capacity: 5"x6". Speed: 80 R.P.M. This is a nice smooth - running machine. Well worth the price. You'll appreciate it.

NO. 3 PERFECT HACK SAW
Capacity: 6"x6". An ideal,all round Machine Shop Saw, always ready, automatic shut-off, adjustable arm and saw guide.

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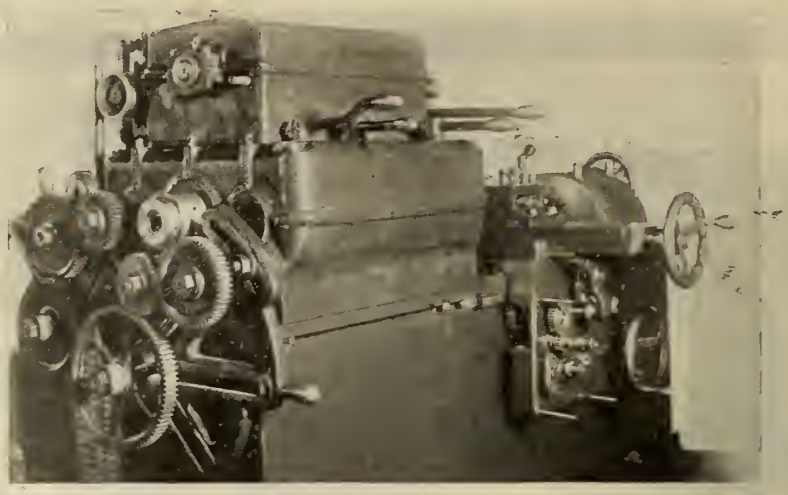
By Hack—"By Heck"

For Relieving the Situation



THE HACK HIGH POWER UNIVERSAL RELIEVING MACHINE

is a high production machine for Hobs of straight or spiral gash, Form Cutters, Counter-bores, Face Form Cutters, Taps, Threading Dies and Worms.

With this equipment Hobs and Cutters are NOT hard to make.

We furnish Hob and Cutter data free to customers only.

Why tie up production, when you can make your own cutters and hobs just the way you want them when you want them?

Several losses due to tied-up production would pay for this wonderful tool. Your tool-room isn't complete without one.

Made in three sizes:

Cutter capacities	Weights
4"	5,000 lbs.
8"	6,500 lbs.
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The Headstock represents a number of new features—attention being called to the self-contained countershaft, which forms a part of the head itself. Power is transmitted to the relieving machine directly from the line-shaft or jack-shaft through one forward and one reverse belt to the machine, without idlers or intermediates of any sort whatsoever. Power is transmitted from the pulleys to the head through a friction clutch, which is very sensitive and permits of an instantaneous forward or reverse movement when required. Power is transmitted directly from the self-contained countershaft pulleys through chrome-nickel spur gearing of various ratios to the spindle.

⅛" and ⅜" cams furnished with each machine; other sizes to order.

Full equipment of change gears and wrenches with each machine.

Tool block opening for tool 1½"x6".

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We want you to see and feel a piece of this "three-time" protected metal: (a) Asphalt, (b) Asbestos, (c) Waterproofing. You will then *know* why this building material is most durable and economical for roofs, siding, ventilators, skylights, building trim, etc.

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A sample like that shown can be had for the asking. With it we will send interesting descriptive literature prepared by our engineers.

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CANADA'S NATIONAL HARDWARE WEEKLY

PUBLISHED EVERY SATURDAY
SINCE 1888

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TORONTO

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The Buyer for a Western Canada hardware wholesaler (name on request)—a company rated upwards of one million dollars, best grade of credit, said last week, "I not only read Hardware and Metal carefully each week, but I prefer to deal with firms that advertise in Hardware and Metal and thus assist us in making the goods better known among the retail trade." This buyer expresses the views of practically every hardware buyer in Canada. We would be glad to have you make inquiries. Ask 100 of the biggest hardware buyers in Canada which paper they read, and which paper they recommend for advertising to the Canadian hardware trade. Advertisers have frequently made this test and the result has always been—Hardware and Metal—the paper that has become the most important connecting force in the Canadian Trade. This is due to 32 years of constant effort to produce each week a paper brimful of authentic and practical information for the hardware men of Canada. There is no other publication in Canada giving a weekly market service on hardware, paints, oils, electrical goods, motor accessories and other hardware lines. There is no other publication in any line that covers its field so thoroughly. This is proven by A.B.C. audit. Advertising in Hardware and Metal has a direct influence on the buying habits of Canadian hardware men both wholesale and retail. Canadian hardware men want to know something about the firms they buy from. You can tell them about your company and your product through Hardware and Metal.

We recommend the use of regular advertising in Hardware and Metal, and we particularly emphasize the importance of using the 32nd Annual Fall Sale and Directory Number to be issued on Aug. 21. Forms are now closing and reservations should be made immediately. Write us at once for interesting information regarding the importance of the Annual Fall Number. Rates: Full page, $65; half page, $36; quarter page, $21; two pages, $120; extra color if desired $25 per page extra. The Canadian hardware trade is awaiting this number because it will contain hundreds of business-building ideas. The buyer referred to above and over 3,600 other Canadian hardware buyers will read your message if you are represented in the 32nd Annual Fall Number. Positions in issue will be alloted in order of reservations.

If you are interested in Canadian hardware men, show your interest in a practical manner by placing your company and products before the trade in an issue that has been an annual feature for 32 years.

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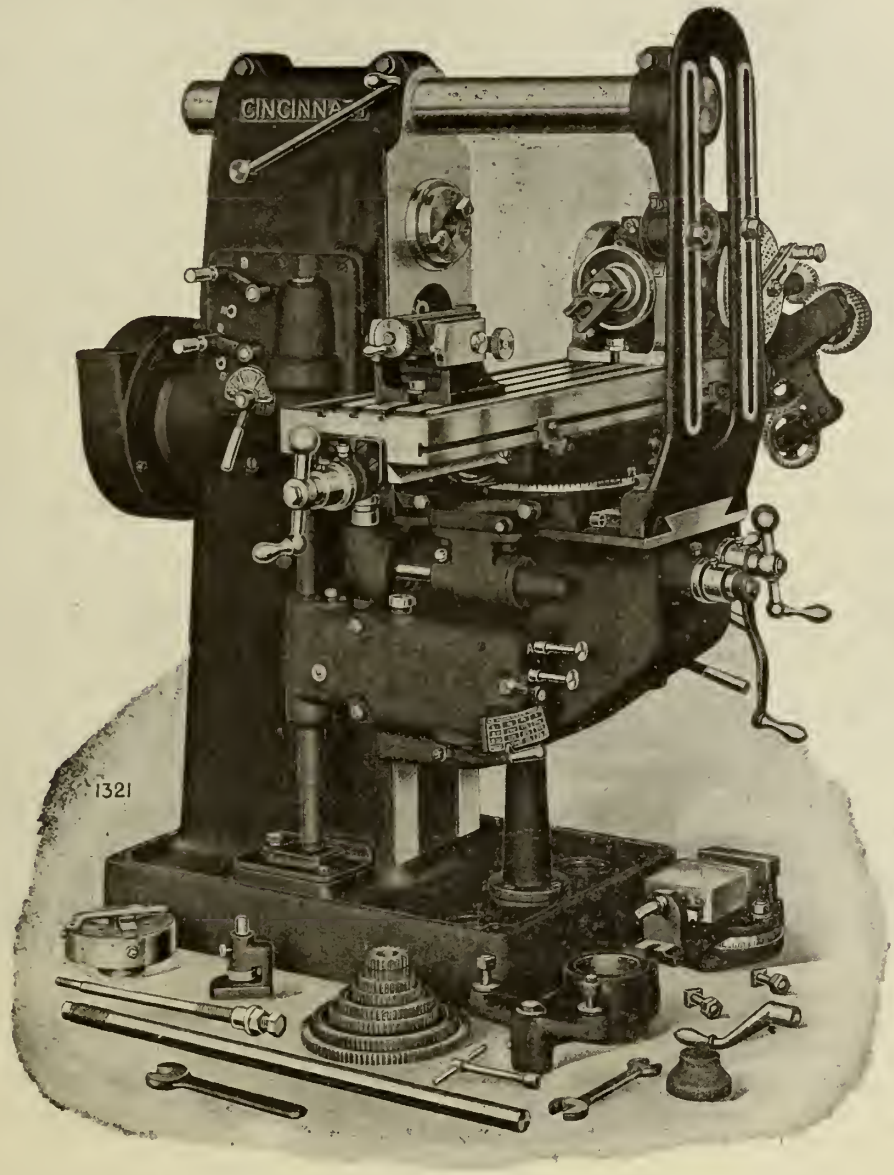

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We offer these Machines in the Nos. 1 and 2 sizes—Plain, Universal and Vertical. They are compact, powerful machines for their range durable, because all gears and shafts are hardened; handy, because all levers may be reached from the operator's position in front of the machine.

Ask for the catalog.

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A New and Better SAW TABLE

Saves Time and Space

This New McKenzie Saw Table has several outstanding features which make it the best machine of its kind to buy. Does the same work as machines of larger dimensions, costs less, takes up less space and produces work faster. It is 23½" x 30". Distance from saw to ripping fence is 13". Floor space 30" x 36". Furnished with belt, ripping fence, two mitre fences and 9" saw.

Specially suitable for pattern shops, technical and manual training schools. Write for prices and full particulars.

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It has been adopted as standard by many firms that found it a long way better than guess work.

CANADIAN MACHINERY would like to see this Chart in every shop in the Dominion. Mail the coupon below for your copy to-day.

Shows at a glance Correct Clearance and Rake Angles for Cutting Tools

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Please send me / us free, one of your tool grinding charts.

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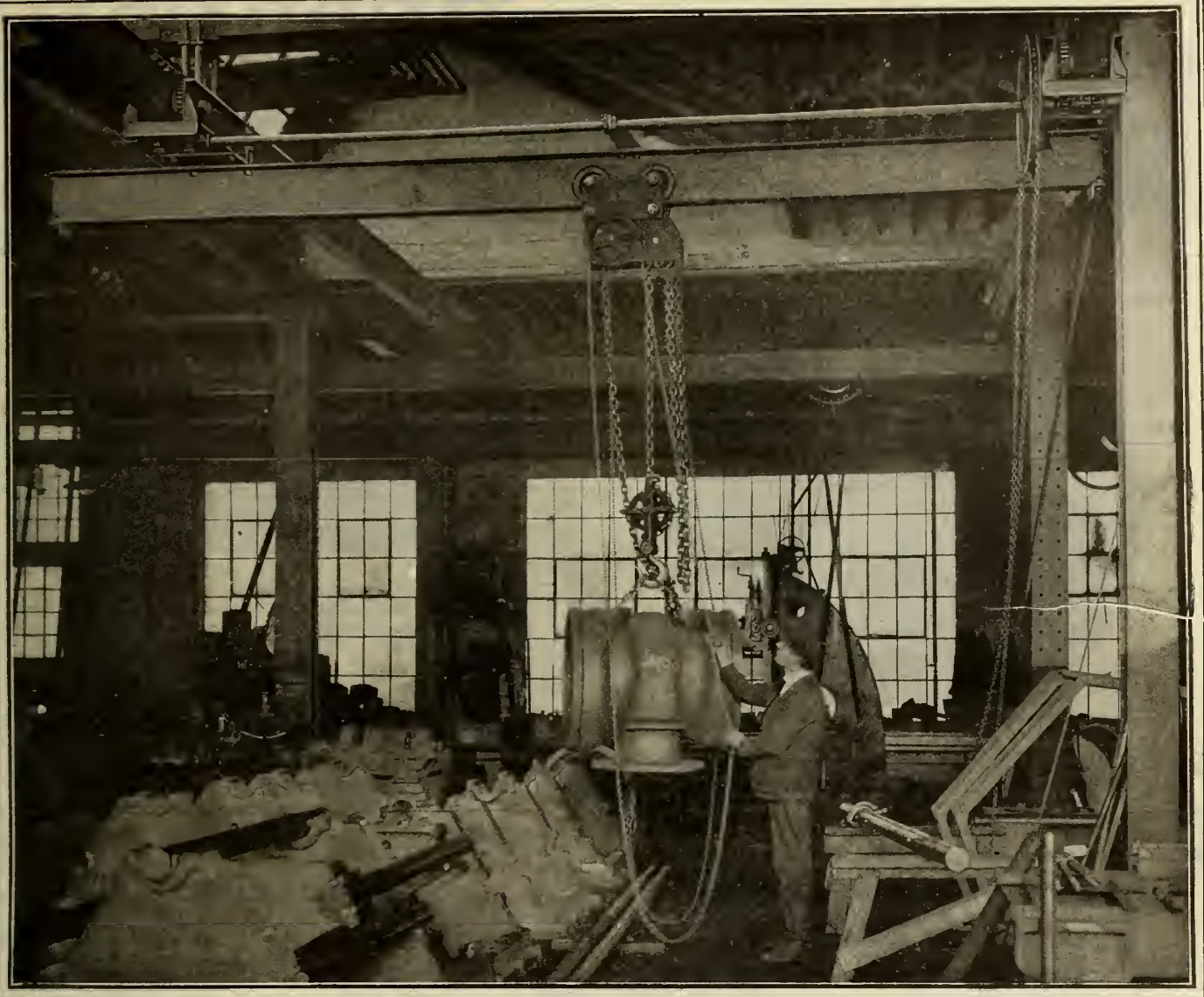

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Study long-wearing "Made-in-Canada" Chucks that are making good everywhere.

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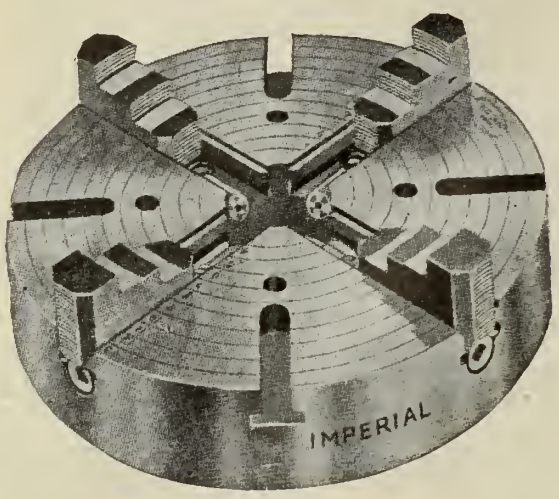

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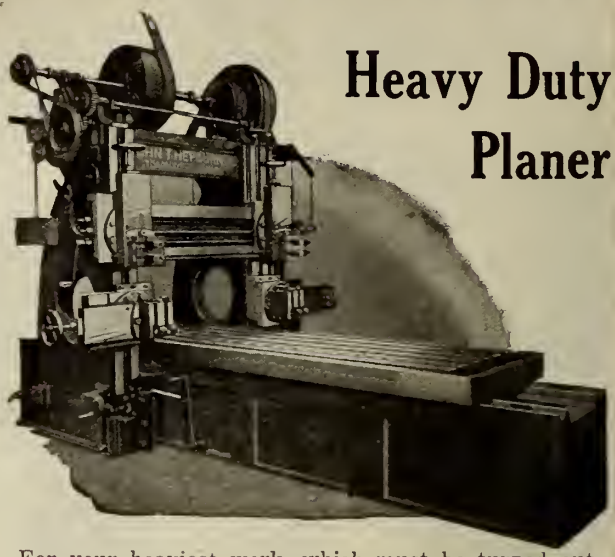

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Your requirements of Special Machinery, Cranes, Steam Pumps, Presses, Grey Iron Castings and Blacksmith work will receive our careful attention.

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Engineers and Iron Founders
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A rearrangement of your patterns might cut their cost 25%: a different method of molding them might double your production at no increase in molding cost. *We can advise you* and we have expert metal and wood patternmakers who are able to make any changes that may commend themselves to you.

If you need some new Patterns

send us a sample, blueprint or sketch, and ask for our advice. It won't cost you anything. If our advice is good and commends itself to you, it is only fair to assume that our work will be equally satisfactory, and we need the work as badly as you need the patterns.

We are in a position to do turning, boring, drilling or other semi-finishing operations on castings supplied by us.

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Engineers, Manufacturers and Erectors of Steel Structures

Industrial Bridges, Buildings, Towers, Smoke Flues and Stacks, Chutes, Coal Bins, Ore Bins, Tanks, Cranes, Engine Houses, Grain Elevators, Derricks.

Structural Steel and Steel Plate Work, and a combination of the two lines.

Prompt Deliveries Assured

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STEEL CASTINGS

QUICK DELIVERIES

High Carbon Steel
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QUALITY GUARANTEED

Sizes—½ lb. to 5,000 lbs. each

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ESTABLISHED 1860

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Send for our Bulletin; it describes both machines fully

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Successors to C. G. Garrigus Machine Company
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FOR Agricultural Implements, Trolley Arms, Fence Posts, Bedsteads—and all kinds of manufacturing purposes. Reliable quality, uniform in size, 14 to 20 gauge, size ⅜" to 2" outside diameter.

STANDARD TUBE & FENCE COMPANY, LTD.
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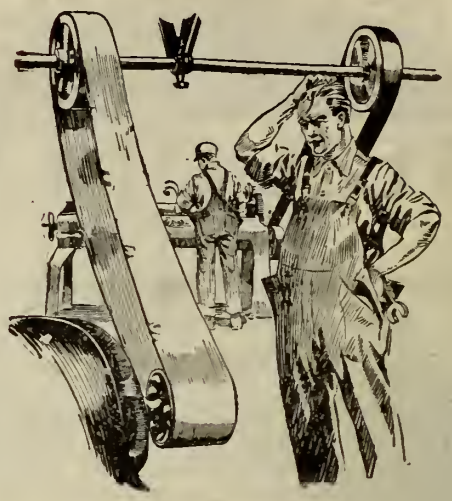
Curing a Mean Drive



Practically every factory of any size has one or more mean drives which seem to defy all attempts to correct them.

Up to date you're beaten—but that's because you want to solve the problem yourself.

Our transmission experts take more real satisfaction in solving mean drives than in selling belts.

Dominion Friction Surface Belting

has helped to solve many transmission problems, and we have yet to find a drive where it will not provide efficient, satisfactory service.

It will cost you nothing to have one of our belting experts study your problem.

If he can't help you he will tell you so. If he can help you it will cost you only the price of a belt that will give you a longer and more satisfactory service than any other belt has given on that particular drive.

The first step to that satisfactory service is to 'phone or wire our nearest service branch.

CANADIAN CONSOLIDATED RUBBER CO. LIMITED
DOMINION RUBBER SYSTEM
AND ASSOCIATED COMPANIES

Our Dominion Hose, Packing and Industrial Rubber Goods are all the same high standard as Dominion Friction Surface Belting.

Dominion Rubber System Service Branches

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St. John	Hamilton	Winnipeg	Calgary
Quebec	London	Brandon	Lethbridge
Montreal	Kitchener	Regina	Vancouver
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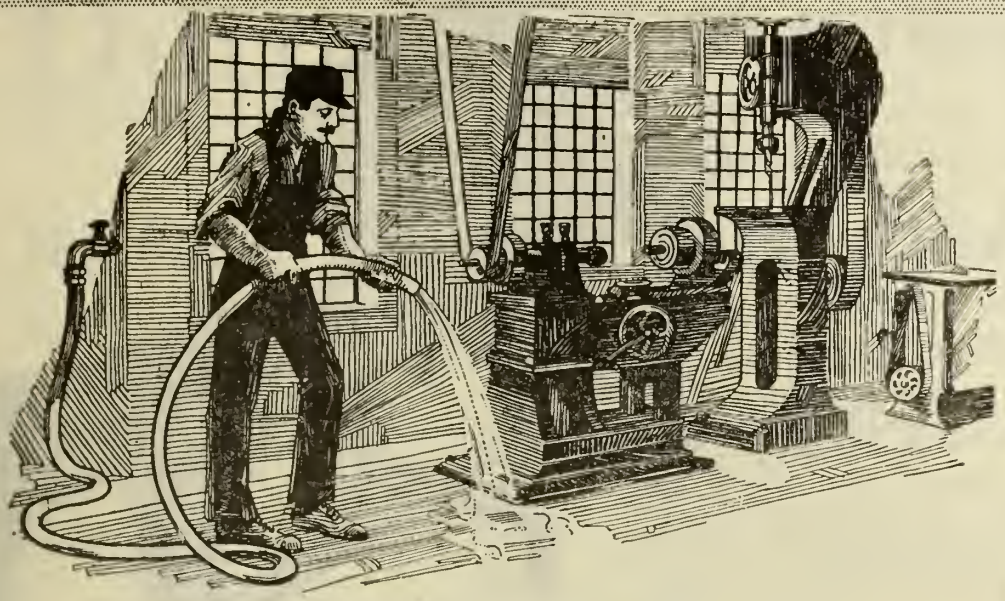

Tradition was Disregarded When Goodyear Built Hose

THE beaten path of established customs has rarely been followed by Goodyear scientists.

Rapidly-changing industrial conditions demanded new and more efficient methods.

Breaking away from preconceived ideas of tire-building created the Goodyear Cord Tire—the finest tire in the world.

Applying the same analytical methods to industry, Goodyear redesigned Industrial Hose—scientifically developed it to meet the needs of present-day industry.

Take Goodyear Water Hose as an example.

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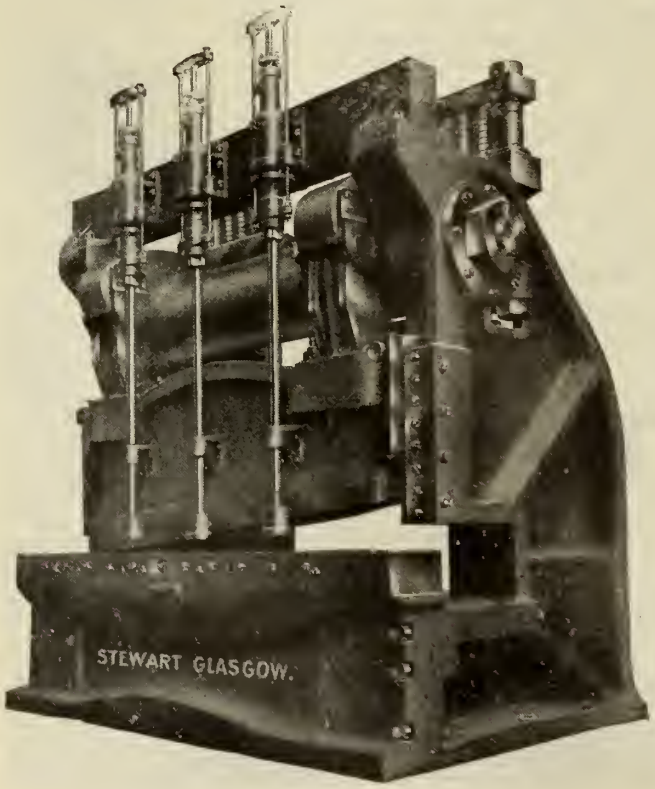

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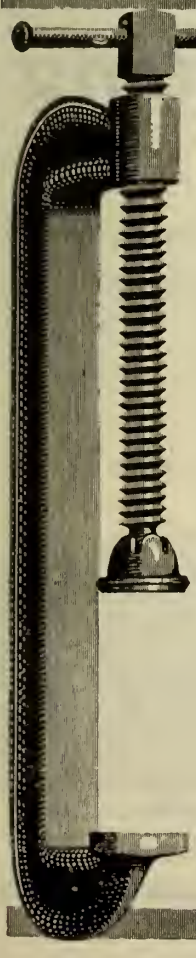

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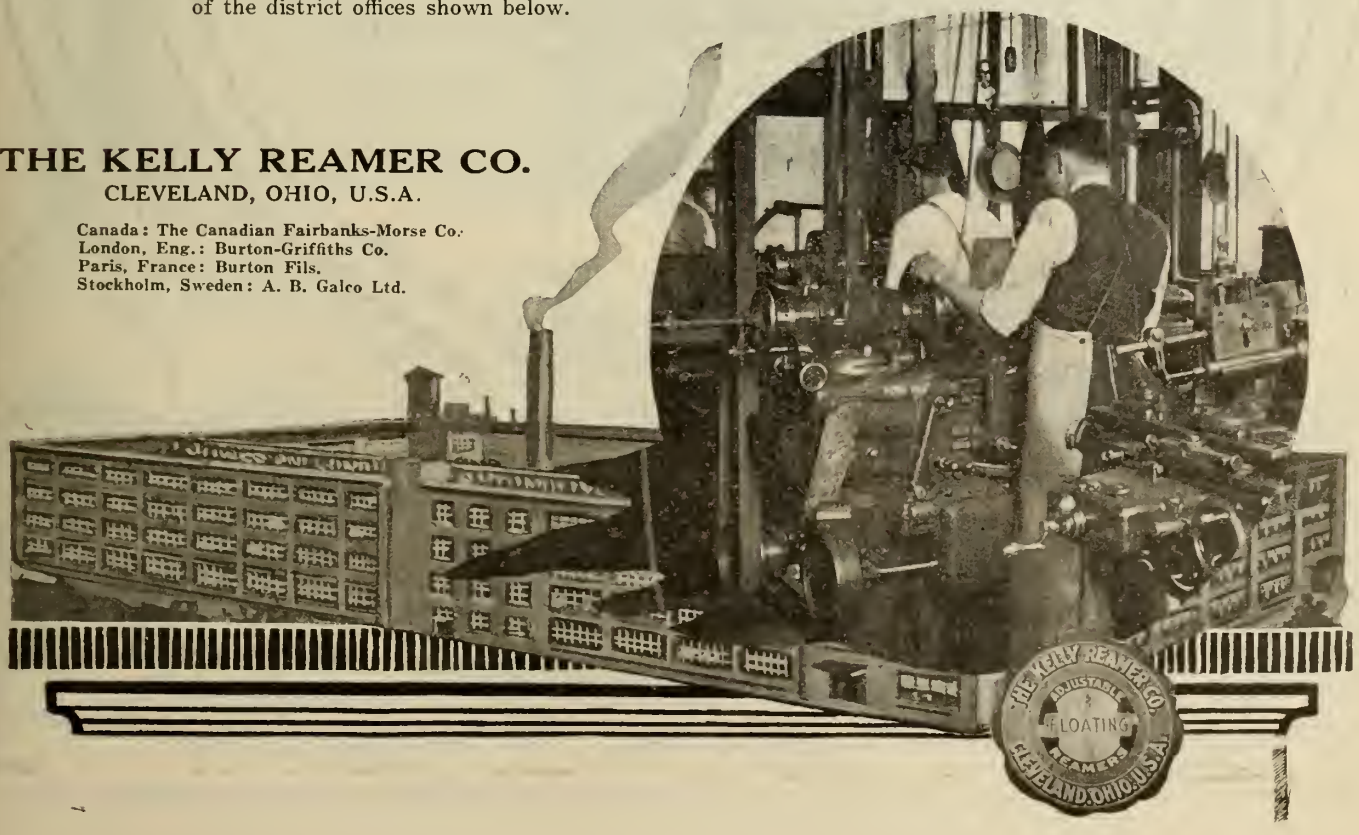

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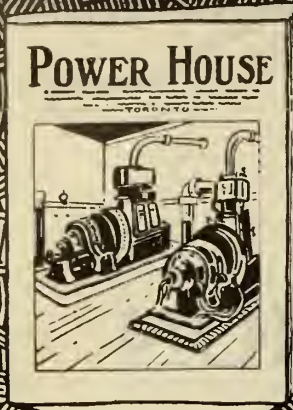

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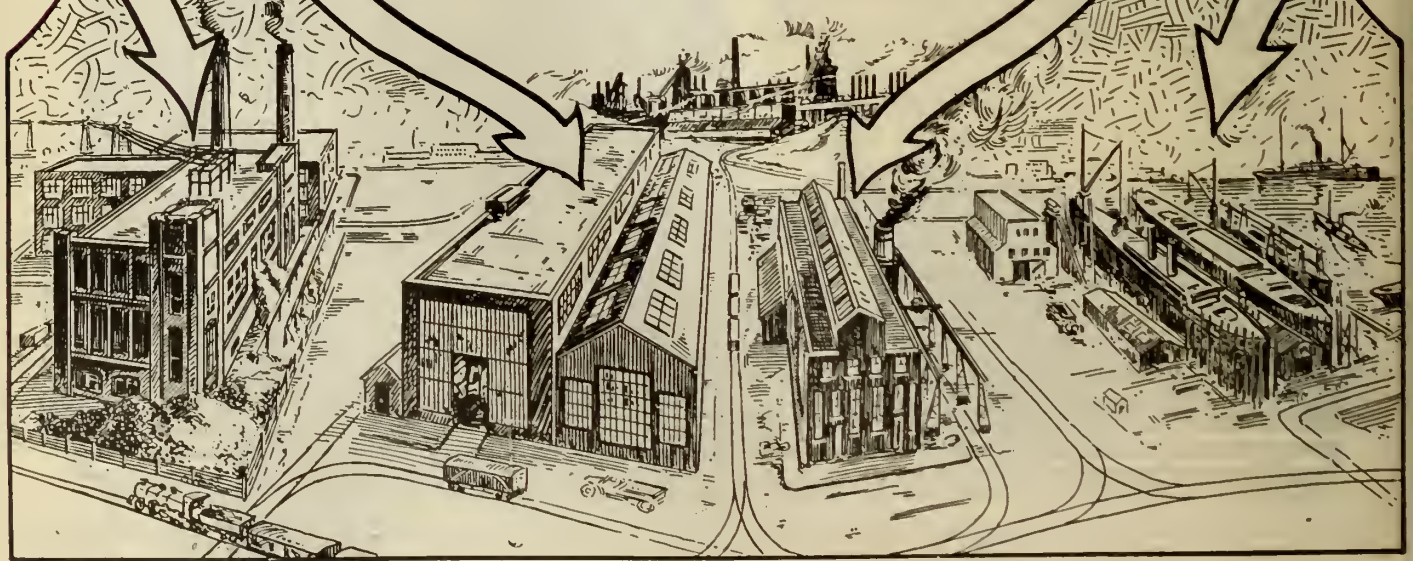

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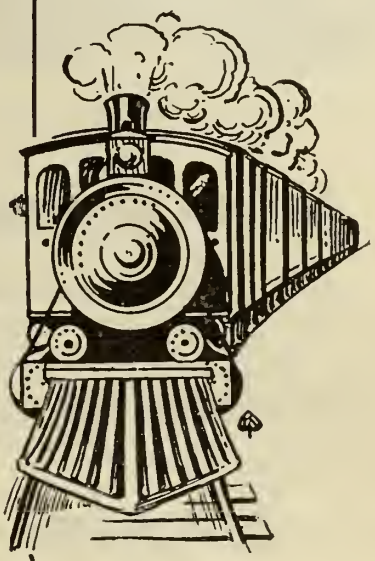

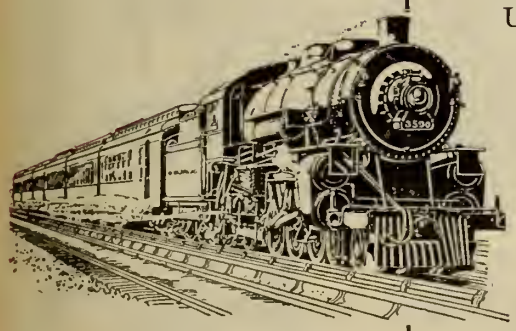

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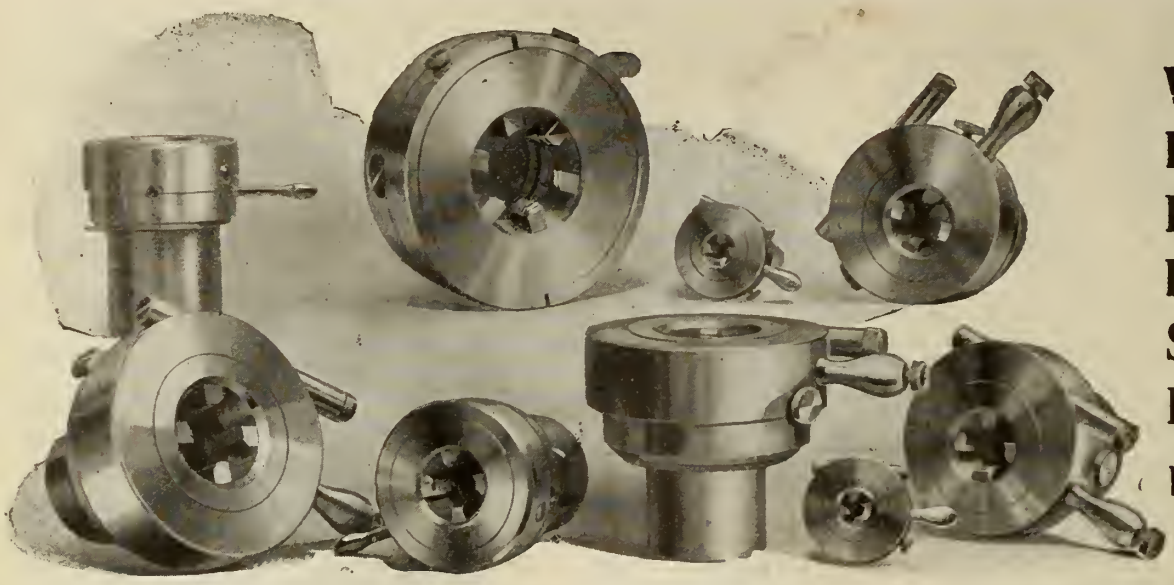

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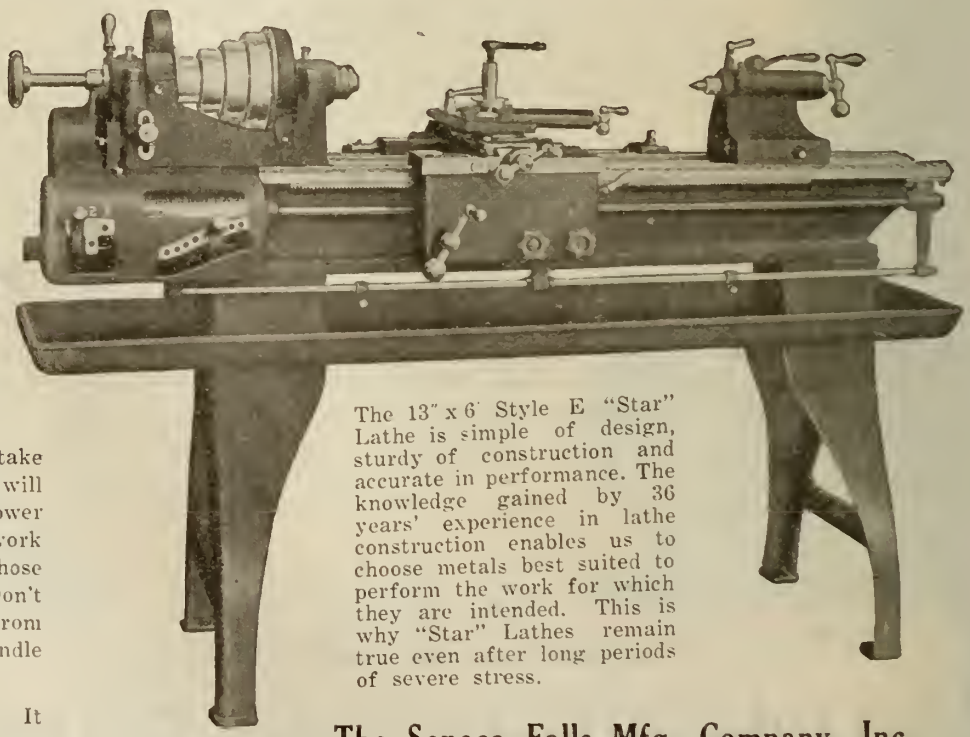

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Binary alloys are classed as solid compounds, but in trinary and quarternary alloys only two of the elements are said to form a compound, as, for instance, in a tin-lead-antimony combination only the tin and antimony form the compound. Other characteristics in this connection will be discussed further on.

We give below the principal ingredients used in babbitt metals, and the approximate melting points, as we shall deal with these figures as we progress, viz:

Tin, 446° Fahrenheit; Lead, 619° Fahrenheit; Antimony, 1166° Fahrenheit; Copper, 1992° Fahrenheit. It is axiomatic that good conditions will favor an inferior metal and adverse conditions militate against a good metal; hence it is not always possible to form an off-hand opinion as to the relative values of babbitts in actual service as careful comparative tests and records are generally necessary to reach a conclusion. In laboratory tests, however, comparative values can be determined quickly and accurately as maximum stresses can be applied and both water and oil lubrication used.

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(Continued next month.)

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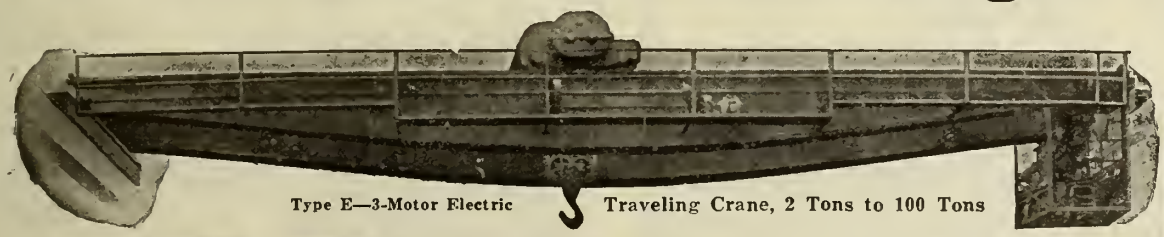

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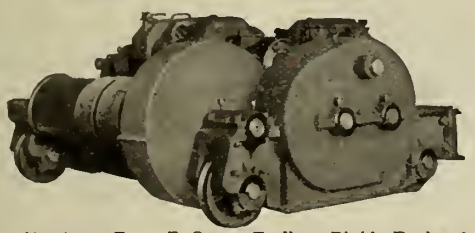

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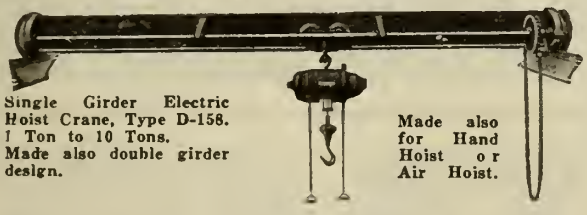

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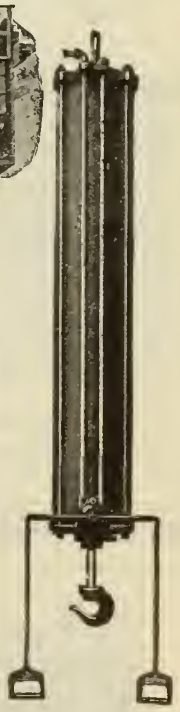

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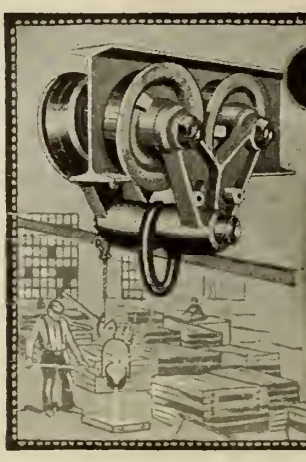

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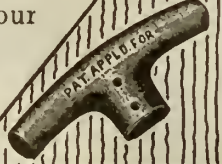

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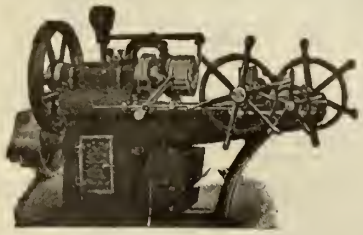

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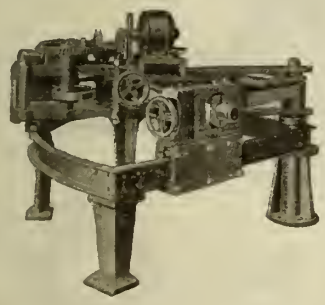

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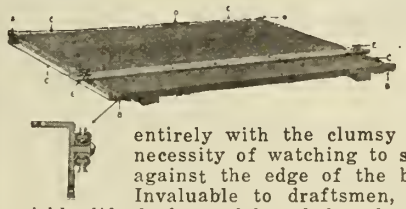

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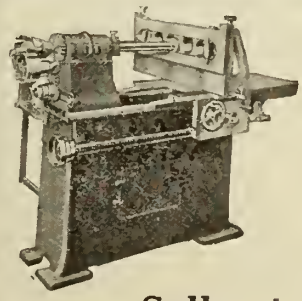

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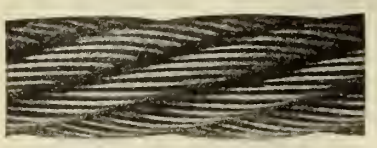

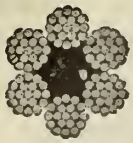

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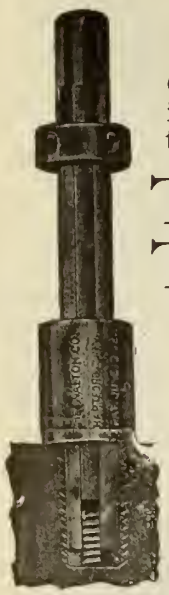

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Foss Mchy. & S'ply Co., Geo. F. Montreal
Garlock-Walker Machinery Co., Toronto.
Petrie, Ltd., H. W., Toronto.

BUCKETS, DUMP
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
St Lawrence Welding Co, Ltd, Montreal

BUCKETS, ELEVATOR
Can. Link-Belt Co., Toronto, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
[illegible]nce Welding Co, Ltd., Montreal

BUCKETS, CLAM SHELL, CRAB, DUMP
Brown Hoisting Machinery Co., Cleveland, Ohio.
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Ltd, Walkerville.

BULLDOZERS
Bertram & Sons Co., John, Dundas.
Canada Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machinery Co., Toronto.
Lourie Manufacturing Co., Springfield, Ill
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

BURNERS, OIL AND NATURAL GAS
Northern Crane Works, Ltd., Walkerville.
W. S. Rockwell Co., New York, N.Y.

BURRS, IRON AND COPPER
Parmenter & Bulloch Co., Gananoque,.

BUSHINGS, BRONZE
Morrow Screw & Nut Co., John, Ingersoll.
St Lawrence Welding Co, Ltd., Montreal

CALIPERS
Brown & Sharpe Mfg. Co., Providence, R.I.
Pangborn Corporation, Hagerstown, Md.

CABINETS, SAND BLAST
Pangborn Corporation, Hagerstown, Md.

CABLE, ELECTRIC
International Machinery & Supply Co., Ltd., Montreal, Que.

CABLES, TRANSMISSION AND TELEPHONES
Northern Electric Co., Ltd., Montreal.

CALKS, BOOT
Lufkin Rule Co., of Can., Windsor, Ont.

CANNERS' MACHINERY
Bliss, E. W. Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Can.

CANNERS' CONVEYORS
Can. Link-Belt Co., Toronto, Ont.

CARBIDE
Carter Welding Co., Ltd., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.
Union Carbide Co., of Canada, Limited, Weland, nt.

CARBONIZING BOXES
Can. Driver-Harris Co., Ltd., Walkerville
Katie Foundry, Galt, Ont.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.
Swedish Crucible Steel Co. Windsor.

CARRIERS, PNEUMATIC TUBE
Jones & Glasco, Montreal.

CARS, INDUSTRIAL
Can. Blower & Forge Co., Kitchener, Ont
Can. Fairbanks-Morse Co., Ltd, Montreal
Elec. Steel & Metals, Welland, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

CAR MOVERS
Holden Co., Ltd., Montreal, Que.

CASES, FILING
Economy Drawing Table Co., Adrian, Mich.

CASTINGS, ALUMINUM, BRASS BRONZE, COPPER, AND GUN METAL
Algoma Steel Corp., Sault Ste. Marie.
Franklin Mfg. Co., Syracuse, N.Y.
Canada Metal Co., Ltd., Toronto, Ont.

CASTINGS, DIE CAST
Canada Metal Co., Ltd., Toronto, Ont.
Franklin Mfg. Co., Syracuse, N.Y.
Fisher Motor Co., Ltd., Orillia, Ont.
Tallman Brass & Metals Ltd., Hamilton, Ont.

CASTINGS, STEEL—ALL KINDS
Canada Electric Castiugs, Ltd., Orillia, Ont.
Dominion Foundries & Steel Ltd., Hamilton, Ont.
Electric Steel & Metals Co., Welland.
Meeta Machine Co., Pittsburgh, Pa.

CASTINGS, ELECTRIC AND ALLOY STEEL
Can. Elec. Castings Co. Ltd., Orillia, Ont
Dominion Foundries & Steel Ltd., Hamilton, Ont.

CARRIERS COUPLING BOLTS
John Morrow Screw & Nut Co., Ingersoll
Alexander Fleet Ltd., Ottawa.
Tallman Brass & Metal Co., Hamilton.

CASTINGS, BENCH LEG.
Brown & Sharpe Mfg. Co., Providence, R.I.

CASTINGS, BRASS AND IRON
Algoma Steel Corp., Sault Ste. Marie.
International Machinery and Supply Co., Ltd., Montreal, Que.

CASTINGS, BUILDING
Katie Foundry, Galt. Ont.

CASTINGS, GRAY IRON
Bernard Industrial Co., A., Fortierville, Q.
Brown & Sharpe Mfg. Co., Providence, R.I.
Brown, Boggs Co., Ltd., Hamilton.
Can. Elec. Castings Co, Ltd., Orillia, Ont
Alexander Fleck, Ltd., Ottawa.
Gardner & Son, Robt., Montreal.
Hull Iron & Steel Foundries, Ltd., Hull
International Malleable Iron Co., Guelph
Kennedy & Sons, Ltd., Wm., Owen Sound.
Katie Foundry, Ltd., Galt, Ont.
Hamilton Co., Wm., Peterboro.
McFarlane Engineering Ltd., G. W., Paris, Ont.

CASTINGS, PLUMBERS'
Katie Foundry, Galt, Ont.

CASTINGS, NICHROME
Can. Driver-Harris Co., Ltd., Walkerville

CASTINGS, HARDWARE
Katie Foundry, Galt, Ont.

CASTINGS, STEEL CHROME AND MANGANESE STEEL
Thos. Davidson Mfg. Co., Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Hull Iron & Steel Foundries, Ltd., Hull.
Kennedy & Sons, Ltd, Owen Sound.

CASTINGS, MALLEABLE
International Malleable Iron Co., Guelph

CASTINGS, NICKEL STEEL
Hull Iron & Steel Foundries, Ltd., Hull.

CEMENT MACHINERY
Can. Fairbanks-Morse Co., Ltd., Montreal.
Gardner, Robt., & Son, Montreal.

CEMENT HANDLING MACHINERY
Can. Link-Belt Co., Toronto, Ont.

CEMENT TOOLS
Atkins & Co., E. C., Hamilton, Ont.

CENTERING MACHINES
Victoria Foundry Co., Ottawa, Ont.

CENTRE REAMERS
Bertram & Sons Co., John, Dundas
Butterfield & Co., Inc., Rock Island, Que.
Gardner, Robt. & Son, Montreal.
Hurlburt, Rogers Mch. Co., South Sudbury, Mass.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co., of Canada, Galt, Ont.

CHAIN, WELDED COIL
Morris Crane & Hoist Co., Herbert, Niagara Falls. Ont.

CHAIN BLOCKS
Aikenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Ford Chain Block & Mfg. Co., Phila., Pa.
Garlock-Walker Machy. Co., Toronto.
Lyman Tube & Supply Co., Montreal, Que.
Morris Crane & HoistCo., Herbert, Niagara Falls, Ont.
Oliver Engineering Co., Montreal.
Rice Lewis & Son, Toronto, Ont.
Jones & Glasco, Montreal, Que.

CHAINS, AGRICULTURAL
Canadian Link-Belt Co., Ltd., Toronto, Ont.
Morse Chain Co., Ithaca, New York.

CHAINS, AUTOMOBILE ENGINE
Can. Link-Belt Co., Ltd., Toronto, Ont.
Morse Chain Co., Ithaca, New York.

CHAINS, BICYCLE, DRIVE AND BLOCK
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.

CHAINS, FOR ELEVATORS AND CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

CHAIN, MALLEABLE, DETACHABLE AND RIVETED
Can. Link-Belt Co., Toronto, Ont.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

CHAINS, POWER TRANSMISSION
Canadian Link-Belt Co., Ltd., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, New York.
Glasgow, N.S.

CHAINS, SPROCKET WHEEL
Can. Link-Belt Co., Ltd., Toronto, Ont.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.

CHAIN DRIVES
Can. Link-Belt Co., Toronto, Ont.
Coventry Chain Co., Coventry, England.
Jones & Glasco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.

CHASERS
National Acme Co., Cleveland, Ohio.
Taylor, J. A. M., 318 Stair Bldg., Toronto, Ont.

CHEMISTS
Toronto Testing Lab'tory, Ltd., Toronto

CHUCKS, AERO, AUTOMATIC
Garvin Machine Co., New York.

CHUCKS, CENTERING
Hoggson & Pettis Mfg. Co., New Haven, Conn.

CHUCKS, COLLET, AIR
Elliott & Whitehall Mach. & Tool Co. Galt, Ont.
Smalley-General Co., Inc., Bay City, Mich.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

CHUCKS, DRILL, LATHE AND UNIVERSAL
Aikenhead Hardware Co., Toronto, Ont.
Bertram & Sons Co., John, Dundas.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Ltd., Brantford.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Mach'y Co., Toronto.
Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Chicago, Ill.
Jacobs Mfg. Co., Hartford, Conn.
Ker & Goodwin Machine Co., Ltd.,
Knight Metal Products, Toronto.
Modern Tool Co., Erie, Pa.
Rice Lewis & Son, Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

CHUCKS, DRILL, AUTOMATIC AND KEYLESS
Aikenhead Hardware Co., Toronto, Ont
Can. Blower & Forge Co., Kitchener.
McCrosky Tool Corp., Meadville, Pa., U. S. A.

CHUCKS, FRICTION AND TAP
Victor Tool Co., Waynesboro, Pa.

CHUCKS, MAGNETIC
Heald Machine Co., Worcester, Mass.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co, Ltd., A. R., Montreal

CHUCKS, RING WHEEL
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.

CHUCKS, WHEEL, CAR
Hoggson & Pettis Mfg. Co., New Haven Conn.

CHUCKING MACHINES
Barber Mchy. Co., Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Garvin Machine Co., New York.
Gisholt Machine Co., Madison, Wis.
National Acme Co., Windsor, Vt.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto.
Warner & Swasey Co., Cleveland, O.
Wood Turret Mach. Co., Brazil, Ind.
Williams Mchy Co., A. R., Toronto, Ont.

CIRCULATING SYSTEMS FOR LUBRICATING OIL
Bowser Co., Ltd., S. F., Toronto, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

CLAY FIRE
Elk Fire Brick Co., Can., Ltd., Hamilton, Ont.

CLEANERS, METER, WASTE, GENERAL
Oakley Chemical Co., New York, N.Y.

CLEANING COMPOUND
Oakley Chemical Co., New York.

CLOCK SPRINGS
The Dunbar Brothers Co., Bristol, Conn

CLOCKS, WATCHMAN, PORTABLE
Gisholt Machine Co. Madison, Wis.

CLOSETS
Crane, Ltd., Montreal, Que.

CLUTCHES, CHAIN
Wright Mfg. Co., Lisbon, Ohio.

CLUTCHES, FRICTION AND PULLEY
Bernard Industrial Co., A., Fortierville, Q
Can. Link-Belt Co., Toronto, Ont.
Carlyle Johnson Mach. Co., Manchester, Conn.
Positive Clutch & Pulley Wks., Aurora Ont.
Jones & Glasco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que

COAL CRUSHERS
Canadian Link-Belt Co., Ltd., Toronto, Ont.
Canadian Mead-Morrison Co., Limited, Montreal, Que.

COAL HANDLING MACHINERY
Brown Hoisting Machinery Co., Cleveland, Ohio.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Can. Link-Belt Co., Toronto, Ont.
Canadian Mead-Morrison Co., Limited Montreal, Que.
Dominion Bridge Co., Montreal, Que.
MacGovern & Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Nova Scotia Steel & Coal Co., New

COLD ROLLED STRIP, ALL METAL
COLLARS, SHAFTING
Can. Driver-Harris Co., Ltd., Walkerville
Williams & Co., J. H., Brooklyn, N.Y

COLLECTORS, PNEUMATIC
Can. Blower & Forge Co., Kitchener
Sturtevant Co., B. F., Galt, Ont.

COLLETS
Becker Milling Machine Co., Boston

COMPOSITION INGOT
Canada Metal Co., Toronto, Ont.

COMPOUNDS, CUTTING AND GRINDING, DRAWING, STAMPING
Oakley Chemical Co., New York N.Y.

COMPRESSORS, AIR
Atkins & Co., E. C., Hamilton, Ont.
Can. Ingersoll-Rand Co., Sherbrooke.
Cleveland Pneumatic Tool Co., Toronto.
Curtis Pneumatic Machy. Co., St. Louis
Elliott & Whitehall, Galt, Ont.
Garlock-Walker Machy. Co., Toronto.
Holden Co., Ltd., Montreal, Que.
MacGovern & Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto.

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Superior Machinery Co., London, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

CONDENSERS
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
MacGovern & Co., Montreal, Que.
Smalley-General Co., Inc., Bay City, Mich.

CONDUITS
Northern Electric Co., Ltd., Montreal Que

CONNECTING RODS
Canada Found'a & Forgings, Ltd., Welland, Ont.

CONNECTING ROD CUTTERS INTERCHANGEABLE
Eclipse Counterbore Co., Ltd., Walkerville, Ont.

CONTRACTORS' HOISTS
Canadian Mead-Morrison Co., Limited, Montreal, Que.

CONTRACT WORK
Brown Engineering Corp., Toronto.
Ford-Smith Machine Co., Hamilton, Ont.
Globe Engineering Co., Hamilton, Ont.
Homer & Wilson, Hamilton, Ont.
Katie Foundry, Ltd., Galt, Ont.
Victoria Foundry Co., Ottawa.

CONTROLLERS, MAGNETIC BRAKES, ELEC. WINCHES, MONO RAIL HOISTS
Volta Mfg. Co., Welland, Ont.

CONTROLLERS AND STARTERS
Williams Mach'y Co., A. R., Toronto.

CONTROLLING INSTRUMENTS
Taylor Instrument Co., Rochester, N.Y.

CONVERTERS, ROTARY
MacGovern & Co., Montreal, Que.
Can. Link-Belt Co., Toronto, Ont.
Jones & Glasco, Montreal.

CONVEYORS—McCASLIN GRAVITY BUCKET
Canadian Mead-Morrison Co., Limited, Montreal, Que.

COOLERS, WITH DRINKING FOUNTAINS
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

COPING MACHINES
Bertram & Sons Co., John, Dundas, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machinery Co., Toronto.
Niles-Bement-Pond Co., New York.
Can. Blower & Forge Co., Kitchener.

COPPER, BUS BAR, SHEET, PATES, RODS
British Smelting & Refining Co., Ltd., Montreal, Que.
Brown's Copper and Brass Rolling Mills, New Toronto.
Brown's Copper and Brass Rolling Mills, New Toronto.

CORE OIL
Swan & Finch, Inc., 165 Broadway.

COUNTERBORES AND COUNTERSINKS
Aikenhead Hardware Co., Toronto, Ont.
Cleveland Twist Drill Co., Cleveland
Eclipse Counterbore Co., Ltd., Walkerville.
Morse Twist Drill & Mach. Co., New Bedford Mass.
McCrosky Tool Corp., Meadville, Pa., U. S. A.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.

COUNTERSINKS, INTERCHANGEABLE
Eclipse Counterbore Co., Ltd., Walkerville, Ont.

COUNTERBORES, INVERTED, INTERCHANGEABLE
Eclipse Counterbore Co., Ltd., Walkerville, Ont.

COUNTERSHAFTS
Almond Mfg. Co., Ashburnham, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Gray Ball Bearing Co., Ltd., Toronto.
Baird Machine Co., Bridgeport, Conn.
Ford-Smith Machine Co., Hamilton, Ont.
Foster Machine Co., Elkhart, Ind.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co, Ltd., A. R., Montreal
Williams Mchy Co., A. R., Toronto, Ont.

COUPLINGS, FRICTION
Bernard Industrial Co., The A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

COUPLINGS, RAPID HOSE
Int. Machinery & Supply Co., Ltd., Montreal, Que.

COILING MACHINERY, WIRE AND SPRING
Garlock-Walker Machinery Co., Toronto.

COKE AND COAL
Hanna & Co., M. A., Cleveland O.

COUPLINGS, PLAIN, FLEXIBLE AND CUT OFF
Cleveland Pneumatic Tool Co., of Canada, Toronto.

CRANES, OVERHEAD, HAND AND
Gardner, Robt. & Son, Montreal.
Independent Pneumatic Tool Co., Chicago

CRANES, LOCOMOTIVE
Can. Link-Belt Co., Toronto, Ont.
Northern Crane Works, Walkerville

ELECTRIC
Volta Manufacturing Co., Welland, Ont.

CUPS, OIL
Can. Winkley Co., Ltd., Windsor, Ont.

COVERS, OIL HOLE
Can. Winkley Co., Ltd., Windsor, Ont.

CRANES, GANTRY
Brown Hoisting Machinery Co., Cleveland, Ohio.

Can. Link-Belt Co., Toronto, Ont.
Canadian Mead-Morrison Co., Limited, Montreal, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.

CRANE RUNWAYS
MacKinnon Steel Co., Sherbrooke, Que.

CRANES, JIB
Brown Hoisting Machinery Co., Cleveland, Ohio.

CRANES, LOCOMOTIVE
Brown Hoisting Machinery Co., Cleveland, Ohio.
Holden Co., Ltd., Montreal, Que.

CRANES, GOLIATH, PNEUMATIC AND PORTABLE
Brown Hoisting Machinery Co., Cleveland, Ohio.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Morris Crane and Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Petrie, Ltd., H. W., Toronto.

CRANES, PILLAR
Brown Hoisting Machinery Co., Cleveland, Ohio.

CRANES, TRAVELLING, ELECTRIC AND HAND POWER
Brown Hoisting Machinery Co., Cleveland, Ohio.
Can. Link-Belt Co., Toronto, Ont.
Curtis Pneumatic Machy. Co., St. Louis.
Dominion Bridge Co., Montreal.
Hepburn, John T., Ltd., Toronto.
Lyman Tube & Supply Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Niles-Bement-Pond Co., New York.
Northern Crane Works, Walkerville.
Oliver Engineering Co., Montreal.

CRANK SHAFTS
Canada Found's & Forgings Ltd., Welland
Williams & Co., J. H., Brooklyn, N.Y.

CRANES, PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Brown Hoisting Machinery Co., Cleveland, Ohio.
Can. Link-Belt Co., Toronto.
Lyman Tube & Supply Co., Montreal, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Rice Lewis & Son, Toronto, Ont.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

CRIMPS, LEATHER
Graton & Knight Mfg. Co., Worcester, Mass.

CRUSHERS
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Elec. Steel & Metals, Welland, Ont.

CUPOLAS
Can. Blower & Forge Co., Kitchener.
Northern Crane Works, Walkerville.

CURB PUMPS FOR OIL, GASOLINE
Bowser Co., Ltd., S. F., Toronto, Ont.

CURRENT TRANSFORMERS
Volta Manufacturing Co., Welland, Ont.

CUT-OFF COUPLINGS, FRICTION
Petrie, Ltd., H. W., Toronto.

CUTTERS, BOLT
See Bolt Cutters.

CUTTERS, GEARS
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Fellows Gear Shaper Co., Springfield, Vt.

CUTTERS, FLUE
Cleveland Pneumatic Tool Co., Toronto.

CUTTER HEADS
Oliver Machinery Co. Grand Rapids, Mich

CUTTERS, PIPE (See Pipe Cutters)

CUTTERS, MILLING
Becker Milling Mach. Co., Boston, Mass.
Butterfield & Co., Rock Island, Que.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Cleveland Twist Drill Co., Cleveland.
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garvin Machine Co., New York.
Illinois Tool Works, Chicago, Ill.
Ingersoll Mache. Co., Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Toronto, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Whitney Mfg. Co., Hartford, Conn.
Wilt Twist Drill Co., Walkerville, Ont.

CUTTER RELIEVING MACHINES
Cleveland Milling Machine Co., Cleveland.

CUTTING-OFF MACHINES
Armstrong Bros., Tool Co., Chicago.
Atkins & Co., E. C., Hamilton, Ont.
Bertram & Sons Co., John, Dundas.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Foss Mchy & S'ply Co., Geo. F., Montreal
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hacker, t. Rogers Machy. Co., South Sudbury, Mass.
Hall & Sons, John H., Brantford, Ont.
Kennedy & Sons, Wm., Owen Sound.
Lyman Tube & Supply Co., Montreal, Que.
Niles-Bement-Pond Co., New York, N.Y.
Prest-O-Lite Co., Inc., Toronto, Ont.
Petrie, Ltd., H. W., Toronto.
Tabor Mfg. Co., Philadelphia, Pa.
Wells Bros. of Can., Galt, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

CUTTING COMPOUND AND CUTTING OIL
Cataract Refining Co., Ltd., Toronto.
Swan & Finch, Inc., New York.

CUTTING OIL, RECLAIMING SYSTEM
Bowser Co., Ltd., S. F., Toronto, Ont.

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Davis-Bournonville Co., Jersey City, N.J.
Prest-O-Lite Co., Inc., Toronto, Ont.
Welding & Supplies Co., Montreal, Que.

CYANIDE AND LEAD BATH POTS
Swedish Crucible Steel Co., Windsor.

CYLINDERS, AIR
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Ford-Smith Machine Co., Hamilton, Ont.
Smalley General Co., Inc., Bay City, Mich

CYLINDERS, AUTOMATIC REBORING JIGS AND REAMERS
Kelley Reamer Co., Cleveland, O.

DEHUMIDIFYING
B. F. Sturtevant Co, Galt, Ont.

DERRICKS
Aikenhead Hardware Co., Toronto, Ont.
Dominion Bridge Co., Montreal.
Hepburn Co., Ltd., J. T., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

DERRICK HOISTS
Canadian Mead-Morrison Co., Limited, Montreal, Que.

DIAMOND (BORTZ)
Furniss, Clarke & Co., Montreal, Que.

DIAMOND TOOLS
Can. Desmond-Stephan Mfg. Co., Hamilton
Ford-Smith Machine Co., Hamilton, Ont.
Furniss, Clarke & Co., Montreal, Que.
Joyce-Koebel Co., Inc., New York City.
Wheel Trueing Tool Co., Detroit.
Petrie, Ltd., H. W., Toronto.

DIAMONDS, CARBON AND BORTZ
Joyce Koebel Co., Inc., New York, N.Y.
Wheel Trueing Tool Co., Detroit.

DIAMONDS, BLACK AND ROUGH
Joyce, Koebel & Co., Inc., New York.
Wheel Trueing Tool Co., Windsor, Ont.

DIE CASTINGS
Fisher Motor Co., Ltd., Orillia, Ont.
Tallman Brass & Metals Ltd., Hamilton, Ont.

DIE HEADS, AUTOMATIC
Greenfield Tap & Die Corp., Greenfield Mass.
Wells Bros. of Can., Galt, Ont.
Petrie, Ltd., H. W., Toronto.

DIES, BRASS PRINTING, EMBOSSING AND LETTERING
Matthews, Jas. H., & Co., Pittsburgh, Pa

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Butterfield & Co., Rock Island, Que.
Crescent Mche. Co., Ltd., Montreal, P.Q.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Wells Brothers Co., of Canada, Galt.

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Ackworthie Ltd., J., Birmingham, Eng.
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Rock Island, Que.
Brown, Boggs Co., Hamilton, Ont.
Crescent Mche. Co., Ltd., Montreal, P.Q.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardner, Robt. & Son, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Jones & Lamson, Springfield, Vt.
Landis Machine Co., Waynesboro, Pa.
Marshall, Son & Bunney, Toronto.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Acme Co., Cleveland, Ohio.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Rickert-Shafer Co., Erie, Pa.
Stoll Co., Inc., D. H., Buffalo, N.Y.
Wells Brothers of Canada, Galt, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

DIES, HAMMERED
Kimber & Hillier Mfg., Co., St. Catharines, Ont.

DIES, DROP FORGE.
Kimber & Hillier Mfg., Co., St. Catharines, Ont.

DIES, METAL STAMPING
Ackworthie Ltd., J., Birmingham, Eng.
Crescent Mche. Co., Ltd., Montreal, P.Q.
Elliott & Whitehall, Galt, Ont.

DIES, PIPE THREADING
Ackworthie Ltd., J., Birmingham, Eng.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Crescent Mche. Co., Ltd., Montreal, P.Q.
Landis Machine Co., Waynesboro, Pa.

DIES, THREADING
Ackworthie Ltd., J., Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Crescent Machine Co., Ltd., Montreal.
Greenfield Tap & Die Corp., Greenfield Mass.
Wells Bros. of Can., Galt, Ont.

DIE SINKERS
Ackworthie Ltd., J., Birmingham, Eng.
Becker Milling Machine Co., Boston
Garvin Machine Co., New York.
Kimber & Hillier Mfg., Co., St. Catharines, Ont.
Pratt & Whitney Co., Dundas, Ont.
Walcott Lathe Co., Jackson, Mich

DIES FOR MACHINES
Ackworthie Ltd., J., Birmingham, Eng.
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Rock Island, Que.
Firth & Sons, Thos., Montreal, Que.
Landis Machine Co., Waynesboro, Pa.
Wells Brothers Co. of Canada, Galt.

DIE HEADS
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Canada, Galt, Ont.

DIES, SELF-OPENING
Geometric Tool Co., New Haven.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Wells Brothers Co. of Can., Galt, Ont.
Petrie, Ltd., H. W., Toronto.

DIE FILING MACHINES
Oliver Mach. Co., Grand Rapids, Mich.

DIE STEEL, HOT AND COLD WORK
Armstrong-Whitworth of Can., Montreal.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall, Son & Bunney, Toronto.
Firth & Sons, Thos., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.

DIES FOR SCREW PLATES
Ackworthie Ltd., J., Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Wells Bros. Co. of Can., Galt, Ont.

DIES, SHEET METAL WORKING
Ackworthie Ltd., J., Birmingham, Eng.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada
Globe Engineering Co., Hamilton, Ont.
Stoll Co., D. H., Buffalo, N.Y.

DIES, SCREW AND THREAD
Ackworthie Ltd., J., Birmingham, Eng.
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
National-Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros., Co. of Can., Galt, Ont

DISCS, LEATHER, STEEL
Graton & Knight Mfg. Co., Worcester, Mass.
Swedish Steel & Importing Co., Montreal

DIRECT CONNECTED UNITS
MacGovern & Co., Montreal, Que.

DRAFT, MECHANICAL
Butterfield & Co., Rock Island, Que.
Can. Blower & Forge Co., Kitchener.
A. B. Jardine & Co., Hespeler, Ont.
Pratt & Whitney Co., Dundas, Ont.
Sturtevant Co., B. F., Galt, Ont.

DRAINAGE FITTINGS
Crane, Ltd., Montreal, Que.

DRAWING INSTRUMENTS
Hughes, Owens Co., Ltd., Montreal, Que.

DRAWING OFFICE SUPPLIES
Hughes, Owens Co., Ltd., Montreal, Que.

DRESSERS, GRINDING AND EMERY WHEEL
Atkins & Co., E. C., Hamilton, Ont.
Can. Desmond-Stephan Mfg. Co., Hamilton
Dominion Abrasive Co., Ltd., Mimico, Ont
Petrie, Ltd., H. W., Toronto.
Wheel Trueing Tool Co., Windsor, Ont

DRILL PRESSES
Aurora Tool Works, Aurora, Ind.
Barber Mchy. Co., Ltd., Toronto, Ont
W. F. & John Barnes Co., Rockford.
Can. Blower & Forge Co., Kitchener.
Canada Machinery Corp., Galt, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal
Garlock-Walker Machinery Co., Toronto
Garvin Machine Co., New York.
A. B. Jardine & Co., Ltd., Hespeler, Ont
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
U. S. Mach. Tool Co., Cincinnati, Ohio.
A. R. Williams Machinery Co., Toronto

DRILL RODS
Atkins & Co., Ltd., Wm., Sheffield, Eng
Kayser-Ellison & Co., Ltd., Montreal.
Lincoln Electric Co. of Canada, Ltd Toronto, Ont
Marshall, Son & Bunney, Toronto.
Swedish Steel & Importing Co., Ltd Montreal.

DRILLING MACHINES, GANG
Barnes, W. F. & John, Co., Rockford, Ill
Barber Mchy. Co., Ltd., Toronto, Ont
Bilton Mach. Tool Co., Bridgeport, Conn
Canada Machinery Corp., Galt, Ont.
Petrie, Ltd., H. W., Toronto.
Silver Mfg. Co., Salem, Ohio.

DRILLING MACHINES, LOCOMOTIVE AND MULTIPLE SPINDLE
Barber Mchy. Co., Ltd., Toronto, Ont
John Bertram & Sons Co., Dundas.
Bilton Mach. Tool Co., Bridgeport, Conn
Can. Blower & Forge Co., Kitchener, Ont
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal
Foss Mchy. & S'ply Co., G. F., Montreal
Garlock-Walker Mach. Co., Toronto.
Garvin Machine Co., New York.
Hoefer Mfg. Co., Freeport, Ill.
Henry & Wright Mfg. Co., Hartford, Conn
A. B. Jardine & Co., Hespeler, Ont.
Landis Tool Co., Waynesboro, Pa.
Nat. Automatic Tool Co., Richmond, Ind
Niles-Bement-Pond Co., New York.
Rockford Drilling Mach Co., Rockford Ill

DRILLING MACHINES, RADIAL AND TURRET
Barber Mchy. Co., Ltd., Toronto, Ont.
John Bertram & Sons Co., Dundas.
Canadian Fairbanks-Morse Co., Montreal
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto
Henry & Wright Mfg. Co., Hartford,
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Williams Mchy Co., A. R., Toronto, Ont.

Oliver Machinery Company

GRAND RAPIDS, MICHIGAN, U.S.A.

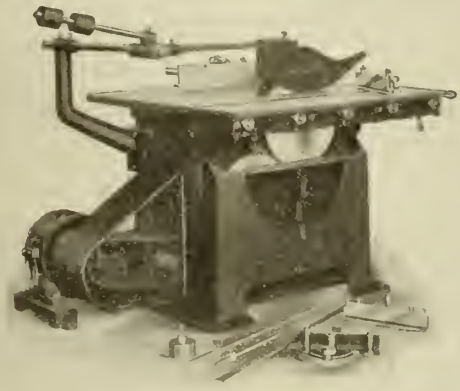
MANUFACTURERS OF PATTERN MAKING MACHINES

Liebers Code Used

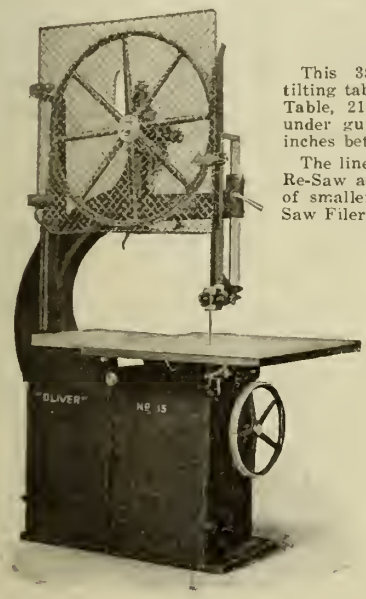
Cable Address "Trimmer"

This Saw Bench has rolling table, tilting table, 41x44 inches. Double Arbor for saws, Universal bevel ripping gauge, mitre cut-off gauges.

The "Oliver" line includes two Arbor Saw Bench, variety Saw Benches, Hand Feed Rip Saws, Swing cut-off Saws, Saw Sharpeners, etc., etc.



"Oliver" No. 60—Universal Saw Bench
This machine carries one 16-inch Rip Saw and one 16-inch Cut-off Saw.

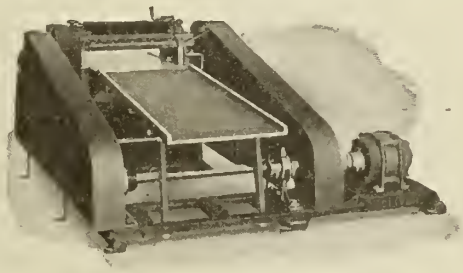


This 38-inch Band Saw has a tilting table, 36x40 inches; Auxiliary Table, 21x22 inches; height of cut under guide, 18 inches; Swings 38 inches between saw and column.

The line also includes Combination Re-Saw and Scroll Saw, Band Saws of smaller sizes, Scroll Saws, Band Saw Filers, Band Saw Setters, etc.

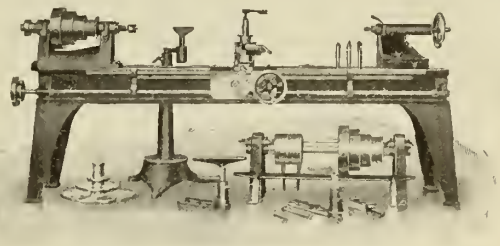
"Oliver" No. 15—38-inch Band Saw
Note Guards Over Wheels.

"Oliver" Surfacers or Thicknessing Planers are built in 20, 24, 30 and 36-inch sizes. "Oliver" Hand Planers and Joinetrs are built in 6, 9, 12, 16, 20, 24 and 30-inch sizes.



"Oliver" No. 99—Motor Driven
Double Belted Single Surfacer, 24-inch. Note the Belt Guards the Rear Table. Motor and Countershaft are Mounted on Sliding Sub-base.

The "Oliver" line of Pattern Lathes is most complete. They swing any diameter work over pit; 104, 96 and 92-inch in the Combination Lathes; 88-inch Face Lathes; 60 and 48-inch Gap Lathes; Lathes similar to the one illustrated in 42, 36, 32, 30, 24, 20, 16 and 12-inch sizes. Many types of Motor Drives are illustrated in our General Catalog.

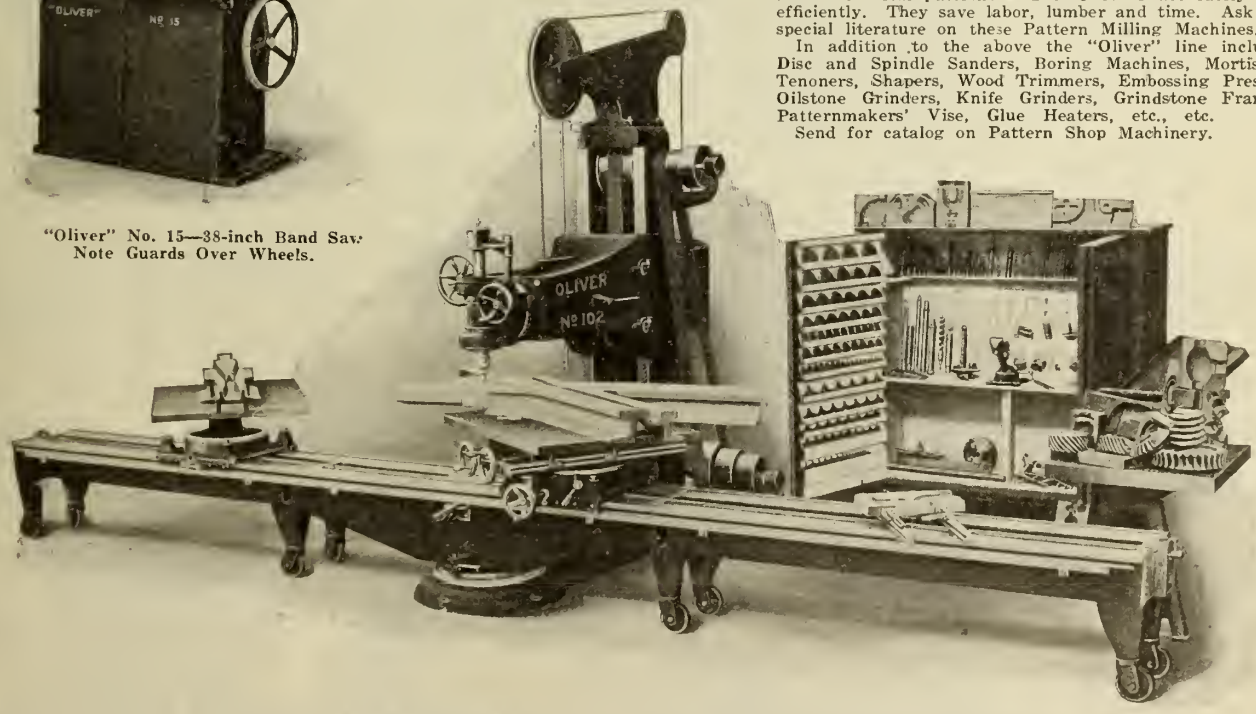


"Oliver" No. 24—Wood Lathe—Belt Drive.

The "Oliver" Pattern Milling Machines are built in two sizes and are wonderful machines for making wood and soft metal patterns and core boxes accurately and efficiently. They save labor, lumber and time. Ask for special literature on these Pattern Milling Machines.

In addition to the above the "Oliver" line includes Disc and Spindle Sanders, Boring Machines, Mortisers, Tenoners, Shapers, Wood Trimmers, Embossing Presses, Oilstone Grinders, Knife Grinders, Grindstone Frames, Patternmakers' Vise, Glue Heaters, etc., etc.

Send for catalog on Pattern Shop Machinery.



"Oliver" No. 102-A—Universal Pattern Milling Machine and Extra Cutters for Same.

If interested tear out this page and place with letters to be answered

DRILLING MACHINES, SENSITIVE
Barber Mchy. Co., Ltd., Toronto, Ont.
Bilton Mach. Tool Co., Bridgeport, Conn.
W. F. & John Barnes Co., Rockford, Ill.
Canadian Fairbanks-Morse Co., Montreal.
Canadian Machinery Corp., Galt, Ont.
Geo. F. Foss Mch. & S'ply Co., Montreal
Garlock-Walker Mach. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
United States Mach. Tool Co., Cincinnati
Williams Mchy Co., A. R., Toronto, Ont.

DRILLING MACHINES, UPRIGHT AND HORIZONTAL
Barber Mchy. Co., Ltd., Toronto, Ont
Aurora Tool Works, Aurora, Ind.
John Bertram & Sons Co., Dundas.
Garlock-Walker Mach. Co., Toronto, Ont
Can. Blower & Forge Co., Kitchener.
Canada Mach. Corp., Galt, Ont.
Gauvin Machine Co., New York.
Ford-Smith Machine Co., Hamilton, Ont
Garlock-Walker Mach. Co., Toronto, Ont
Hoefer Mfg. Co., Freeport, Ill.
A. B. Jardine & Co., Hespeler, Ont.
Knight Metal Products, Toronto.
Landis Tool Co., Waynesboro, Pa.
R. McDougall Co., Galt.
Nat. Automatic Tool Co., Richmond, Ind.
Rockford Drilling Mach. Co., Rockford, Ill
Niles-Bement-Pond Co., New York.
Silver Mfg. Co., Salem, Ohio.
A. R. Williams Machinery Co., Toronto

DRILLING MACHINES, SPECIAL
Hoefer Mfg. Co., Freeport, Ill.

DRILLING POSTS
Aikenhead Hardware Co., Toronto, Ont.
Keystone Mfg. Co., Buffalo, N.Y.
Rice Lewis & Son, Toronto, Ont.
Silver Mfg. Co., Salem, Ohio.

DRILLS, BENCH
Aikenhead Hardware Co., Toronto.
W. F. & John Barnes Co., Rockford, Ill
Can. Blower & Forge Co., Kitchener.
Can. Fairbanks-Morse Co., Montreal.
Geo. F. Foss Mch. & S'ply Co., Montreal
Garlock-Walker Machinery Co., Toronto.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
U.S. Electrical Tool Co., Cincinnati, O.

DRILLS, BLACKSMITH AND BIT STOCK
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Inc., Rock Island, Que.
Can. Blower & Forge Co., Kitchener.
Cleveland Twist Drill Co., Cleveland.
Geo. F. Foss Mch. & S'ply Co., Montreal
A. B. Jardine & Co., Hespeler, Ont.
Morrow Screw & Nut Co., John, Ingersoll
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.
Wilkinson & Kompass, Hamilton, Ont.
Wilt Twist Drill Co. of Can., Walkerville

DRILLS, CENTRE
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
Morrow Screw & Nut Co., John, Ingersoll
Morse Twist Drill & Machine Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto.
Rice Lewis & Son, Toronto, Ont.
Wilt Twist Drill Co., of Can., Walkerville

DRILLS CORE, INTERCHANGEABLE
Eclipse Counterbore Co., Ltd., Walkerville, Ont.

DRILLS, CARBON
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Marshall, Son & Bunney, Toronto.
John Morrow Screw & Nut Co., Ingersoll

DRILLS, ELECTRIC, CORNER
Holden Co., Ltd., Montreal, Que.

DRILLS, ELECTRIC, PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener.
Cincinnati Electrical Tool Co., Cincinnati
Geo. F. Foss Mch. & S'ply Co., Montreal
Hanking Co., R. C., Chicago, Ill.
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
Pilot Steel & Tool Co., Montreal, Que.
Prest-O-Lite Co., Inc., Toronto, Ont.
Strelinger Co., C. A., Windsor, Ont.
U. S. Electrical Tool Co., Cincinnati, O.
A. R. Williams Mach. Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

DRILLS, HAMMER
Samuel Osborne, Ltd., Montreal, P.Q.

DRILLS, EMERY
Garlock-Walker Mach. Co., Toronto, Ont.

DRILLS, HIGH SPEED TWIST
Aikenhead Hardware Co., Toronto, Ont.
Armstrong-Whitworth of Can., Montreal.
Atkins & Co., Ltd. Wm., Sheffield, Eng.
Butterfield & Co., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
Canadian Fairbanks-Morse Co., Montreal
H. A. Drury Co., Montreal.
Geo. F. Foss Mch. & S'ply Co. Montreal
Lyman Tube & Supply Co., Montreal, Que.
Marshall, Son & Bunney, Toronto.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
W. F. & John Barnes Co., Rockford, Ill
Osborne, Samuel, Montreal, P.Q.
Pratt & Whitney Co., Dundas, Ont.
Petrie, H. W. Toronto.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.
Taylor J. A. M., Stair Bldg., Toronto.
Wilt Twist Drill Co. of Can., Walkerville
Wilkinson & Kompass, Hamilton, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

DRILLS, OIL TUBE
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.

DRILLS, PNEUMATIC
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co., Toronto.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
Williams Mchy Co, Ltd., A. R., Montreal
Greenfield Tap & Die Corp., Greenfield, Mass.

DRILLS, PNEUMATIC CORNER
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool Co., Chicago.

DRILLS, RATCHET AND HAND
Aikenhead Hardware Co., Toronto, Ont.
Armstrong Bros. Tool Co., Chicago, Ill.
Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cincinnati Electrical Tool Co., Cincinnati.
Cleveland Twist Drill Co., Cleveland.
Garlock-Walker Mchy. Co., Toronto, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Wilt Twist Drill Co. of Can., Walkerville.

DRILLS, ROCK
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co., Toronto.
The Foss Mchy. & Supply Co. Montreal
Holden Co., Ltd., Montreal, Que.
Samuel Osborne Ltd., Montreal, P.Q.
A. R. Williams Machy. Co., Toronto

DRILLS, SQUARE & HEXAGON
Globe Engineering Co.

DRILLS, TRACK
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
The Foss Mchy. & Supply Co., Montreal.
Holden Co., Ltd., Montreal, Que.
Morrow Screw & Nut Co., J., Ingersoll Ont
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Wilt Twist Drill Co. of Can., Walkerville.

DRINKING FOUNTAINS, SANITARY
Crane, Ltd., Montreal, Que.
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

DRIVES, CHAIN
See Belting, Chain.

DRIVING TOOLS
The Thos. Pink Co., Ltd., Pembroke, Ont.

DRY CLEANING SYSTEM
Bowser Co., Ltd., S. F., Toronto, Ont.

DRYERS, SAND
Lyman Tube & Supply Co., Montreal, Que.
Pangborn Corporation, Hagerstown, Md.

DRYING APPLIANCES
Baird Machine Co., Bridgeport, Conn.
Sturtevant Co., B. F., Galt, Ont.
W. S. Rockwell Co., New York, N.Y.

DRUM CONTROLS
Volta Manufacturing Co., Welland, Ont.

DUMP CARS
Canadian Fairbanks-Morse Co., Montreal.
MacKinnon Steel Co., Sherbrooke, Que.

DUST EXHAUSTER, ARRESTER SYSTEM
Pangborn Corporation, Hagerstown, Md.

DUST HANDLING EQUIPMENT
Pangborn Corporation, Hagerstown, Md.
Sturtevant Co., B. F., Galt, Ont.

DUST SEPARATORS
Can. Blower & Forge Co., Kitchener, Ont.
Sturtevant Co., B. F., Galt, Ont.

DYNAMOS AND ELECTRICAL SUPPLIES
Canadian Fairbanks-Morse Co., Montreal.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
MacGovern & Co., Montreal, Que.
A. R. Williams Machy. Co., Toronto.

ELECTRICAL SUPPLIES
Can. General Electric Co., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Northern Electric Co., Ltd., Montreal Que

ELECTRIC FURNACES
Electric Furnace Construction Co., Philadelpria, Pa.
Hamilton & Hansell, Inc., New York City
Volta Manufacturing Co., Welland, Ont.

EECTRIC FURNACE REGULATORS, WINCHES, ROOF COOLERS AND ELECTRODE HOLDERS
Volta Manufacturing Co., Welland, Ont.

ELECTRICAL RESISTANCE MATERIALS, NICHROME, KROMORE, CHROMAX, CLIMAX, NICKEL, SILVER, ADVANCE.
Can. Driver-Harris Co., Walkerville, Ont.

ELECTRIC HOISTS, STATIONARY AND MONO RAIL
Canadian Link-Belt Co., Ltd., Toronto,
Canadian Mead-Morrison Co., Limited, Montreal, Que.
Volta Manufacturing Co., Welland, Ont.

ELECTRIC MOTORS
Lincoln Electric Co. of Canada, Ltd., Toronto, Ont.
Sturtevant Co., B. F., Galt, Ont.
Volta Manufacturing Co., Welland, Ont.

ELECTRIC TRUCKS
Cowan Truck Co., Holyoke, Mass.
Goad Engineering Co., Toronto, Ont.

ELEVATOR, ENCLOSURES
Volta Mfg. Co., Welland, Ont.
Canada Wire & Iron Goods Co., Hamilton

ELEVATOR WEIGHTS
Katie Foundry, Galt, Ont.

ELEVATORS AND BUCKETS
Can. Link-Belt Co., Toronto, Ont.
Curtis Pneumatic Machy. Co., St. Louis.

ELEVATING AND CONVEYING MACHINERY
Can. Link-Belt Co., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Petrie, Ltd., H. W., Toronto.

EMBOSSING PRESSES
Dom. Steel Products Co., Ltd., Brantford.
Oliver Machinery Co., Grand Rapids, Mich

EMERY GRINDERS (PNEUMATIC)
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Cleveland Pneumatic Tool Co., Toronto.
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.

EMERY CLOTH
Atkins & Co., E. C., Hamilton, Ont.

EMERY PAPER
Atkins & Co., E. C., Hamilton, Ont.

EMERY AND EMERY WHEELS
Atkins & Co., E. C., Hamilton, Ont.
Brantford Emery Wheel Co., Brantford, Canada.
The Foss Mchy. & Supply Co., Montreal.
Garvin Machine Co., New York.
Canadian Fairbanks-Morse Co., Montreal.
Canada Emery Wheels Co., Hamilton.
Dominion Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Mach. Co., Hamilton, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.
Wilkinson & Kompass, Hamilton, Ont.
Dominion Abrasive Wheel Co., Ltd., Mimico, Ont.

EMERY WHEEL DRESSINGS
Dominion Abrasive Co., Ltd., Mimico, Ont.
Wheel Trueing Tool Co., Windsor Ont.

ENAMELWARE
Crane, Ltd., Montreal, Que.

END MILLS
John Morrow Screw & Nut Co., Ingersoll

ENGINEERS—INDUSTRIAL CLEANING (Free Consultation)
Oakley Chemical Co., New York, N.Y.

ENGINEERS
Samuel Osborne (Canada) Ltd., Montreal.

ENGINES—HOISTING, PILE DRIVING, BRIDGE ERECTING, MINING
Canadian Mead-Morrison Co., Limited, Montreal, Que.

ENGINES, STEAM, GAS, GASOLINE
Furniss, Clarke & Co., Montreal, Que
Canadian Fairbanks-Morse Co., Montreal
Holden Co., Ltd., Montreal, Que.
Johnson Mach. Co., Carlyle, Manchester, Conn.
MacGovern & Co., Montreal, Que.
Sturtevant Co., B. F., Galt, Ont.

ENGINES, HORIZONTAL AND VERTICAL
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Johnson Mach. Co., Carlyle, Manchester, Conn.
Petrie, Ltd., H. W., Toronto.
A. R. Williams Machy. Co., Toronto.

ENGINES, OIL
Holden Co., Ltd., Montreal, Que.
Ker & Goodwin Machine Co., Ltd., Brantford, Ont.

ENGINES, HEAVY OIL, DIESEL TYPE
Dom. Steel Products Co. Ltd. Brantford
Holden Co., Ltd., Montreal, Que.

ENGINES, MARINE
Can. Ingersoll-Rand Co. Sherbrooke, Que.
Sturtevant Co., B. F., Galt, Ont

ENGINES, STATIONARY, FUEL, OIL, GAS OR GASOLINE
Holden Co., Ltd., Montreal, Que.

ESCUTCHEON PINS
Parmenter & Bulloch, Gananoque, Ont.

EXHAUST HEADS AND HOODS
Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Sturtevant Co., B. F., Galt, Ont.

EXHAUSTERS
Can. Blower & Forge Co., Kitchener, Ont.
Pangborn Corporation, Hagerstown, Md.
Petrie, Ltd., H. W., Toronto.
Sturtevant Co., B. F., Galt, Ont.

EXTRACTORS, TAP
Walton Co., The, Hartford, Conn.

EYE BOLTS AND NUTS
Can. Foundries & Forgings, Ltd., Welland, Ont.

EYE PROTECTORS
Standard Optical Co., Geneva, N.Y.

FACTORY GATES
Page Steel & Wire Co., Adrian, Mich.

FACTORY LOCATIONS
City of St. Johns, Quebec.

FACTORY SITES
City of St. Johns, Quebec.

FANS
Baird Machine Co., Bridgeport, Conn.
Can. Blower & Forge Co., Kitchener, Ont.
Sturtevant Co., B. F., Galt, Ont.

FENCING, WIRE
Page Steel & Wire Co., New York, N.Y.

FENCE, IRON AND FACTORY
Can. Wire & Iron Goods, Hamilton, Ont.
Page Steel & Wire Co., Adrian, Mich.

FERRO-TUNGSTEN
Vanadium-Alloys Steel Co., Pittsburgh, Pa

FIBRE, RODS AND SHEETS
Diamond State Fibre Co., Bridgeport, Pa.

FILES
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Wm., Sheffield, Eng.
Ingersoll File Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Marshall, Son & Bunney, Toronto, Ont.
Nicholson File Co., Port Hope, Ont.
Rice Lewis & Son, Toronto, Ont.
Simonds Mfg. Co., Fitchburg, Mass.
Whitman & Barnes Mfg. Co., Akron, O
Wilkinson & Kompass, Hamilton, Ont.

FILES, COMMUTATOR SLOTTING
Lyman Tube & Supply Co., Montreal, Que.

FILING MACHINES, BENCH AND MOTOR DRIVEN
Barry Mfg. Co., Chicago, Ill.

FILTERING AND CIRCULATING SYSTEMS FOR LUBRICATING OIL
Bowser Co., Ltd., S. F., Toronto, Ont.
Can. Wire & Iron Goods, Hamilton, Ont.

FIRE BRICK
Elk Fire Brick Co., Hamilton, Ont.
General Combustion Co., Ltd., Montreal, Que.

FIRE CLAY
Elk Fire Brick Co., Can., Ltd., Hamil-
General Combustion Co., Ltd., Montreal. Que.

FINISHING MACHINES
Brown & Sharpe Mfg. Co., Providence, R.I.

FIRE EXTINGUISHERS
Strong, Kennard & Nutt Co., Cleveland, O.

FITTINGS, CAST IRON, SCREWED, FLANGED
Crane, Ltd., Montreal, Que.

FIXTURES
Brown Engineering Corp., Toronto, Ont.
Crescent Mchy. Co., Ltd., Montreal, Que.
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.
Toronto Tool Co., Toronto, Ont.

FLAT SPRINGS
The Dunbar Brothers Co., Bristol, Conn

FLEXIBLE SHAFT EQUIPMENT
Chicago Flexible Shaft Co., Chicago, Ill.
R. C. Hanking Co., Chicago, Ill.

FLOODLIGHTS, ELECTRIC
Holden Co., Ltd., Montreal, Que.
n Electric Co., Ltd., Montreal Que

FLOTATION MACHINERY
Elec. Steel & Metals, Welland, Ont.

FLUMES
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
William Hamilton Co., Peterboro, Ont.

FORGES, HAND PORTABLE
Aikenhead Hardware Co., Toronto, Ont
Can. r & Forge Co., Kitchener.
A. B. Jardine & Co., Ltd., Hespeler, Ont
Rice Lewis & Son, Toronto, Ont.
Sturtevant Co., B. F., Galt, Ont.

FORGE TOOLS
Kimber & Hillier Mfg., Co., St. Catharines, Ont.

FORGES, OIL
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.

FORGINGS
Mesta Machine Co., Pittsburgh, Pa.
Can. Found. & Forgings, Ltd., Welland
Nova Scotia Steel & Coal Co., New Glasgow, N.S.

FORGINGS, DROP, AUTOMOBILE AND LOCOMOTIVE FORGING AND WELDING
Dominion Bridge Co., Montreal, Que.
Dom. Forge & Stamp'g Co., Walkerville
Steel Co. of Canada, Ltd., St. Catharines
Victoria Foundry Co., Ottawa.
Williams & Co., J. H., Brooklyn, N.Y.

FORGING MACHINERY
John Bertram & Sons Co., Dundas, Ont.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.
National Mechy. Co., Tiffin, Ohio.
Petrie, Ltd., H. W., Toronto.
Chicago Flexible Shaft Co., Chicago, Ill.

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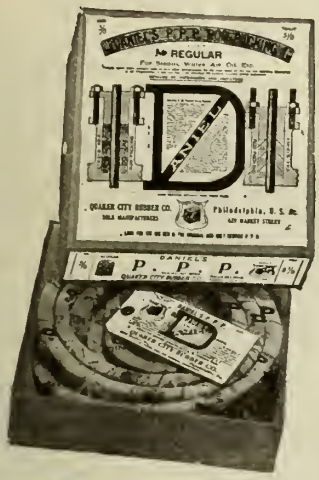
Take packings—rod and sheet—away from the industries, and even the most inexperienced knows what would happen.
With the operation of practically all kinds of plans, factories, mills, etc., so utterly dependent on rod and sheet packings to allow proper operation, why use any but thoroughly reliable and well-known products?



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Many practical tests by experienced engineers under various conditions have clearly demonstrated that P.P.P. is the most economical rod packing to use. Its long life is remarkable, its ability to create a saving in the fuel bill is well known.

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is a booklet that should be in the hands of everyone who has anything to do with rod packing whether buyer or user.

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Used exclusively in many of the largest power houses, factories, and machine shops, for high pressures, super-heated steam, hot water, ammonia, oils and acids and all other kinds of joints requiring packing.
EBONITE will hold a vibrating joint absolutely tight, and where there is a varying expansion or contraction of the pipes EBONITE is especially desirable.

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WRIGHT MANUFACTURING COMPANY

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FORGINGS, SPECIAL
Armstrong-Whitworth of Can., Montreal.
Can. Found. & Forgings, Ltd., Welland
Williams & Co., J. H., Brooklyn, N.Y.

FORMING
Brown & Sharpe Mfg. Co., Providence, R.I.

FRICTION LEATHERS
Graton & Knight Mfg. Co., Montreal.

FRICTION SURFACE BELTING
Can. Consolidated Rubber Co., Montreal

FUEL OIL SYSTEMS
Bowser Co., Ltd., S. F., Toronto, Ont.

FURNACES, ANNEALING, CASE HARDENING AND TEMPERING
Bellevue Furnace Co., Detroit, Mich.
Brown & Sharpe Mfg. Co., Providence, R.I
Chicago Flexible Shaft Co., Chicago, Ill.
Gen. Combustion Co, Can., Ltd, Montreal
Mechanical Eng'r'g Co., Three Rivers, Q
W. S. Rockwell Co., New York, N.Y.
Petrie, Ltd., H. W., Toronto.

FURNACES, BLAST
Bellevue Industrial Furnace Co., Detroit
Chicago Flexible Shaft Co., Chicago, Ill.
W. S. Rockwell Co., New York, N.Y.
Toronto Iron Works, Ltd., Toronto.

FURNACES — BRASS MELTING
General Combustion Co., Ltd., Montreal,

FURNACES — CRUCIBLE
Chicago Flexible Shaft Co., Chicago, Ill

FURNACES, CYANIDE AND LEAD HARDENING
Chicago Flexible Shaft Co., Chicago, Ill.

FURNACES, ELECTRIC
Electric Furnace Construction Co., Philadelpria, Pa.
Hamilton & Hansell, Inc., New York City

FURNACES, FORGING
Chicago Flexible Shaft Co., Chicago, Ill.
Gen. Combustion Co. of Can., Ltd., Montreal.
W. S. Rockwell Co., New York, N.Y.

FURNACES — HIGH-SPEED STEEL
Chicago Flexible Shaft Co., Chicago, Ill.

FUSE BOXES, STEEL
Dom. Forge & Stamp. Co., Walkerville.

FUSE PLUGS AND FUSES
Northern Electric Co., Ltd., Montreal Que

GALVANIZING FLUX
British Smelting & Refining Co., Ltd. Montreal, Que.

GANG PLANER TOOLS
Armstrong Bros. Tool Co., Chicago.

GAS AND STEAM ENGINES
Mesta Machine Co., Pittsburgh, Pa.

GASKETS, LEATHER, ETC.
Graton & Knight Mfg. Co., Montreal.

GASOLINE METERS
Bowser Co., Ltd., S. F., Toronto, Ont.

GASOLINE TANKS
Bowser Co., Ltd., S. F., Toronto, Ont.

GASOLINE PUMPS, SELF-MEASURING
Bowser Co., Ltd., S. F., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.

GAUGES
Crescent Mach. Co., Ltd., Montreal, P.Q
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.

GAUGES, CALIPERS
Williams & Co., J. H., Brooklyn, N.Y

GAUGES, MERCURY COLUMN, DRAFT
Taylor Instrument Co., Rochester, N.Y.

GAUGES, HYDRAULIC
Taylor Instrument Co., Rochester, N.Y

GAUGES, MANUFACTURERS, LIMIT, THREAD
Greenfield Tap & Die Corp., Greenfield
Wells Bros. of Can., Galt, Ont

GAUGES, SNAP, THREAD AND CYLINDRICAL
C. E. Johanson, Inc., Toronto, Ont.

GAUGES, VACUUM AND PRESSURE
Bristol Co., Waterbury, Conn.
Taylor Instrument Co., Rochester, N.Y

GAUGES, STANDARD
Brown Engineering Corp., Toronto, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Crescent Mche. Co., Ltd., Montreal, Que.
Garvin Machine Co., New York.
C. E. Johanson, Inc., Toronto, Ont.
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Hartford, Conn
Taylor, J. A. M., 518 Stair Bldg., Toronto
Toronto Tool Works, Toronto, Ont.
Wells Brothers Co. of Canada, Galt, Ont.

GEAR BLANKS
Can. Steel Foundries, Ltd., Montreal,
Dom. Found. & Steel, Hamilton, Ont.
Kayser-Ellison & Co., Ltd., Montreal.
Williams & Co., J. H., Brooklyn, N.Y.

GEAR BLANKS, CAST
Katie Foundry, Galt, Ont.

GEAR BLANKS, RAWHIDE
Lyman Tube & Supply Co., Montreal, Que.

GEAR BOXES ,REDUCTION
Can. Link-Belt Co., Ltd., Toronto, Ont.

GEAR SHAPERS AND CUTTERS
Fellows Gear & Shaper Co., Springfield, V.

GEAR-CUTTING MACHINERY
Bilton Mach. Tool Co., Bridgeport, Conn.
Fellows Gear & Shaper Co., Springfield, V.
Garlock-Walker Mchy. Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto.
A. R. Williams Machy. Co., Toronto.

GEAR-TESTING MACHINE
Gisholt Machine Co., Madison, Wis.

GEARS, CHAIN
Morse Chain Co., Ithaca, New York.
Can. Link-Belt Co., Ltd., Toronto, Ont.

GEARS, COMPENSATING
Morse Chain Co., Ithaca, New York.
Can. Link-Belt Co., Ltd., Toronto, Ont.

GEARS, CUT, MORTISE, ANGLE, WORM
Can. Link-Belt Co., Toronto, Ont.
Diamond State Fibre Co., Bridgeport, Pa.
Dom. Steel Products Co., Ltd., Brantford.
Dominion Bridge Co., Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Elliott & Whitehall, Galt, Ont.
Gardner, Robt., & Son, Montreal.
Hamilton Gear & Machine Co., Toronto.
Hull Iron & Steel Found., Ltd., Hull, Q.
Jones & Glassco, Montreal.
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Philadelphia Gear Works, Philadelphia
Victoria Foundry Co., Ottawa.

GEARS, RAWHIDE
Gardner, Robt., & Son, Montreal.
Grant Gear Works, Boston, Mass.
Hamilton Gear & Machine Co., Toronto.
Hamilton Co., Ltd., Wm., Peterborough,
Jones & Glassco, Montreal.
Lyman Tube & Supply Co., Montreal, Que.
Philadelphia Gear Works, Philadelphia.
A. R. Williams Machy. Co., Toronto.

GENERATORS, GEAR
Fellows Gear & Shaper Co., Springfield, V

GEARS, SILENT CHAIN
Can. Link-Belt Co., Ltd., Toronto, Ont.

GEARS, SPRING
Morse Chain Co., Ithaca, New York.

GEARS, SPUN, BENCH, SPIRAL
Brown & Sharpe Mfg. Co., Providence, R.I.

GENERAL MACHINE WORK
Elliott & Whitehall, Galt, Ont.

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Northern Elec. Co., Ltd., Montreal, P.Q.

GENERATORS, MOTOR
MacGovern & Co., Montreal.
Northern Elec. Co., Ltd., Montreal, P.Q.
Sturtevant Co., B. F., Galt, Ont.

GENERATORS, STEAM TURBO
Can. Link-Belt Co., Ltd., Toronto, Ont.

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Brown's Copper and Brass Rolling Mills New Toronto.

GLOVES, ASBESTOS, ACID PROOF, WATERPROOF, ETC.
Strong, Kennard & Nutt Co., Cleveland

GLUE HEATERS
Oliver Machinery Co., Grand Rapids, Mich

GLASSES, SAFETY
Strong, Kennard & Nutt Co., Cleveland.
Willson & Co., Inc., T. A., Reading, Pa.

GRAPHITE
Aikenhead Hardware, Ltd., Toronto.
Rice Lewis & Son, Toronto.

GOGGLES
Consolidated Optical Co., Toronto.
Standard Optical Co., Geneva, N.Y.

GRAB BUCKETS—CLAMSHELL and ORANGE PEEL
Canadian Link-Belt Co., Ltd., Toronto, Ont.
Canadian Mead-Morrison Co., Limited, Montreal, Que.

GRAVITY CARRIERS
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal.
Morris Crane & Hoist Co., Ltd., Herbert Niagara Falls, Ont.

GREASE CUPS, PRESSED STEEL, BRASS
Can. Winkley Co., Ltd., Windsor, Ont.

GREASES (See Lubricants)

GRINDERS, AUTOMATIC KNIFE
Canada Machinery Corp., Galt, Ont.
Foss Mchry. & S'ply Co., G. F., Montreal
Garlock-Walker Machinery Co., Toronto.

GRINDERS, BENCH
Superior Machinery Co., London, Ont.

GRINDERS, CENTRE COLUMN, PEDESTAL AND BENCH
Can. Machinery Corp., Galt, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Haskins & Co., R. C., Chicago, Ill.
Wisconsin Electric Co., Inc., Racine, Wis
Cleveland Pneumatic Tool Co., Toronto.
Ford-Smith Mach. Co., Hamilton, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machinery Co., Toronto.
Katie Foundry, Galt, Ont.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford.
Niles-Bement-Pond Co., New York, N.Y.
Perfect Machine Co., Galt, Ont.
United States Elec. Tool Co., Cincinnati.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

GRINDERS, CUTTER
Brown & Sharpe Mfg. Co., Providence, R.I
Cincinnati Milling Mach. Co., Cincinnati.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garvin Machine Co., New York.
Globe Engineering Co., Hamilton, Ont.
Greenfield Machine Co., Greenfield, Mass.
Greenfield Tap & Die Corp., Greenfield, M.
Heald Machine Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.
Manhattan Machine & Tool Co., Grand Rapids, Mich.
Norton Co., Worcester, Mass.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. of Can., Galt, Ont.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

GRINDERS, DIE AND CHASER
Haskins & Co., R. C., Chicago, Ill.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
National-Acme Co., Cleveland, Ohio.

GRINDERS, DISK
Armstrong Bros. Tool Co., Chicago, Ill.
Atkins & Co., E. C., Hamilton, Ont.
Ford-Smith Mach. Co., Hamilton.
Gardner Machine Co., Beloit, Wis.
Heald Machine Co., Worcester, Mass.

GRINDERS, FLEXIBLE CASTING
Manhattan Machine & Tool Co., Grand Rapids, Mich.

GRINDERS, DRILL
Aikenhead Hardware Co., Toronto.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield,
Petrie, Ltd., H. W., Toronto.
United States Elec. Tool Co., Cincinnati.
Wells Bros. of Canada, Galt, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

GRINDERS, CYLINDER, INTERNAL
Barber Mchy. Co., Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I
Foss Mchy. & S'ply Co., G. F., Montreal.
Greenfield Machine Co., Greenfield, Mass.
Heald Machine Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Norton Co., Worcester, Mass.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

GRINDERS, PORTABLE, ELECTRIC HAND, TOOL POST, FLOOR AND BENCH
Baird Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Ford-Smith Mach. Co., Hamilton, Ont.
Haskins & Co., R. C., Chicago, Ill.
Grant Mfg. & Mach. Co., Bridgeport, Con
Garlock-Walker Machinery Co., Toronto.
Greenfield Machine Co., Greenfield, Mass.
Independent Pneumatic Tool Co., Chicago
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
United States Elec. Tool Co., Cincinnati
Wisconsin Electric Co., Inc., Racine, Wis.
Williams Mchy Co., A. R., Toronto, Ont.
Wilkinson & Kompass, Hamilton, Ont.

GRINDERS, MANUFACTURING
Barber Mchy. Co., Ltd., Toronto, Ont.
Universal Grinding Mach. Co., Fitchburg, Mass.

GRINDERS, HOLE, HOLE AND AND DEEP HOLE
Barber Mchy. Co., Ltd., Toronto, Ont.
Bryant Chucking Grinder Co., Springfield, Vermont.
Heald Machine Co., Worcester, Mass.

GRINDERS, PLAIN CYLINDRICAL
Barber Mchy. Co., Ltd., Toronto, Ont.
Fitchburg Grinding Mach. Co., Fitchburg, Mass.

GRINDERS, PNEUMATIC
Can. Ingersoll-Rand Co., Montreal.
Cleveland Pneumatic Tool Co., Toronto.
Garlock-Walker Machinery Co., Toronto.
Heald Machine Co., Worcester, Mass.
Independent Pneumatic Tool Co., Chicago
MacGovern & Co., Montreal, Que.

GRINDERS, PROFILE
Cleveland Milling Machine Co., Cleveland.

GRINDERS, ROTARY SURFACE
Brown & Sharpe Mfg. Co., Providence, R.I
Bristol Machine Tool Co., Bristol, Conn.
Manhattan Machine & Tool Co., Grand Rapids, Mich.

GRINDERS, TOOL AND HOLDER
Armstrong Bros. Tool Co., Chicago.
W. F. & John Barnes Co., Rockford, Ill.
Blount & Co., J. G., Everet, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I
Ford-Smith Machine Co., Hamilton, Ont.
Greenfield Machine Co., Greenfield, Mass.
Greenfield Tap & Die Corp., Greenfield.
National-Acme Co., Cleveland, Ohio.
Tabor Mfg. Co., Philadelphia, Pa.
Wells Bros. of Canada, Galt, Ont.

GRINDERS, UNIVERSAL, PLAIN
Barber Mchy. Co., Ltd., Toronto, Ont.
Manhattan Machine & Tool Co., Grand Rapids, Mich.
Modern Tool Co., Erie, Pa.
Norton Co., Worcester, Mass.
Williams Mchy Co. Ltd., A. R., Montreal

GRINDERS, VERTICAL, SURFACE
Brown & Sharpe Mfg. Co., Providence, R.I
Can. Fairbanks-Morse Co., Montreal.
Heald Machine Co., Worcester, Mass.
Petrie, Ltd., H. W., Toronto.
Pratt & Whitney Co., Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Norton Co., Worcester, Mass.
Williams Mchy Co., A. R., Toronto, Ont.

GRINDING DISCS
Wausau Abrasives Co., Chicago, Ill.

GRINDING AND POLISHING MACHINES, PORTABLE, PNEUMATIC AND SPRING FRAME
Can. Fairbanks-Morse Co., Montreal.
Cincinnati Elec. Tool Co., Cincinnati, O.
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner & Son, Robt., Montreal.
Garvin Machine Co., New York.
Garlock-Walker Machy. Co., Toronto.
Greenfield Machine Co., Greenfield, Mass.
Haskins & Co., R. C., Chicago, Ill.
Hall & Sons, John H., Brantford, Ont.
Niles-Bement-Pond Co., New York, N.Y.
Norton Co., Worcester, Mass.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
Wisconsin Electric Co., Racine, Wis.
Williams Mchy Co., A. R., Toronto, Ont.

GRINDING MACHINES, CAR WHEEL, CUTTER, CYLINDRICAL, CRANKSHAFT
Barber Mchy. Co., Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I
Norton Co., Worcester, Mass.

GRINDING WHEELS
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., E. C., Hamilton, Ont.
Brantford Emery Wheel Co., Brantford.
Can. Fairbanks-Morse Co., Montreal.
Carborundum Co., Niagara Falls, N.Y.
Dominion Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Norton Co., Worcester, Mass.

GRINDING WHEEL DRESSER
Dominion Abrasive Wheel Co., Ltd., Mimico, Ont.

GUARDS, WINDOW AND MACHINE
Canada Machinery Corp., Galt, Ont.
Canada Wire & Iron Goods Co., Hamilton
Dennis Wire & Iron Works, London, Ont.
B. Greening Wire Co., Hamilton, Ont.
Page Steel & Wire Co., Adrian, Mich.

GUTTERS AND SKYLIGHTS
H. H. Robertson, Ltd., Sarnia, Ont.

HACK SAW BLADES
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., E. C., Hamilton, Ont.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Can. Fairbanks-Morse Co., Montreal.
Diamond Saw & Stamping Wks., Buffalo.
Ford-Smith Machine Co., Hamilton, Ont.
Kayser-Ellison & Co., Ltd., Montreal.
Lyman Tube & Supply Co., Montreal, Que.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Plewes, Ltd., Winnipeg, Man.
Pilot Steel & Tool Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto.
Racine Tool & Machine Co., Racine, Wis.
Rice Lewis & Son, Toronto, Ont.
Simonds Mfg. Co., Fitchburg, Mass.
L. S. Starrett Co., Athol, Mass.
Standard Machy. & Supplies, Montreal.
Victor Saw Works, Ltd., Hamilton.
Wilkinson & Kompass, Hamilton.
Williams Mchy Co., A. R., Toronto, Ont.

HANDLES, BALANCE, CRANK AND MACHINE
Williams & Co., J. H., Brooklyn, N.Y.

HANGERS, SHAFT
Can. Link-Belt Co., Ltd., Toronto, Ont.

HACK SAW FRAMES
Aikenhead Hardware Co., Toronto.
Atkins & Co., E. C., Hamilton, Ont.
Can. Fairbanks-Morse Co., Montreal.
Ford-Smith Machine Co., Hamilton, Ont.
Garvin Machine Co., New York City.
Victor Saw Works, Hamilton, Ont.
Rice Lewis & Son, Toronto, Ont.
Wilkinson & Kompass, Hamilton, Ont.

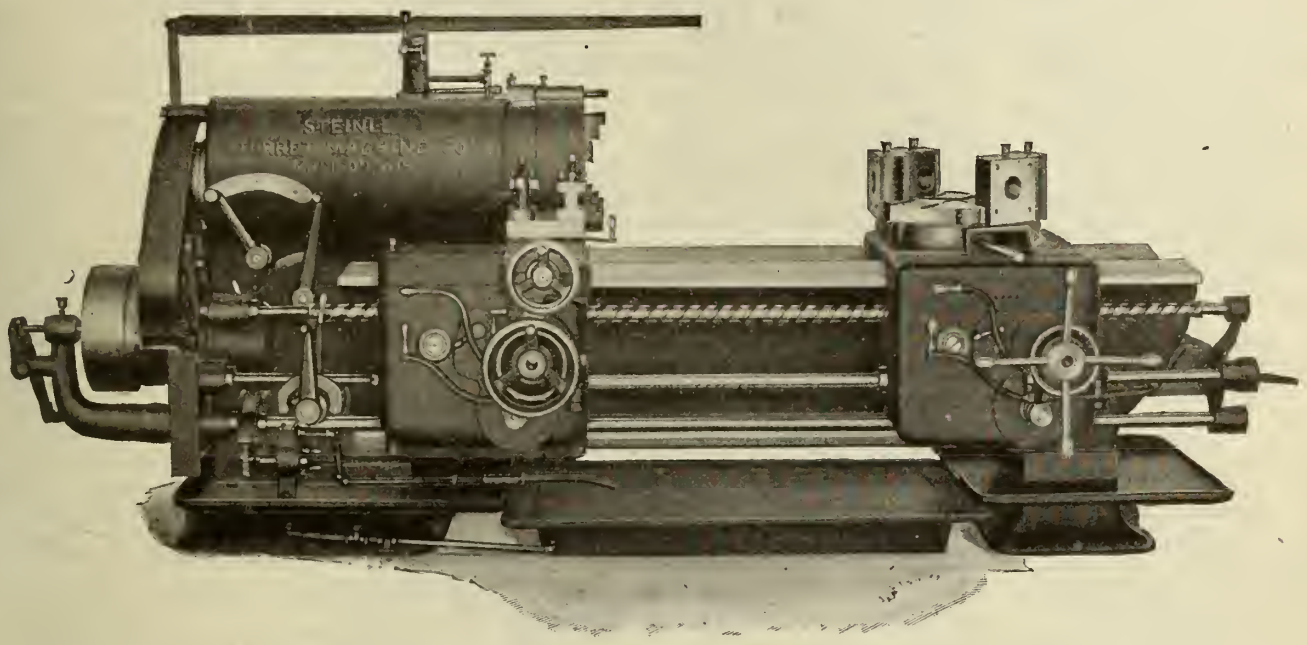
HACK SAWS, POWER
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., E. C., Hamilton, Ont.
Can. Fairbanks-Morse Co., Montreal.
Diamond Saw & Stamping Wks., Buffalo.
Foss Mchy. & S'ply Co., G. F., Montreal.
Ford-Smith Machine Co., Hamilton.
Perfect Machine Co., Galt, Ont.
Starrett Co., L. S., Athol, Mass.
Victor Saw Works, Hamilton, Ont.
Williams Machy. Co., A. R., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

HAMMERS, FORGING
Nazel Eng. & Mach. Wks., Philadelphia.

HAMMERS, ELECTRIC
Hoskins & Co., R. C., Chicago, Ill.

STEINLE

Full Swing Side Carriage Turret Lathe



Perfect Co-ordination of Component Units

One of the chief reasons for the big production obtainable on Steinle Heavy Duty Full Swing Side Carriage Turret Lathes is the particular care taken in the design of the machine to permit of the perfect co-ordination and unified action of the various component units in connection with the working or cutting tool equipment.

This harmony in the design and functioning of the various parts means greater production, greater accuracy, and a corresponding decrease in the cost of the product.

May we furnish you with further details covering design and construction of our machine together with tooling recommendations for the proper production of your work?

Steinle Turret Machine Company

Madison, Wis., U. S. A.

ORIGINATORS OF THE FULL SWING SIDE CARRIAGE TURRET LATHE

AGENTS: Machine Tool Engineering Co., Singer Building, New York; Cadillac Tool Company, Dodge Power Building, Detroit, Michigan; L. G. Henes, 75 Fremont Street, San Francisco, California; and Title Insurance Building, Los Angeles, California. FOREIGN: Leo. C. Steinle, 53 Victoria Street, London, England.

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Beaudry & Co., Boston, Mass.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton.
Can. Billings & Spencer, Ltd., Welland.
Canada Machinery Corp., Galt, Ont.
High Speed Hammer Co., Rochester, N.Y
Jardine & Co., A. B., Hespeler, Ont.
Niles-Bement-Pond Co., New York, N.Y
Petrie, Ltd., H. W., Toronto.
Toledo Machine & Tool Co., Toledo.
United Hammer Co., Boston, Mass.
Williams Mchy Co, Ltd., A. R., Montreal

HAMMERS, HELVE POWER
Canada Machinery Corp., Galt, Ont.
Petrie, Ltd., H. W., Toronto.
West Tire Setter Co., Rochester, N.Y.
Williams Mchy Co, Ltd., A. R., Montreal

HAMMERS, CHIPPING, CAULKING, PNEUMATIC
Can. Ingersoll-Rand Co., Montreal, Que.
Garlock-Walker Machinery Co., Toronto.
Independent Pneumatic Tool Co., Chicago.
Nazel Eng. & Mach. Wks., Philadelphia.

HAMMERS, MARKING
Matthews & Co., Jas. H., Pittsburgh, Pa.

HAMMERS, NAIL MACHINE
Rice Lewis & Son, Toronto, Ont.
United Hammer Co., Boston, Mass.

HAMMERS, POWER
Nazel Eng. & Mach. Wks., Philadelphia.

HAMMERS, STEAM
Canada Machinery Corp., Galt, Ont.
Niles-Bement-Pond Co., New York.

HAND PLANERS
Oliver Mchry. Co., Grand Rapids, Mich.

HAND PLANING AND JOINTING MACHINERY
Oliver Engineering Co., Montreal, P.Q.

HAND LEATHERS OR PADS
Graton & Knight Mfg. Co., Montreal.

HANDLES, FIBRE
Diamond State Fibre Co., Bridgeport, Pa.

HANGERS
Brown & Sharpe Mfg. Co., Providence, R.I
Canadian Link-Belt Co., Ltd., Toronto, Ont.

HANGERS, SHAFT
Algoma Steel Corp., Sault Ste. Marie.
Dhapmah Double Ball Bearing Co., Toronto.
Gray Ball Bearing Co., Ltd., Toronto.
Baird Machine Co., Bridgeport, Conn.
Can. S K F Co., Toronto, Ont.
Gardner & Son, Robt., Montreal.
Jones & Glassco, Montreal.
Williams Mchy Co, Ltd., A. R., Montreal

HARDNESS TESTING INSTRUMENTS
Shore Instrument & Mfg. Co., New York.

HEAD, AUXILIARY
Hoefer Mfg. Co., Freeport, Ill.

HEATING AND VENTILATING ENGINEERS
Can. Blower & Forge Co., Kitchener, Ont.
Sturtevant Co., B. F., Galt, Ont.

HEAT GAUGES, HARDENING AND ANNEALING
Shore Instrument & Mfg. Co., New York

HELMETS, SANDBLAST, AMMONIA
Strong, Kennard & Nutt Co., Cleveland

HIGH SPEED STEEL
See Steel.

HINGE MACHINERY
Baird Machine Co., Bridgeport, Conn.

HINGES
Butterfield & Co., Inc., Rock Island, Que.
London Bolt & Hinge Wks., London, Ont.

HOBS
Greenfield Tap & Die Co., Greenfield, Mass
Pratt & Whitney Co., Dundas, Ont.
Taylor, J. A. M., 318 Stair Bldg., Toronto
Wells Bros. of Canada, Galt, Ont.

HOISTING MACHINERY
Canadian Mead-Morrison Co., Limited, Montreal, Que.

HOISTS, AIR
Can. Ingersoll-Rand Co., Ltd., Sherbrooke
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

HOISTS, CHAIN AND PNEUMATIC
Can. Ingersoll-Rand Co., Montreal, Que.
Garlock-Walker Machinery Co., Toronto.
Ford Chain Block & Mfg., Philadelphia.
Independent Pneumatic Tool Co., Chicago
Lyman Tube & Supply Co., Montreal, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Wright Mfg. Co., Lisbon, Ohio.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co, Ltd., A. R., Montreal

HOISTS, ELEC., STATIONARY, MONO RAIL
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
A. Leatty & Sons, Ltd., Welland, Can.
Oliver Engineering Co., Montreal.
Volta Mfg. Co., Welland, Ont.

HOISTS, ELECTRICAL
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Montreal, Que.
Electric Steels & Metals Ltd., Welland
Kennedy & Sons, Owen Sound, Ont.
Morris Crane & Hoist Co., Herbert Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co, Ltd., A. R., Montreal

HOLDERS, ADJUSTABLE LENGTH
Eclipse Counterbore Co., Ltd., Walkerville, Ont.

HOLDERS, STEEL DIE FOR MARKING
Matthews & Co., Jas. H., Pittsburgh, Pa.

HOLDERS, ELECTRIC
Electric Steels & Metals, Ltd., Welland

HOOKS, BELT LACING
Clipper Belt Lacer Co., Grand Rapids.

HOPPERS
MacKinnon Steel Co., Ltd., Sherbrooke.
Dominion Bridge Co., Montreal, Que.
William Hamilton Co., Peterboro, Ont.
Toronto Iron Works, Ltd., Toronto, Ont.

HOSE, FIRE PROTECTION
Quaker City Rubber Co, Philadelphia, Pa
International Mach. Sply, Ltd., Montreal

HOSE, PNEUMATIC
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto.
Gutta Percha & Rubber, Ltd., Toronto.
Independent Pneumatic Tool Co., Chicago.
Quaker City Rubber Co., Philadelphia, Pa.
Wells Bros. Co. of Canada, Galt, Ont.

HOSE, ALL KINDS
Goodyear Tire & Rubber Co., of Canada, L..., Toronto.
Gutta Percha & Rubber, Ltd., Toronto.
Quaker City Rubber Co, Philadelphia, Pa
International Mach. Sply, Ltd., Montreal
Dunlop Tire & Rubber Goods Co., Ltd., Toronto.

HOSE, SAND BLAST
Pangborn Corporation, Hagerstown, Md.
Goodyear Tire & Rubber Co. of Can., Ltd. Toronto
Quaker City Rubber Co., Philadelphia, Pa.
Intern'l. Machine Tool Co., Indianapolis.

HOSE, STEAM, SUCTION AND WATER
Gutta Percha & Rubber, Ltd., Toronto.
Quaker City Rubber Co, Philadelphia, Pa
International Mach. Sply, Ltd., Montreal
Dunlop Tire & Rubber Goods Co., Ltd., Toronto.

HUMIDIFIERS
Sturtevant Co., B. F., Galt, Ont.

HYDRAULIC ACCUMULATORS
Dom. Steel Products Co., Ltd., Brantford.

HYDRAULIC MACHINERY
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Dom. Steel Products Co., Ltd., Brantford
Garlock-Walker Machinery Co., Toronto
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Metalwood Mfg. Co., Detroit, Mich.
Niles-Bement-Pond Co., New York.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.
West Tire Setter Co., Rochester, N.Y.
Victoria Foundry Co., Ottawa.

HYDRAULIC TURBINES
Que.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,

HYDROMETERS, HYGROMETERS, HYGRODNIKS
Taylor Instrument Co., Rochester, N.Y.

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Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., E. C., Hamilton, Ont.
Brown & Sharpe Mfg. Co., Providence.
Starrett Co., L. S., Athol, Mass.

INDEX CENTRES
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Dickow, Fred. C., Chicago, Ill.
Ford-Smith Machine Co., Hamilton, Ont.
Garvin Machine Co., New York.
Petrie, Ltd., H. W., Toronto.

INDICATING INSTRUMENTS
Taylor Instrument Co., Rochester, N.Y

INDICATING SCALES
Can. Kron Scale Co., Montreal.

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City of St. Johns, Quebec.

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Thomas Moore & Son, Montreal.

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Electric Steel & Metals Co., Welland.

INSULATING COMPOUNDS
Robertson Co., Ltd., H. H., Sarnia, Ont.

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Hanna & Co., M. A. Cleveland, O.

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Swedish Steel & Impt. Co., Ltd., Montreal

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Aikenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Globe Engineering Co.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Norton, A. O., Coaticook, Que.
Rice Lewis & Son, Toronto, Ont.
Petrie, Ltd., H. W., Toronto.

JACKS, PIT AND TRACK
Canadian Fairbanks-Morse Co., Montreal
Lyman Tube & Supply Co., Montreal, Que.
Northern Crane Works, Walkerville.

JAWS, FACE PLATE
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Ltd., Brantford
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Elliott & Whitehall Mach. & Tool Co., Galt.
Gisholt Machine Co., Madison, Wis.
Globe Engineering Co., Ltd., Hamilton.
Homer & Wilson, Hamilton, Ont.
Jones & Lamson, Springfield, Vt.
Toronto Tool Co., Toronto, Ont.

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Canada Foundries & Forgings, Welland.
Dominion Foundries & Steel Ltd., Hamilton, Ont.

KEY SEATERS
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Garvin Machine Co., New York.
Morton Mfg. Co., Muskegon Heights, M.
Petrie, Ltd., H. W., Toronto.
Williams Machy. Co., A. R., Toronto.

KEYS, MACHINE
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Williams & Co., J. H., Brooklyn, N.Y.

KILNS
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General Combustion Co., Ltd., Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
Sturtevant Co., B. F., Galt, Ont.

KNIVES, MACHINE
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LABORATORIES, INSPECTION AND TESTING (see Chemists)

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National Machy. Co., Tiffin, Ohio.

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Robertson, Ltd., H. H., Sarnia, Ont.

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Acme Machine Tool Co., Cincinnati, Ohio.
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LATHE CHUCKS (See Chucks)

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Armstrong Bros. Tool Co., Chicago.
Hendey Machine Co., Torrington, Conn.
Williams & Co., J. H., Brooklyn, N.Y.

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Gisholt Machine Co., Madison, Wis.
Wood Turret Machine Co., Brazil, Ind.

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Barber Mchy. Co., Ltd., Toronto, Ont.
Betts Mach. Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.

LATHES, BORING
Barber Mchy. Co., Ltd., Toronto, Ont.
Bridgeford Mach. Tool Works, Rochester
Canada Machinery Corp., Galt, Ont.
Lodge & Shipley, Cincinnati, O.
Petrie, Ltd., H. W., Toronto.

LATHES, PRECISION, BENCH
W. F. & John Barnes Co., Rockford.
J. G. Blount & Co., Everett, Mass.
Canadian Fairbanks-Morse Co., Montreal.
Geo. F. Foss Machy. & Supply Co., Montreal.
Garlock-Walker Machinery Co., Toronto.
Hardinge Bros., Chicago, Ill.
Pratt & Whitney Co., Dundas, Ont.
Seneca Falls Mfg Co., Seneca Falls, N.Y.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

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Acme Machine Tool Co., Cincinnati, Ohio
Hardinge Bros., Chicago, Ill.
Wood Turret Machine Co., Brazil, Ind.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

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Acme Machine Tool Co., Cincinnati, O.
Barber Mchy. Co., Ltd., Toronto, Ont.
John Bertram & Sons, Co., Dundas.
Canada Machy. Corp., Galt, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cisco Machine Tool Co., Cincinnati, O.
G. F. Foss, Mchy. & S'ply Co., Montreal
Garlock-Walker Machinery Co. Toronto.
Garvin Machine Co., New York.
Gisholt Machine Co., Madison, Wis.
Kennedy & Sons, Wm., Owen Sound, Ont.
Lehman Mach. Co., St. Louis, Mo.
R. McDougall Co., Galt.
Niles-Bement-Pond Co., New York.
Perfect Machine Co., Galt, Ont.
Rae Mach. Tool Co., Hamilton.
Smalley-General Co., Inc., Bay City, Mich.
Standard Equipment & Tool Wks. Montreal, P.Q.
Seneca Falls Mfg. Co., Seneca Falls, N.Y.
Sidney Tool Co., Sidney, Ohio.
Walcott Lathe Co., Jackson, Mich.
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Williams Mchy Co., A. R., Toronto, Ont.

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Seneca Falls Mfg. Co., Seneca Falls, N.Y

LATHES, HORIZONTAL
Intern'l. Mchy. Supplies Ltd., Montreal.
Wood Turret Machine Co., Brazil, Ind.

LATHES, JOURNAL TRUEING
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.

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Wood Turret Machine Co., Brazil, Ind.
G. F. Foss Mchy. & S'ply Co., Montreal
Garlock-Walker Machy. Co., Toronto, Ont.

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Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

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Bertram & Sons Co., John, Dundas, Ont.
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Canada Machinery Corp., Galt, Ont.
Cisco Machine Tool Co., Cincinnati, O.
Foss Mchy. & Sply Co., G. F., Montreal
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Hepburn Ltd., John T., Toronto, Ont.
Lehman Machine Co., St. Louis, Mo.
Niles-Bement-Pond Co, New York.
Rae Mach. Tool Co., Hamilton.
Seneca Falls Mfg. Co., Seneca Falls, N.Y.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
Williams Machy. Co., A. R., Toronto.
Wood Turret Machine Co., Brazil, Ind.

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Bliss Co., E. W., Brooklyn, N.Y.

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Cisco Machine & Tool Co., Cincinnati, O.
Canada Machinery Corporation, Galt, Ont.
Knight Metal Products, Toronto.
Lehman Machine Co., St. Louis, Mo.
Rae Mach. Tool Co., Hamilton.
Seneca Falls Mfg. Co., Seneca Falls, N.Y

LATHES, QUICK CHANGE
Lehman Machine Co., St. Louis, Mo.

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Hardinge Bros., Chicago, Ill.
Acme Machine Tool Co., Cincinnati, Ohio

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Turner Brass Works, Sycamore, Ill.

LEATHER STRAPPING
Graton & Knight Mfg. Co., Worcester M

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LEVELS

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See Belting, Chain.

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Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Williams Machy. Co., A. R., Toronto.

MACHINERY GUARDS (See Guards; MACHINERY SUPPLIES

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Globe Engineering Wks., Hamilton, Ont.
Knight Metal Products, Toronto.

MACHINERY, SPECIAL

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Crescent Machine Co., Ltd., Montreal, Que.
McClean Machine & Tool Co., Ltd., Hamilton, Ont.

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Pratt & Whitney Co., Dundas, Ont.

MARKING DEVICES

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MARKING MACHINERY

Brown, Boggs Co., Hamilton, Ont.
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Petrie, Ltd., H. W., Toronto.

MATERIALS, HANDLING PLANTS

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See Chemists.

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Oakley Chemical Co., New York, N.Y.

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METAL SAWS

See Saws.

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Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

MILLING ARBORS

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Brown & Sharpe Mfg. Co., Providence, R.I.
Kearney & Trecker Co., Milwaukee Wis.

MILLING ATTACHMENTS

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Bertram & Sons Co., John, Dundas, Ont.
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Canada Machinery Corp., Galt, Ont.
Cincinnati Milling Machine Co., Cincinnati
Ford-Smith Mach. Co., Hamilton, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Knight Metal Products, Toronto.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
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Whitney Mfg. Co., Hartford, Conn.
Williams Machy. Co., A. R., Toronto.

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Bilton Mach. Tool Co., Bridgeport, Conn.
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Betts Machine Co., Rochester, N.Y.
Petrie, Ltd., H. W., Toronto.
Standard Equipment & Tool Wks., Montreal, P.Q.

MILLING CUTTERS

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Cleveland Milling Machine Co., Cleveland.
Deloro Smelting & Refining Co., Ltd, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Marshall, Son & Bunney, Toronto.
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Wilt Twist Drill Co., Walkerville, Ont.

MILLING MACHINES, HAND

Bristol Machine Tool Co., Bristol, Conn.

MILLING MACHINES, THREAD

Gisholt Machine Co., Madison, Wis.
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Pratt & Whitney Co., Dundas, Ont.
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Canada Machinery Corp., Galt, Ont.
Ford-Smith Mach. Co., Hamilton, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Knight Metal Products, Toronto.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Rockford Milling Mach. Co., Rockford, Ill.
United States Mach. Tool Co., Cincinnati.
Whitney Mfg. Co., Hartford, Conn.
Williams Machy. Co., A. R., Toronto.

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Canada Machinery Corp., Galt, Ont.
Cleveland Milling Machine Co., Cleveland.
Cincinnati Milling Machine Co., Cincinnati
Ford-Smith Mach. Co., Hamilton, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Garvin Machine Co., New York.
National Machy. Co., Tiffin, Ohio.
Gooley & Eduud, Inc., Cortland, N.Y.
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Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Knight Metal Products, Toronto.
Niles-Bement-Pond Co., New York.
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Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
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Modern Tool Co., Erie, Pa.
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Petrie, Ltd., H. W., Toronto.
Williams Machy. Co., A. R., Toronto.
Williams Mchy Co., A. R., Toronto, Ont

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Lincoln Electric Co. of Canada, Ltd., Toronto, Ont.
MacGovern & Co., Montreal, Que.
Northern Elec. Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto.
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Volta Mfg. Co., Welland, Ont.
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Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

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See Steel.

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Garvin Machine Co., New York.
Hall & Son, J. H., Brantford, Ont.
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Landis Machine Co., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
Petrie, Ltd., H. W., Toronto.

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OIL STONES

Alkenhead Hardware Co., Toronto, Ont.
Carborundum Co., Niagara Falls, N.Y.
Norton Co., Worcester, Mass.
Rice Lewis & Son, Toronto, Ont.

OIL STONE GRINDERS

Oliver Machy. Co., Grand Rapids Mich.

OIL STORAGE SYSTEMS

Bowser Co., Ltd., S. F., Toronto, Ont.
St. Lawrence Welding Co., Ltd., Montreal.

OPENING DIE HEADS

Greenfield Tap & Die Corp, Greenfield
Wells Bros. of Canada, Galt, Ont.

OPTICAL SUPPLIES

Consolidated Optical Co., Toronto, Ont.

ORE HANDLING EQUIPMENT

Brown Hoisting Machinery Co., Cleveland, Ohio.
Canadian Link-Belt Co., Ltd., Toronto, Ont.
Canadian Mead-Morrison Co., Limited, Montreal, Que.

OSCILLATING VALVE GRINDERS (PNEUMATIC)

Cleveland Pneumatic Tool Co. of Canada Toronto

OVENS FOR BAKING, BLUING, DRYING, ENAMELING, JAPANNING AND LACQUERING

Brantford Oven & Rack Co., Brantford.

OVEN TRUCKS, STEEL

Brantford Oven & Rack Co., Brantford.
MacKinnon Steel Co., Sherbrooke, Que.

OVENS FOR DRYING, TEMPER AND OXYGEN, ELECTROLYTIC CELLS UNDER TRUCKS

Welding & Supplies Co., Montreal, Que.
Brantford Oven & Rack Co., Brantford.

OXY-ACETYLENE WELDING AND CUTTING AND OUTFITS

Carter Welding Co., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.
Prest-o-Lite Co., Inc. Toronto, Ont.
Davis-Bournonville Co., Toronto, Ont.

OXYGEN

Carter Welding Co., Ltd., Toronto, Ont.
Dominion Oxygen Co., Ltd., Toronto, Ont.
Nat. Electro Products Ltd., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.

OXYGEN PLANTS (ELECTROLYTIC)

Davis-Bournonville Co., Toronto, Ont.

PACKINGS, ASBESTOS

Cleveland Wire Spring Co., Cleveland.

PACKING, ROD AND SHEET

Dunlop Tire & Rubber Goods Co., Ltd. Toronto.
Goodyear Tire & Rubber Co., Can., Ltd. Toronto
Gutta Percha & Rubber, Ltd., Toronto.
International Mach. Sply., Ltd., Montreal
Petrie, Ltd., H. W., Toronto.
Quaker City Rubber Co., Philadelphia, Pa.

PANS, WET AND DRY

Frost Mfg. Co., Chicago, Ill.

PAPER MILL CONVEYORS AND DRIVES

Bertrams, Ltd., Edinburgh, Scotland.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Can. Link-Belt Co., Toronto, Ont.
Gutta Percha & Rubber, Ltd., Toronto.
MacKinnon Steel Co., Sherbrooke, Que.

PARTITIONS, WIRE

See Guards

PAPER MILL MACHINERY

Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Garlock-Walker Machinery Co., Toronto.
Hamilton Co., Ltd., Wm., Peterborough Ont.
MacKinnon Steel Co., Sherbrooke, Que.

PATTERN SHOP EQUIPMENT

Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Oliver Machy. Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto.

PATTERN MAKERS' LATHES

See Lathes.

PATENT SOLICITORS

Sudden, Hanbury A., Montreal.
Fetherstonhaugh & Co., Ottawa.
Marion & Marion, Montreal.
Aidout & Maybee, Toronto.

PECK CARRIERS FOR POWER PLANTS

Can. Link-Belt Co., Toronto, Ont.

PENSTOCKS

William Hamilton Co., Peterboro, Ont.

PERFORATED METALS AND ORNAMENTAL IRON GOODS

Canada Wire & Iron Goods Co., Hamilton

PHOSPHOR TIN, COPPER AND BRONZE

British Smelting & Refining Co., Ltd., Montreal, Que.

PHOTOSTATS

Commercial Camera Co., Providence, R.I.

PIG IRON

Hanna & Co., M. A., Cleveland, O.
Steel Co. of Canada, Ltd., Hamilton, Ont.

PINS, TAPER

Morrow Screw & Nut Co., J., Ingersoll, Ont.

PINS, BELT-LACING

Clipper Belt Lacer Co., Grand Rapids.

PIPE, BLACK & GALVANIZED

Crane, Ltd., Montreal, Que.

PIPE FITTINGS, MALLEABLE AND CAST IRON

International Malleable Iron Co., Guelph

PIPE CUTTING AND THREADING MACHINES

Barber Mchy. Co., Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Curtis & Curtis Co., Bridgeport, Conn.
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield.
Hall & Sons, John H., Brantford.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
McDougall Co., R., Galt.
Petrie, Ltd., H. W., Toronto.
Wells Bros. Co. of Canada, Galt, Ont.
Williams Tool Co., Erie, Pa.
Williams Machy. Co., A. R., Toronto.

PIPE, JOINT COMPOUNDS

Crane, Ltd., Montreal, Que.

PIPE RIVETED STEEL

Toronto Iron Works, Ltd., Toronto.
William Hamilton Co., Peterboro, Ont.

PIERCING

Oliver Machy. Co., Grand Rapids, Mich.

PIPE CUTTERS, ROLLING

Curtis & Curtis Co., Bridgeport, Conn.
Greenfield Tap & Die Corp., Greenfield
Hall & Sons, Ltd., John H., Brantford.
Wells Bros. Co. of Canada, Galt, Ont.

Instead of Specifying This:

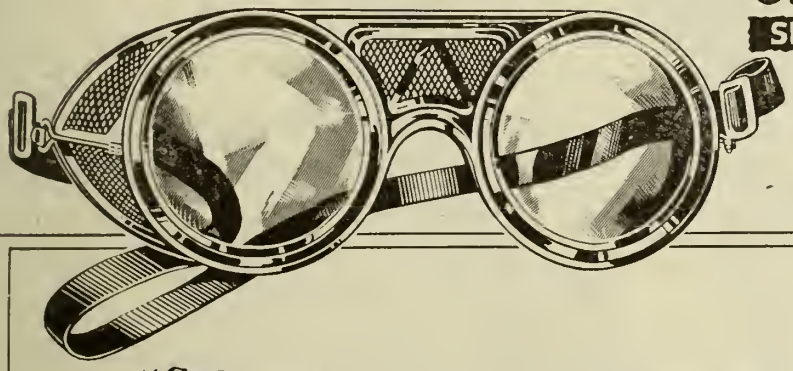
"to be substantial enough to weather the individual workman's idea of bending the goggle to suit himself"

Write this:

STOCO SAFETY GOGGLES

"CELOGLAS"

SHATTER-PROOF LENS



"STOCO Safety Goggles" is the quickest way to specify a protection glass which will at least give you a run for your money under the unusual conditions peculiar to shop wear. It has a one piece front that will not warp or twist out of shape, one piece folding side shields and a rim locking device that permits anyone to change a pitted lens quickly without special tools.

And "Celoglas Lenses" added to the order is shorthand for a lens that cannot shatter into the wearer's eyes no matter how hard it may be hit.

We are always glad to demonstrate the STOCO Safety Goggle and Celoglas Shatter-Proof Lens—by mail and without obligation—promptly on receipt of request.

STOCO Safety Goggles
Price per Hundred
(F. O. B. Geneva, N. Y.)

With optical glass lenses	$ 90.00
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Of course we sell in lots of less than 100. We also give interesting discounts for quantity orders.

Black elastic headbands or easy cable earbows at the same price.

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If interested tear out this page and place with letters to be answered

PIPE TOOLS AND DIES
Ackworthie Ltd., J., Birmingham, Eng.
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PIPE CUTTERS AND REAMERS
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PIPE STOCKS AND THREADERS
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PIPE TAPS AND VISES
Ackworthie Ltd., J., Birmingham, Eng.
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PIPE WRENCHES
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PISTON AND PISTON RING MACHINES
National Acme Co., Windsor, Vt.

PLANER BOLTS
Atkins & Co., E. C., Hamilton, Ont.
Morrow Screw & Nut Co., J., Ingersoll, Ont

PLANER JACKS
Armstrong Bros. Tool Co., Chicago.

PLANERS, STANDARD AND ROTARY
Betts Machine Co., Rochester, N.Y.
Barber Mchy. Co., Ltd., Toronto, Ont.
Bertram & Sons Co., John, Dundas.
Oliver Machy. Co., Grand Rapids, Mich.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Fess Mchy. & S'ply Co., G. F., Montreal
Gardner & Son, Robt., Montreal.
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Morton Mfg. Co., Muskegon Heights, Mich
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
Standard Equipment & Tool Wks., Montreal.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.

PLANING AND SHAPING MACHINERY
Barber Mchy. Co., Ltd., Toronto, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Fess Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co, New York.
Niles-Bement-Pond Co., New York.
Ohio Mach. Tool Co, Kenton, Ohio.
Perrin, Ltd., William, Toronto.
Williams Mchy Co. Ltd., A. R., Montreal

PLANER-SHAPER, COMBINED OPEN SIDE
Lynd-Farquhar Co., Boston.
Petrie, Ltd., H. W., Toronto.

POWER HAMMERS
Quickwork Co., St. Marys, Ohio.

PLANING MILL EXHAUSTERS
Can. Blower & Forge Co., Kitchener, Ont.
MacGovern & Co., Montreal, Que.
Niles-Bement-Pond Co., New York.
Sturtevant Co., B. F., Galt, Ont.

PLATES, Q.M., SHEARED AND CHEQUERED
Pedlovers, Ltd., Toronto, Ont.

PLATING, PLANTS & SUPPLIES
Can. Hanson Van Winkle Co., Ltd., Toronto, Ont.

PLIERS
Aikenhead Hardware Co., Toronto.
Can. Billings & Spencer, Ltd., Welland.
Elec Lewis & Son, Toronto, Ont.

PNEUMATIC EQUIPMENT
Strelinger Co., C. A., Windsor, Ont.

PNEUMATIC TOOLS
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland P'matic Tool Co., Can., Toronto.
Curtis Pneumatic Machy. Co., St. Louis
Garlock-Walker Machy. Co., Toronto.
Int. Mach. & Supply Co., Ltd., Montreal.
Independent Pneumatic Tool Co., Chicago.

POWER CRANES, HAND
MacKinnon Steel Co., Sherbrooke, Que.

POLISHING MACHINES
Ackworthie Ltd., J., Birmingham, Eng.
Brown & Sharpe Mfg. Co., Providence, R.I.
Ford-Smith Machine Co., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto.

POLISHING PLATES
Greenfield Tap & Die Corp., Greenfield.
Petrie, Ltd., H. W., Toronto.
Wells Bros. of Canada, Galt, Ont.

POLISHING PAPER
H. H. Barton & Son Co., Philadelphia.

POTS AND KETTLES, CAST STEEL
Elec Steel & Metals, Welland, Ont.

POWER HOUSE CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

PORTABLE MACHINERY
Haskins & Co., R. C., Chicago, Ill.

POWER TRANSMISSION MCHY
Canadian Link-Belt Co., Ltd., Toronto, Hamilton Co., Ltd., Wm., Peterborough, Ont.
Petrie, Ltd., H. W., Toronto.

PRESSED STEEL PARTS
Ackworthie Ltd., J., Birmingham, Eng.
Gray Ball Bearing Co., Ltd., Toronto.

PRESSERS, ARBOR
Atlas Press Co., Kalamazoo, Mich
Metalwood Mfg. Co., Detroit, Mich.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
Lourie Manufacturing Co., Springfield, Ill.

PRESSES, BROACHING, FORGING AND FLANGING
Atlas Press Co., Kalamazoo, Mich.
Barber Mchy. Co., Ltd., Toronto, Ont.
Bliss Co., E. W., Brooklyn, N.Y.
Dom. Steel Products Co., Ltd., Brantford
Metalwood Mfg. Co., Detroit, Mich
Petrie, Ltd., H. W., Toronto.
Toledo Machine & Tool Co., Toledo.
Stoll Co., D. H., Buffalo, N.Y.
Williams Mchy Co., Ltd., A. R., Montreal

PRESSES, CAM, TOGGLE, EYELET
Baird Machine Co., Bridgeport, Conn.
Bliss Co., E. W., Brooklyn N.Y.
Toledo Machine & Tool Co., Toledo.
Stoll Co., D. H., Buffalo, N.Y.

PRESSES, FILTER
Perrin, Ltd., William R., Toronto.
Smalley-General Co., Inc., Bay City, Mich.

PRESSES, PNEUMATIC
Barber Mchy. Co., Ltd., Toronto, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Metalwood Mfg. Co., Detroit, Mich.
Toledo Machine & Tool Co., Toledo.

PRESSES, DROP AND FORGING
Barber Mchy. Co., Ltd., Toronto, Ont.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs Co, Ltd., Hamilton.
Can. Fairbanks-Morse Co., Montreal.
Niles-Bement-Pond Co., New York.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co, Toledo.

PRESSES, HYDRAULIC
Barber Mchy. Co., Ltd., Toronto, Ont.
Bertram & Sons Co., John, Dundas.
Can. Ingersoll-Rand Co., Ltd. Sherbrooke,
Dom. Steel Products Co., Ltd., Brantford
Lourie Manufacturing Co., Springfield, Ill.
Metalwood Mfg. Co., Detroit, Mich.
Niles-Bement-Pond Co., New York.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.
Toledo Machine & Tool Co, Toledo.
Stoll Co., Inc., D. H., Buffalo, N.Y.
Williams Machy. Co., A. R., Toronto.

PRESSES, HYDRO-PNEUMATIC
Eastern Production Co., Detroit, Mich.

PRESSES, BALING
Perrin, Ltd., William R., Toronto.

PRESSES, POWER
Baird Machine Co., Bridgeport, Conn.
Barber Mchy. Co., Ltd., Toronto, Ont.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machinery Co., Toronto.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo.
Williams Machy. Co., A. R., Toronto.

PRESSES, SPRING FOOT
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Ont.
Toledo Machine & Tool Co., Toledo.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., Ltd., A. R., Montreal

PRESSES, SCREW
Barnes & Co., W. F. & Jno., Rockford, Ill
Bliss Co., E. W., Brooklyn, N.Y.
Manhattan Machine & Tool Co., Grand Rapids, Mich.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.

PRESSES, TIRE
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,

PRESSES, TRIMMING
Bliss Co., E. W., Brooklyn, N.Y.
Canada Machinery Corp., Galt, Ont.
Petrie, Ltd., H. W., Toronto.
Stoll Co., D. H., Buffalo, N.Y.

PROJECTORS, FLOOD LIGHTING
Lyman Tube & Supply Co., Montreal, Que

PROPELLERS
Kennedy & Sons, Wm., Owen Sound.

PROTECTIVE COATINGS
H. H. Robertson, Ltd., Sarnia, Ont.

PSYCROMETERS, SLING
Taylor Instrument Co., Rochester, N.Y.

PULLEYS
Algoma Steel Corp., Sault Ste. Marie, Ont
American Pulley Co., Philadelphia.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., Fortierville, Que.
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Diamond State Fibre Co., Bridgeport, Pa.
Ford-Smith Machine Co., Hamilton, Ont.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Kennedy & Sons, Ltd., W., Owen Sound.
Positive Clutch & Pulley Works Ltd., Toronto.
Petrie, Ltd., H. W., Toronto.

PULLEYS, STEEL SASH, STEEL BELT
American Pulley Co., Philadelphia, Pa.

PULLEYS, FRICTION, CLUTCH
American Pulley Co., Philadelphia, Pa.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., A., Fortierville, Q
Can. Link-Belt Co., Toronto, Ont.
Carlyle Johnson Mch. Co., Manchester, Ct.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Jones & Glassco, Montreal.
Positive Clutch & Pulley Works, Toronto.
Petrie, Ltd., H. W., Toronto.

PULP MILL MACHINERY
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Hamilton Co., Ltd., Wm., Peterborough, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

PUMPS, AIR LIFT
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,

PUMPS, BOILER FEED
Can. Ingersoll-Rand Co., Ltd. Sherbrooke,

PUMPS, CENTRIFUGAL
Bowser Co., Ltd., S. F., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Ingersoll-Rand Co., Montreal, Que.
Darling Bros., Ltd., Montreal, Que.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

PUMPS, FUEL OIL
Bowser Co., Ltd., S. F., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Darling Bros., Ltd., Montreal, Que.
Trahern Pump Co., Rockford, Ill.

PUMPS, GEARED
Darling Bros., Ltd., Montreal, Que.
Globe Engineering Co., Hamilton, Ont.

PUMPS, HIGH PRESSURE
Perrin, Ltd., William R., Toronto.

PUMPS, HYDRAULIC
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Clarke & Co., Furniss, Montreal, Que.
Garlock-Walker Machinery Co., Toronto.
Darling Bros., Ltd., Montreal, Que.
Elec. Steel & Metals, Welland, Ont.
Metalwood Mfg. Co., Detroit, Mich.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

PUMPS, LUBRICATING, OIL STORAGE
Bowser Co., Ltd., S. F., Toronto, Ont.

PUMPS, RETURN AIR
Can. Ingersoll-Rand Co. Ltd., Sherbrooke,

PUMPS, SPECIAL
Elec. Steel & Metals, Welland, Ont.

PUMPS, RUBBER CEMENT
Bowser Co., Ltd., S. F., Toronto, Ont.

PUMPS, KEROSENE, OIL, SELF-MEASURING
Bowser Co., Ltd., S. F., Toronto, Ont.

PUMPS, LUBRICANT, OIL, WATER
Darling Bros., Ltd., Montreal, Que.
Trahern Pump Co., Rockford, Ill.

PUMPS — ROTARY
General Combustion Co., Ltd., Montreal, Que.

PUMP LEATHERS
Graton & Knight Mfg. Co., Worcester.

PUNCHES AND DIES
Atkins & Co., Ltd., Wm., Sheffield, Eng.
E. W. Bliss Co, Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Can.
Can. Blower & Forge Co., Kitchener, Ont.
Crescent Mach. Co., Ltd., Montreal, P.Q.
Can. Fairbanks-Morse Co., Montreal.
Elliott & Whitehall Machine and Tool Co., Galt, Ont.
Gardner & Son, Robert, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Marshall, Son & Blunney, Toronto.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, O.
Williams Mchy Co., A. R., Toronto, Ont.

PUNCHES, POWER
John Bertram & Sons Co., Dundas, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd, Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machinery Co., Toronto.
A. B. Jardine & Co., Hespeler, Ont.
Long & Allstatter, Hamilton, Ohio.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
D. H. Stoll Co., Buffalo, N.Y.
Williams Mchy Co., A. R., Toronto, Ont.

PUNCHING MACHINES, HORIZONTAL
Bertrams, Ltd., Edinburgh, Scotland.
Bertrams & Sons, John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co, Ltd., Hamilton, Ont.
Garlock-Walker Mach'y. Co., Toronto.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

PYROMETERS
Bristol Co., Waterbury, Conn.
Shore Instrument & Mfg. Co., New York
Taylor Instrument Co., Rochester, N.Y.

QUARTERING MACHINES
Bertram & Sons, John, Dundas, Ont.
Canadian Mead-Morrison Co., Limited, Montreal, Que.
Niles-Bement-Pond Co., New York.

QUARRY HOISTS
Canadian Mead-Morrison Co., Limited, Montreal, Que.

RAIL BENDERS
Algoma Steel Corp., Sault Ste. Marie, O.

PUNCHES, HAND
Niles-Bement-Pond Co., New York.

RAILROAD TOOLS
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machinery Co., Toronto.
Niles-Bement-Pond Co., New York.
Petrie Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

RASPS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall, Son & Bunney, Toronto.

RAWHIDE PINIONS (See Gears)

REAMERS
Butterfield & Co., Inc., Rock Island, Que.

REAMERS, ADJUSTABLE
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co. Cleveland
Elliott & Whitehall Machine and Tool Co., Galt, Ont.
Greenfield Tap & Die Corp., Greenfield.
Ingersoll Machy. Co., Ingersoll, Ont.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
McCrosky Tool Corp., Meadville, Pa., U. S. A.
Plewes, Ltd., Winnipeg, Man.
Pratt & Whitney Co., Dundas, Ont.
The Kelly Reamer Co., Cleveland, O.
J. A. M. Taylor, 318 Stair Bldg., Toronto.
Wells Bros. of Can., Galt, Ont

REAMERS, BRIDGE, EXPANDING AND HIGH SPEED
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Aikenhead Hardware Co., Toronto.
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Elliott & Whitehall Machine and Tool Co., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Lyman Tube & Supply Co., Montreal, Que
Marshall, Son & Bunney, Toronto.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Morse Twist Drill & Mch. Co., New Bedford, Mass.
McCrosky Tool Corp., Meadville, Pa., U. S. A.
Samuel Osborne, Ltd., Montreal, P.Q.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

REAMERS, STEEL TAPER AND SELF-FEEDING
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

REAMERS, CHUCKING
Ackworthie Ltd., J., Birmingham, Eng.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Inc., Rock Island, Que
Elliott & Whitehall Machine and Tool Co., Galt, Ont.
Greenfield Tap & Die Corp., Greenfield.
Ingersoll Machy. Co., Ingersoll, Ont.
Marshall, Son & Bunney, Toronto.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wells Bros. of Canada, Galt, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

REAMERS, HAND
Ackworthie Ltd., J., Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Elliott & Whitehall, Galt, Ont.
Greenfield Tap & Die Corp., Greenfield
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wells Bros. of Can., Galt, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

REAMERS, PIN
Ackworthie Ltd., J., Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield.
Morrow Screw & Nut Co., John, Ingersoll.
Wells Bros. of Can., Galt, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

REAMER FLUTING MACHINES
Garvin Machine Co., New York.

REAMING MACHINES, PNEUMATIC
Cleveland Pneumatic Co. of Can., Toronto
Garlock-Walker Machinery Co., Toronto.

RECORDING INTRUMENTS
Bristol Co., Waterbury, Conn.
Gisholt Machine Co., Madison, Wis.
Taylor Instrument Co., Rochester, N.Y.

REELS, WIRE AND TEXTILE MFG.
American Pulley Co., Philadelphia, Pa.

REGULATORS, AUTOMATIC
Electric Steels & Metals, Ltd., Welland.

REGULATORS, PRESSURE, TEMPERATURE
Can. Fairbanks-Morse Co., Montreal.
Taylor Instrument Co., Rochester, N.Y.

REPAIR WORK — SAWS
Atkins & Co., E. C., Hamilton, Ont.

REPAIR WORK, ALL KINDS
Elec. Steel & Metals, Welland, Ont.

RIVETS.
Aikenhead Hardware Co., Toronto, Ont.
Parmenter & Bulloch Co., Gananoque.
Rice, Lewis & Son, Toronto.
Steel Co. of Canada, Ltd., Hamilton.

RIVET HEATERS
Chicago Flexible Shaft Co., Chicago, Ill.

RIVETERS, PNEUMATIC, HYDRAULIC, HAMMER, COMPRESSION
Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Montreal.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto.
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.

RIVETING MACHINES, ELASTIC, ROTARY BLOW
Grant Mfg. & Machine Co., Bridgeport.
High-Speed Hammer Co., Rochester.
Petrie, Ltd., H. W., Toronto.
F. B. Shuster Co., New Haven, Conn.
Strelinger Co., C. A., Windsor, Ont.

ROAD BUILDING EQUIPMENT
Can. Ingersoll-Rand Co., Ltd., Sherbrooke.

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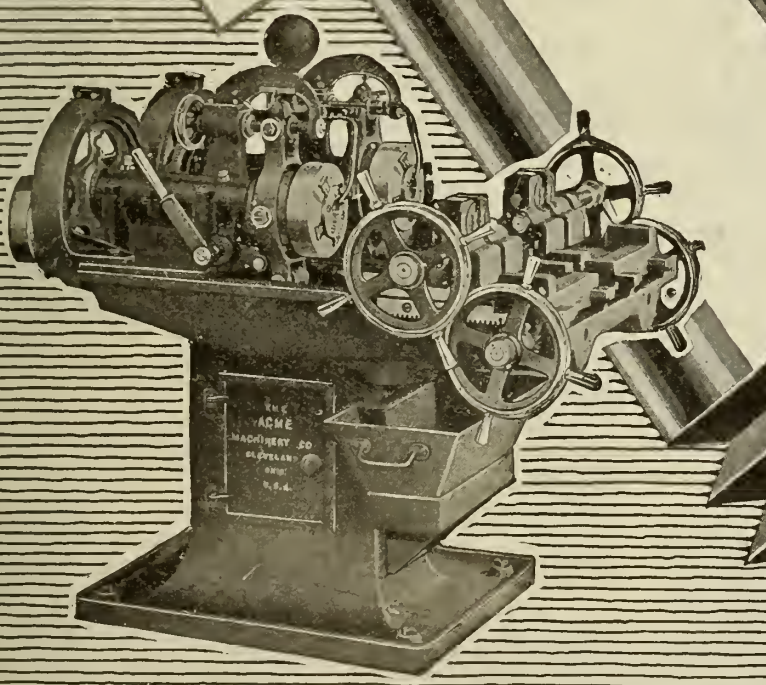

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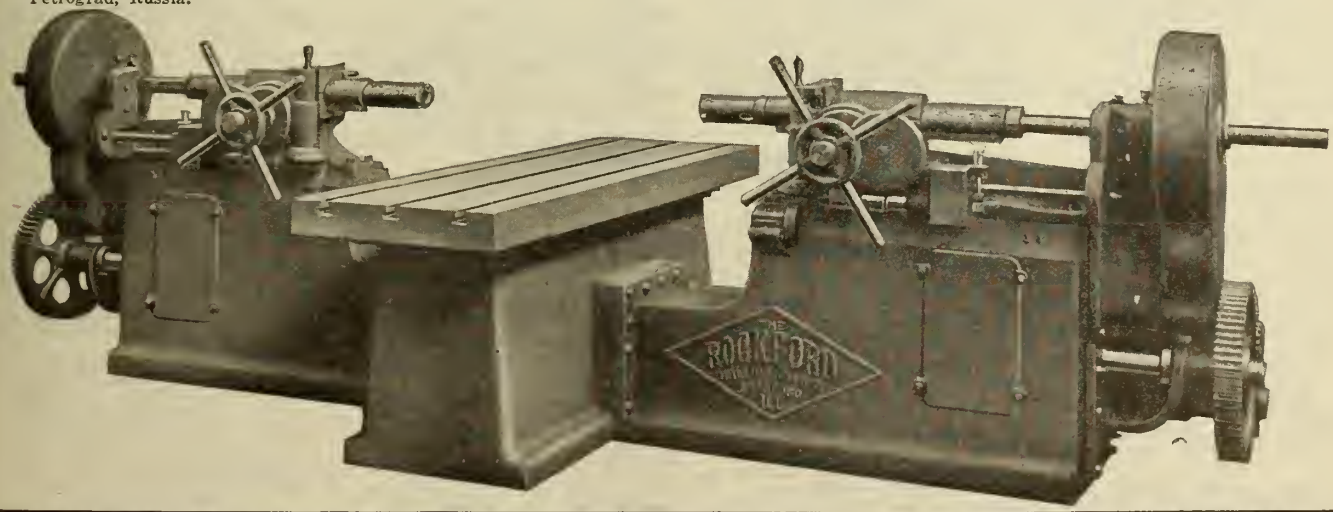

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Dominion Foundries & Steel Ltd., Hamilton, Ont.
Drury, H. A., Co., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.
Vanadium-Alloys Steel Co., Pittsburgh.
Wells Bros. of Can., Galt, Ont.

"STELLITE"
Deloro Smelting & Refining Co., Ltd. Toronto, Ont.

STOCK RACKS FOR BARS, PIPING, ETC.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

STOCKS AND DIES
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros., of Can., Galt, Ont.

STOCKS, PIPE
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Rice Lewis & Son Toronto, Ont.
Wells Bros., Co., of Canada, Galt, Ont.

STONES, COMMUTATORS
Lyman Tube & Supply Co., Ltd., Montreal

STRAIGHTENING MACHINERY
Baird Machinery Co., Bridgeport, Conn.
Bertrams, Ltd., Edinburgh, Scotland.

STRAND
Dom. Steel Products Co., Ltd., Brantford.
Page Steel & Wire Co., Adrian, Mich.

SURFACE PLATES
Brown & Sharpe Mfg. Co., Providence, R.I.

STRUCTURAL STEEL WORKS
William Hamilton Co., Peterboro, Ont.

SWITCHBOARDS
Northern Electric Co., Ltd., Montreal Que

SWITCHES, RAILWAY
Can. Steel Foundries, Ltd., Montreal.

TABLES, DRAWING
Economy Drawing Table Co., Adrian, Mich.

TABLES, SAND-BLAST
Panghorn Corporation, Hagerstown, Md.

TAPPING MACHINES (PNEUMATIC)
Cleveland Pneumatic Tool Co., Toronto.

TANKS, AIR, EXPANSION
Can. John Wood Mfg. Co., Ltd., Toronto

TANKS, GASOLINE, KEROSENE AND OIL
Bowser Co., Ltd. S. F., Toronto, Ont.
Can. John Wood Mfg. Co., Ltd., Toronto
Dominion Bridge Co., Montreal, Que.
Dom. Forge & Stamping Co., Walkerville.
MacKinnon Steel Co., Sherbrooke, Que.
Marshall, Son & Bunney, Toronto.

TANKS, LEAD LINED
Can. Hanson Van Winkle Co., Ltd.,

TANKS, LUBRICATING, OIL STORAGE
Bowser Co., Ltd., S. F., Toronto, Ont.
Can. John Wood Mfg. Co., Ltd., Toronto

TANKS, PNEUMATIC AND CLOSET
Can. John Wood Mfg. Co., Ltd., Toronto

TANKS, RUBBER CEMENT
Bowser Co., Ltd., S. F., Toronto, Ont.

TANKS, STEEL, WATER PRESSURE
Bowser Co., Ltd., S. F., Toronto, Ont.
Dominion Bridge Co., Montreal, Quebec.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
MacGovern & Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Toronto Iron Works, Ltd, Toronto.

TANK WAGONS
MacKinnon Steel Co., Sherbrooke, Que.
Toronto Iron Works, Ltd., Toronto.

TANKS, WELDED
Can. John Wood Mfg. Co., Ltd., Toronto
Can. Hanson Van Winkle Co., Ltd.,
Lincoln Electric Co. of Canada, Ltd., Toronto, Ont.

TANKS
Can. Ingersoll-Rand Co., Ltd., Sherbrooke
Elec. Steel & Metals, Welland, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
William Hamilton Co., Peterboro, Ont.

TAPER PINS
Galt Machine Screw Co., Ltd., Galt, Ont.

TAPES, MEASURING
James Chesterman & Co., Ltd., Sheffield, Eng.
Rice Lewis & Son, Toronto, Ont.

TAPPING MACHINES AND ATTACHMENTS
Bertram, John & Sons Co., Dundas.
Canada Machinery Corp., Galt, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garvin Machine Co., New York.
The Geometric Tool Co., New Haven.
J. H. Hall & Sons, Brantford, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Niles-Bement-Pond Co., New York.
Rickert-Shafer Co., Erie, Pa.
National-Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto.
L. S. Starrett Co., Athol, Mass.
Whitney Mfg. Co., Hartford, Conn.

TAPS, ADJUSTABLE
Butterfield & Co., Rock Island, Que.
Geometric Tool Co., New Haven.
Ingersoll Mach. Co., Ingersoll, Ont.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Pilot Steel & Tool Co., Montreal, Que.
Victor Tool Co., Waynesboro, Pa.

TAPS, GUN, HAND, BOILER
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

TAPS, MACHINE RELIEVED
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

TAPS, MACHINE SCREW
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

TAPS, PIPE
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield.
Ingersoll Mach. Co., Ingersoll, Ont.
Marshall, Son & Bunney, Toronto.
Wells Bros. of Can., Galt, Ont.

TAPS, SPECIAL
Elliott & Whitehall, Galt, Ont.

TAPS, STAYBOLT, TAPPER
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

TAPS, DIES AND WRENCHES
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Rice Lewis & Son, Toronto, Ont.
Starrett Co., L. S., Athol, Mass.
Taylor, J. A. M., 315 Stair Bldg., Toronto.
Wells Bros. of Canada, Galt, Ont.

TAP EXTRACTORS
Walton Co., The, Hartford, Conn.

THERMOMETERS, INDUSTRIAL ENGRAVED TEMPERATURE AND PRESSURE
Taylor Instrument Co., Rochester, N.Y.

THERMOMETERS, RECORDING AND INDEX
Bristol Co., Waterbury, Conn., U.S.A.
Taylor Instrument Co., Rochester, N.Y.

TESTING INSTRUMENTS, METALLURGICAL
Shore Instrument & Mfg. Co., New York.

TENOVERS
Oliver Machy. Co., Grand Rapids, Mich.

TESTING LABORATORIES
Toronto Testing Laboratory, Toronto.

THREAD-CUTTING MACHINES
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Mach. Co., Ltd., Toronto
Geometric Tool Co., New Haven.
Jardine & Co., Ltd., A. B., Hespeler.
Landis Machine Co., Waynesboro, Pa.
National-Acme Co., Cleveland, Ohio.
National Machy. Co., Tiffin, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Wells Bros. Co. of Canada, Galt, Ont.

THREADING TOOLS
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield.
Landis Machine Co., Waynesboro, Pa.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. of Canada, Galt, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

THREADING MACHINES FOR BOLTS, NUTS AND PIPES
Greenfield Tap & Die Corp., Greenfield.
Petrie, Ltd., H. W., Toronto.
Wells Bros. Co. of Canada, Galt., Ont.

THREAD MILLING MACHINES
Taft-Pierce Mfg. Co., New York, N.Y.
Smalley-General Co., Bay City, Mich.

THUMB SCREWS AND NUTS
See Screws.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

TIN—PIG AND BAR
British Smelting & Refining Co., Ltd., Montreal, Que.

TINSMITHS' TOOLS
Brown, Boggs & Co., Hamilton, Can.
Petrie, Ltd., H. W., Toronto.

TIRE BENDERS
Jardine & Co., Ltd., A. B., Hespeler.

TIRE SETTING MACHINES, HYDRAULIC
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Perrin, Ltd., William R., Toronto.
West Tire Setter Co., Rochester, N.Y.

TOOL CASES
Rice Lewis & Son, Toronto, Ont.

TOOL HOLDERS
Aikenhead Hardware Co., Toronto, Ont.
Armstrong Bros. Tool Co., Chicago.
Cleveland Twist Drill Co., Cleveland.
Deloro Smelting & Refining Co., Ltd Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

TOOL MAKERS
Samuel Osborne (Can.), Ltd., Montreal

TOOL POSTS, LATHE
Armstrong Bros. Tool Co., Chicago.
Williams & Co., J. H., Brooklyn, N.Y.

TOOL ROOM PARTITIONS
Canada Wire & Iron Goods Co., Hamilton.

TOOLS, BLACKSMITHS'
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Rice Lewis & Son Toronto, Ont.

TOOLS, ADJUSTABLE BORING
Kelly Reamer Co., Cleveland, O.
Petrie, Ltd., H. W., Toronto.

TOOLS, ELECTRIC
Independent Pneumatic Tool Co., Chicago.
Williams Machy. Co., A. R., Toronto.
Ford-Smith Machine Co., Hamilton, Ont.
U. S. Electrical Tool Co., Cincinnati, O.

TOOLS, FORMING
Davidson Tool Mfg. Co., New York, N.Y.
Deloro Smelting & Refining Co., Ltd. Toronto, Ont.

TOOLS, LUMBERING
Thos. Pink & Co., Pembroke, Ont.

TOOLS, LATHE, PLANER, SLOTTER
Armstrong Bros. Tool Co., Chicago.
Gisholt Machine Co., Madison, Wis.
Williams & Co., J. H., Brooklyn, N.Y.

TOOLS, SCREW MACHINE
Foster Machine Tool Co., Hibbard, Ind.

TOOLS, SHOP
Strelinger Co., C. A., Windsor, Ont.
Landis Machine Co., Waynesboro, Pa.
Morse Twist Drill & Mchy. Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Rice Lewis & Son, Toronto, Ont.
Starrett Co., L. S., Athol, Mass.
Taylor, J. A. M., 315 Stair Bldg., Toronto.
Wells Bros. of Canada, Galt, Ont.

TAP EXTRACTORS
Walton Co., The, Hartford, Conn.

THERMOMETERS, INDUSTRIAL ENGRAVED TEMPERATURE AND PRESSURE
Taylor Instrument Co., Rochester, N.Y.

THERMOMETERS, RECORDING AND INDEX
Bristol Co., Waterbury, Conn., U.S.A.
Taylor Instrument Co., Rochester, N.Y.

TESTING INSTRUMENTS, METALLURGICAL
Shore Instrument & Mfg. Co., New York.

TENOVERS
Oliver Machy. Co., Grand Rapids, Mich.

TESTING LABORATORIES
Toronto Testing Laboratory, Toronto.

THREAD-CUTTING MACHINES
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Mach. Co., Ltd., Toronto
Geometric Tool Co., New Haven.
Jardine & Co., Ltd., A. B., Hespeler.
Landis Machine Co., Waynesboro, Pa.
National-Acme Co., Cleveland, Ohio.
National Machy. Co., Tiffin, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Wells Bros. Co. of Canada, Galt, Ont.

THREADING TOOLS
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield.
Landis Machine Co., Waynesboro, Pa.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. of Canada, Galt, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

THREADING MACHINES FOR BOLTS, NUTS AND PIPES
Greenfield Tap & Die Corp., Greenfield.
Petrie, Ltd., H. W., Toronto.
Wells Bros. Co. of Canada, Galt., Ont.

THREAD MILLING MACHINES
Taft-Pierce Mfg. Co., New York, N.Y.
Smalley-General Co., Bay City, Mich.

THUMB SCREWS AND NUTS
See Screws.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

TIN—PIG AND BAR
British Smelting & Refining Co., Ltd., Montreal, Que.

TINSMITHS' TOOLS
Brown, Boggs & Co., Hamilton, Can.
Petrie, Ltd., H. W., Toronto.

TIRE BENDERS
Jardine & Co., Ltd., A. B., Hespeler.

TIRE SETTING MACHINES, HYDRAULIC
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Perrin, Ltd., William R., Toronto.
West Tire Setter Co., Rochester, N.Y.

TOOL CASES
Rice Lewis & Son, Toronto, Ont.

TOOL HOLDERS
Aikenhead Hardware Co., Toronto, Ont.
Armstrong Bros. Tool Co., Chicago.
Cleveland Twist Drill Co., Cleveland.
Deloro Smelting & Refining Co., Ltd Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

TOOL MAKERS
Samuel Osborne (Can.), Ltd., Montreal

TOOL POSTS, LATHE
Armstrong Bros. Tool Co., Chicago.
Williams & Co., J. H., Brooklyn, N.Y.

TOOL ROOM PARTITIONS
Canada Wire & Iron Goods Co., Hamilton.

TOOLS, BLACKSMITHS'
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Rice Lewis & Son Toronto, Ont.

TOOLS, ADJUSTABLE BORING
Kelly Reamer Co., Cleveland, O.
Petrie, Ltd., H. W., Toronto.

TOOLS, ELECTRIC
Independent Pneumatic Tool Co., Chicago.
Williams Machy. Co., A. R., Toronto.
Ford-Smith Machine Co., Hamilton, Ont.
U. S. Electrical Tool Co., Cincinnati, O.

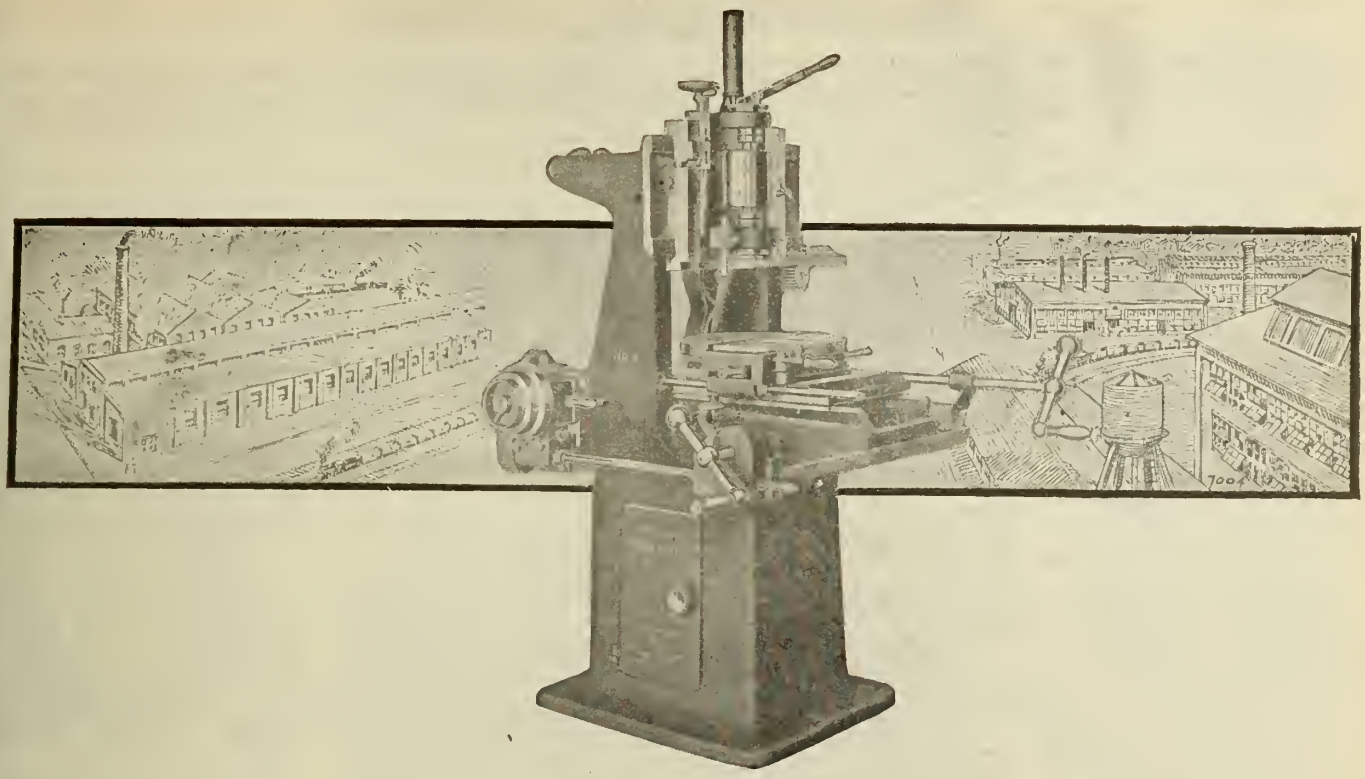
TOOLS, FORMING
Davidson Tool Mfg. Co., New York, N.Y.
Deloro Smelting & Refining Co., Ltd. Toronto, Ont.

TOOLS, LUMBERING
Thos. Pink & Co., Pembroke, Ont.

TOOLS, LATHE, PLANER, SLOTTER
Armstrong Bros. Tool Co., Chicago.
Gisholt Machine Co., Madison, Wis.
Williams & Co., J. H., Brooklyn, N.Y.

TOOLS, SCREW MACHINE
Foster Machine Tool Co., Hibbard, Ind.

TOOLS, SHOP
Strelinger Co., C. A., Windsor, Ont.



Garvin Profiling Machine

an aid to manufacturing economy

The cost of machining irregular outlines depends to a great extent on the machine tool used. For work of this character you will want to employ a well designed profiling machine. It must be flexible, cover a wide range of work and be easy to operate. You cannot expect to do as satisfactory work with a machine not designed for the purpose or one which is sluggish to manipulate. Garvin Profiling Machines meet your most exacting demand for speed, accuracy and economy.

Both main and rotary table of the No. 4 machine pictured above are arranged for power feed. Both tables also have automatic trips for throwing out the feed. The six changes of feed are all enclosed, free from accident to themselves or the operator. Provisions are made for disengaging the power feed to the rotary table, so it can be operated by hand, or the feed can be withdrawn from the table and will quickly make spot or jump cuts.

There are a great many other features about which you will want to know. The whole story is told in Circular 197. Ask for your copy.

Ask your dealer or address.

The Garvin Machine Company, Spring & Varick Streets, New York, N.Y.

GARVIN

BUILDER OF BETTER MACHINE TOOLS

TOOLS, SPECIAL
Crescent Machine Co., Ltd., Montreal, Que.
McClean Macbine & Tool Co., Ltd., Hamilton, Ont.
McCrosky Tool Corp., Meadville, Pa., U. S. A.

TORCHES, BLOW
Int. Mach. & Supply Co., Ltd., Montreal.

TORCHES, GASOLINE, KEROSENE AND ALCOHOL
Turner Brass Works, Sycamore, Ill.

TORCHES, STEEL
Armstrong, Whitworth of Can., Montreal.
Prest-O-Lite Co., Inc., Toronto, Ont.

TRACK SYSTEMS
Brown Hoisting Machinery Co., Cleveland, Ohio.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.

TRAM RAIL SYSTEMS (Overhead)
Brown Hoisting Machinery Co., Cleveland, Ohio.

TRAMWAYS, BRIDGE
Brown Hoisting Machinery Co., Cleveland, Ohio.

TRANSFORMERS
Can. General Electric Co., Toronto, Ont
MacGovern & Co., Montreal, Que.
Northern Electric Co., Ltd., Montreal.

TRANSITS
Hughes, Owens Co., Ltd., Montreal, Que.

TRANSMISSION CHAIN
Lyman Tube & Supply Co., Ltd., Montreal
Morris Chain Co., Ithaca, New York.

TRANSMISSION MACHINERY
American Pulley Co., Philadelphia, Pa.
Can. Link-Belt Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Coventry Chain Co., Coventry, England.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Hamilton Gear & Machine Co., Toronto.
Jones & Glassco, Montreal.
Kennedy & Sons, Wm., Owen Sound, Ont.
Morse Chain Co., Ithaca, N.Y.
Petrie, Ltd., H. W., Toronto.
Williams Machinery Co., A. R., Toronto.

TRANSMISSION ROPE
Jones & Glassco, Montreal, Que.
MacKinnon Steel Co., Ltd., Sherbrooke.

TRANSMISSION TOWERS
Curtis Pneumatic Machy. Co., St. Louis.
Dominion Bridge Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Northern Crane Works, Walkerville.
Tallman Brass & Metal Co., Hamilton.

TROLLEYS
Brown Hoisting Machinery Co., Cleveland, Ohio.
Lyman Tube & Supply Co., Ltd., Montreal
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

TRUCKS, FACTORY, FREIGHT, ETC
Canada Machinery Corp., Galt, Ont.
Chapman Double Ball Bearing, Toronto.
Cowan Truck Co., Holyoke, Mass.
Holyoke Truck Co., Holyoke, Mass.
MacKinnon Steel Co., Sherbrooke, Que.
Rice Lewis & Son, Toronto, Ont.

TRUCKS, ELECTRIC
Cowan Truck Co., Holyoke, Mass.
Good Engineering Co., Toronto, Ont.

TRUCKS, FLOOR
Cowan Truck Co., Holyoke, Mass.
Holyoke Truck Co., Holyoke, Mass.

TRUCKS, HAND
Can. Kron Scale Co., Montreal, P.Q
Cowan Truck Co., Holyoke, Mass.

TRUCKS, LUMBER AND KILN
Holyoke Truck Co., Holyoke, Mass.
Swedish Steel & Importing Co., Montreal
Northern Crane Works, Walkerville.

TRUCKS, LIFT, ELEVATING & TRANSFER
Cowan Truck Co., Holyoke, Mass.
Holyoke Truck Co., Holyoke, Mass.

TUBES, BOILER
Lyman Tube & Supply Co., Montreal, Que

TUBING ELECTRIC WELDED OR OXYACETYLENE WELDED
Tube Co. of Can., Ltd., Toronto, Ont.

TUBE PROUCTS
Tube Co. of Can., Ltd., Toronto, Ont.

TUBING, SEAMLESS, BRASS AND COPPER
Lyman Tube & Supply Co., Montreal, Que.
Standard Tube & Fence Co., Woodstock.
Tallman Brass & Metal Co., Hamilton.

TUBING, FLEXIBLE METALLIC
Lyman Tube & Supply Co., Montreal, Que.

TUBING, SEAMLESS STEEL
Tube Co. of Can., Ltd., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.

TUBING, WELDED STEEL
Lyman Tube & Supply Co., Montreal, Que.
Tube Co. of Can., Ltd., Toronto, Ont.

TURRET MACHINES, LATHES
Acme Mach. Tool Co., Cincinnati, Ohio
Brown & Sharpe Mfg. Co., Providence.
Garlock-Walker Machinery Co., Toronto
Greenfield Tap & Die Corp., Greenfield
Hardinge Bros., Chicago, Ill.
Oliver Mchy. Co., Grand Rapids, Mich
Pratt & Whitney, Hartford, Conn.
Petrie, Ltd., H. W., Toronto.
Steinle Turret Mach. Co., Madison, Wis
Warner & Swasey Co., The, Cleveland, O

TURBO GENERATOR UNITS
MacGovern & Co., Montreal, Que.
Warner & Swasey, Cleveland, O.
Garvin Machine Co., New York.

TURNBUCKLES
Canada Fdrs. & Forg. Ltd., Welland.
Morrow Screw & Nut Co., Ingersoll, Ont.
Rice Lewis & Son, Toronto, Ont.

TURNTABLES
Can. Link-Belt Co., Toronto, Ont.
Dom. Bridge Co., Ltd., Montreal, P.Q
Elec. Steel & Metals, Welland, Ont.
Morris Crane & Hoist Co., Ltd., Herbert Niagara Falls, Ont.

TWIST DRILLS
Butterfield & Co., Inc., Rock Island, Que

UPSETTING AND BENDING MACHINERY
Bertram & Sons Co., John, Dundas.
Brown, Boggs Co., Ltd., Hamilton, Can.
Ford-Smith Machine Co., Hamilton, Ont
Garlock-Walker Machinery Co., Toronto
Jardine & Co., A. B., Hespeler, Ont.
National Machy. Co., Tiffin, O.
Canada Machinery Corp., Galt, Ont.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Williams Machy. Co., A. R., Toronto.

VALVE LEATHERS
Graton & Knight Mfg. Co., Montreal.

VALVES, MIXING
Crane, Ltd., Montreal, Que.

VALVES (IRON) STANDARD AND EXTRA HEAVY
Crane, Ltd., Montreal, Que.

VALVE GRINDERS (PNEUMATIC)
Cleveland Pneumatic Tool Co., Toronto.

VALVES, HYDRAULIC
Metalwood Mfg. Co., Detroit, Mich.

VALVES, RUBBER PUMP
International Mach. Spls., Ltd., Montreal
Quaker City Rubber Co., Philadelphia.

VENTILATORS
H. H. Robertson, Lt., Sarnia, Ont.

VENTILATING APPARATUS
Brantford Oven & Rack Co., Brantford.
Can. Blower & Forge Co., Kitchener, Ont.
Petrie, Ltd., H. W., Toronto.
Sturtevant Co., B. F., Galt, Ont.
Williams Machy. Co., A. R., Toronto.

VISE STANDS, PORTABLE
Williams & Co., J. H., Brooklyn, N.Y

VISES, BENCH
Aikenhead Hardware Co., Toronto, Ont.
Becker Milling Machine Co., Boston, Mass.
Foss Machy. & Sply. Co., G. F., Montreal.
Petrie, Ltd., H. W., Toronto.
Chicago Flexible Shaft Co., Chicago, Ill.
Superior Machinery Co., London, Ont.

VISES, DRILL
Superior Machinery Co., London, Ont.

VISES, PIPE
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Rock Island, Que.
Marshall, Son & Bunney, Toronto.
Petrie, Ltd., H. W., Toronto.
Wells Bros. Co. of Canada, Galt, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

VISES, MILLING MACHINE
Brown & Sharpe Mfg. Co., Providence, R.I.
Superior Machinery Co., London, Ont.

VISES, PLANER AND SHAPER
Aikenhead Hardware Co., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Petrie, Ltd., H. W., Toronto.
Superior Machinery Co., London, Ont.

VOLMETERS & AMMETERS
Northern Electric Co., Ltd., Montreal Que

WASHER MACHINES
National Machy. Co., Tiffin, Ohio.

WASHERS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Barnes, Wallace, Co., Bristol, Conn.
Graton & Knight Mfg. Co., Worcester.
Kayser-Ellison & Co., Ltd., Montreal.
London Bolt & Hinge Wks., London, Ont.
Marshall, Son & Bunney, Toronto.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Norton, Ralph B., Agent, Montreal.
Steel Co. of Canada, Ltd., Hamilton, Ont.

WASTE
Wilkinson & Kompass Hamilton, Ont.
Wood Turret Machine Co., Brazil, Ind.

WASTE CLEANER AND OIL RECLAIMER
Oakley Chemical Co., New York, N.Y.

WATER-INTAKE SCREENS
Can. Link-Belt Co., Toronto, Ont.

WATER TOWERS
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Toronto Iron Works, Ltd., Toronto.

WATER WHEELS
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Hamilton Co., Ltd., Wm., Peterborough,

WELDED TANKS
Can. John Wood Co., Toronto, Ont.
Lincoln Electric Co. of Canada, Ltd., Toronto, Ont.

WELDERS, ELECTRIC, SPOT AND BUTT
Knight Metal Products, Toronto.

WELDERS, ELECTRIC ARC
Lincoln Electric Co. of Canada, Ltd., Toronto, Ont.

WELDING, ELECTRIC, SPOT, BUTT, ETC.
McClean Machine & Tool Co., Ltd., Hamilton, Ont.
Tabor Mfg. Co., Philadelphia, Pa.

WELDING MASKS
Carter Welding Co., Ltd., Toronto, Ont.
Davis-Bournonville Co., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.

WELDING GOGGLES
Carter Welding Co., Ltd., Toronto, Ont.
Davis-Bournonville Co., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.
Willson Goggles Inc., Reading, Pa.

WELDING RODS AND WIRE
Carter Welding Co., Ltd., Toronto, Ont.
Davis-Bournonville Co., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.
Lincoln Electric Co. of Canada, Ltd., Toronto, Ont.
Page Steel & Wire Co., Adrian, Mich.

WELDING SUPPLIES
Carter Welding Co., Ltd., Toronto, Ont.
Davis-Bournonville Co., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.
Lincoln Electric Co. of Canada, Limited, Toronto, Ont.
Nat. Electro Products Ltd., Toronto, Ont.
Union Carbide Co., Toronto, Ont.

WELDING AND CUTTING OUTFITS
L'Air Liquide Society, Toronto, Ont.
Carter Welding Co., Ltd., Toronto, Ont.

WELDLESS BOILER TUBES
Furniss, Clarke & Co., Montreal, Que.

WHEELS, BALL BEARING
Lyman Tube & Supply Co., Montreal, Que

WHEELS, CAR, STEEL
Dominion Foundries & Steel Ltd., Hamilton, Ont.
Elec. Steel & Metals, Welland, Ont.

WHEELS, SPROCKET AND TRACTION
Can. Link-Belt Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto.

WHEELS, TURBINE, WATER
Elec. Steel & Metals, Welland, Ont.

WHEELS, PRESSED STEEL
American Pulley Co., Philadelphia, Pa.

WHEEL TRUEING TOOLS
Petrie, Ltd., H. W., Toronto.
Wheel Trueing Tool Co., Windsor, Ont.

WINCHES
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Canadian Mead-Morrison Co., Limited, Montreal, Que.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Hall & Sons, John H., Brantford.
Kennedy & Son, Wm., Owen Sound, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville

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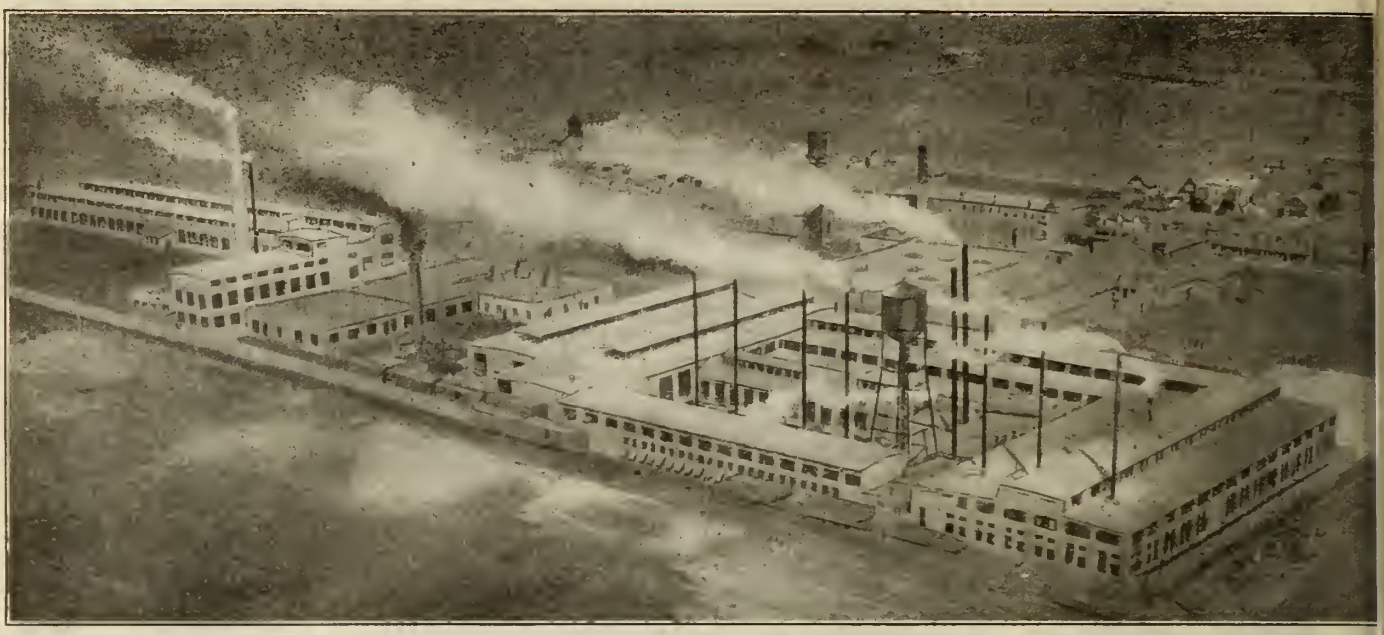

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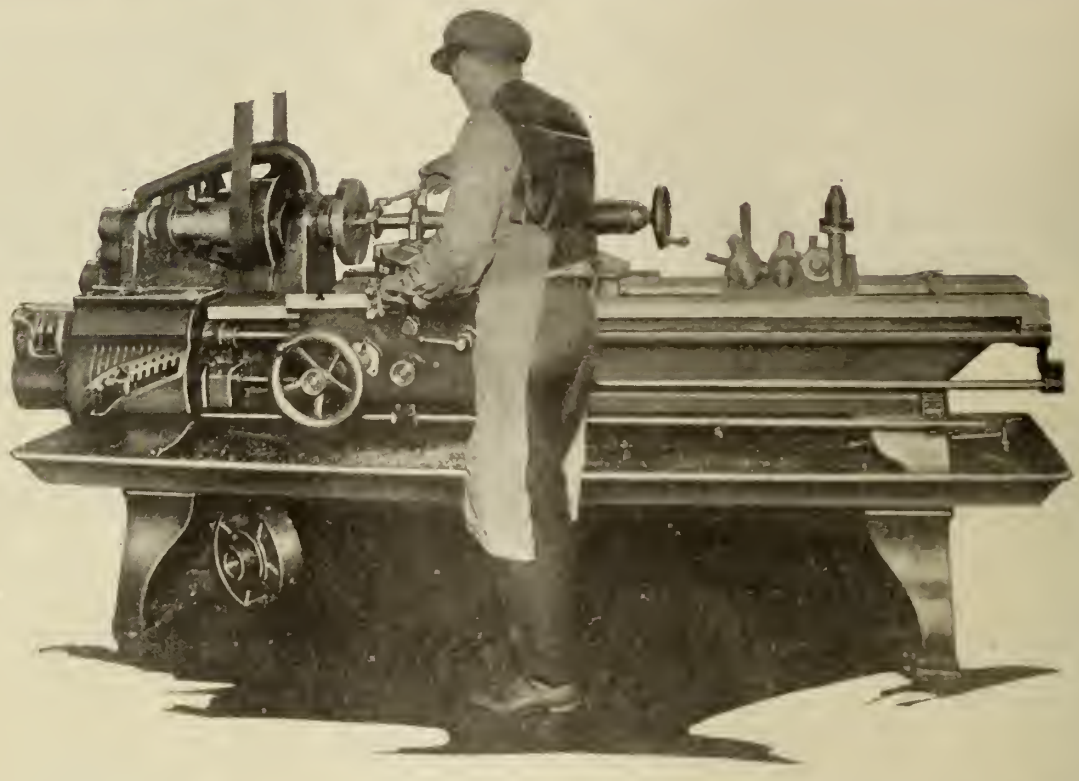

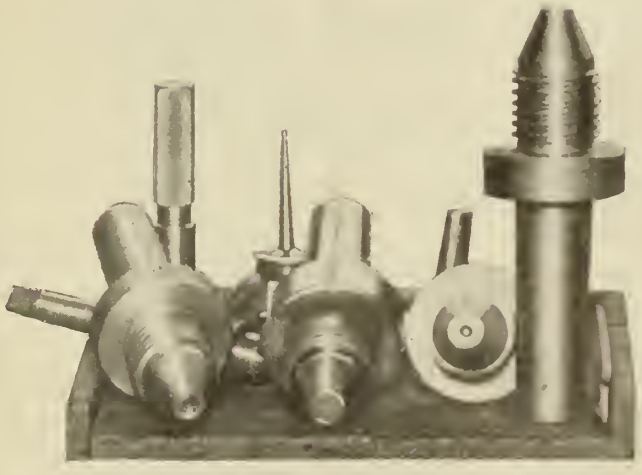

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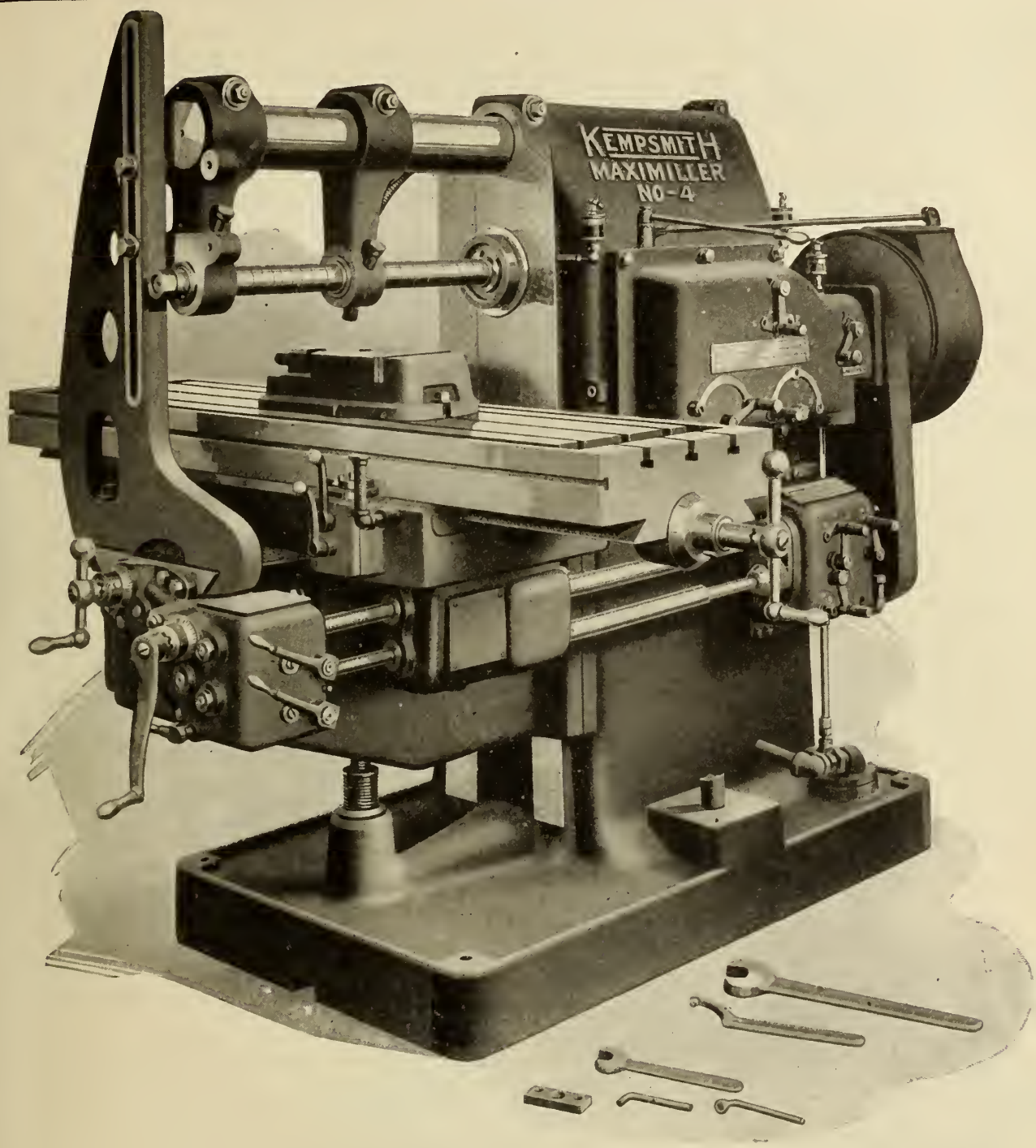

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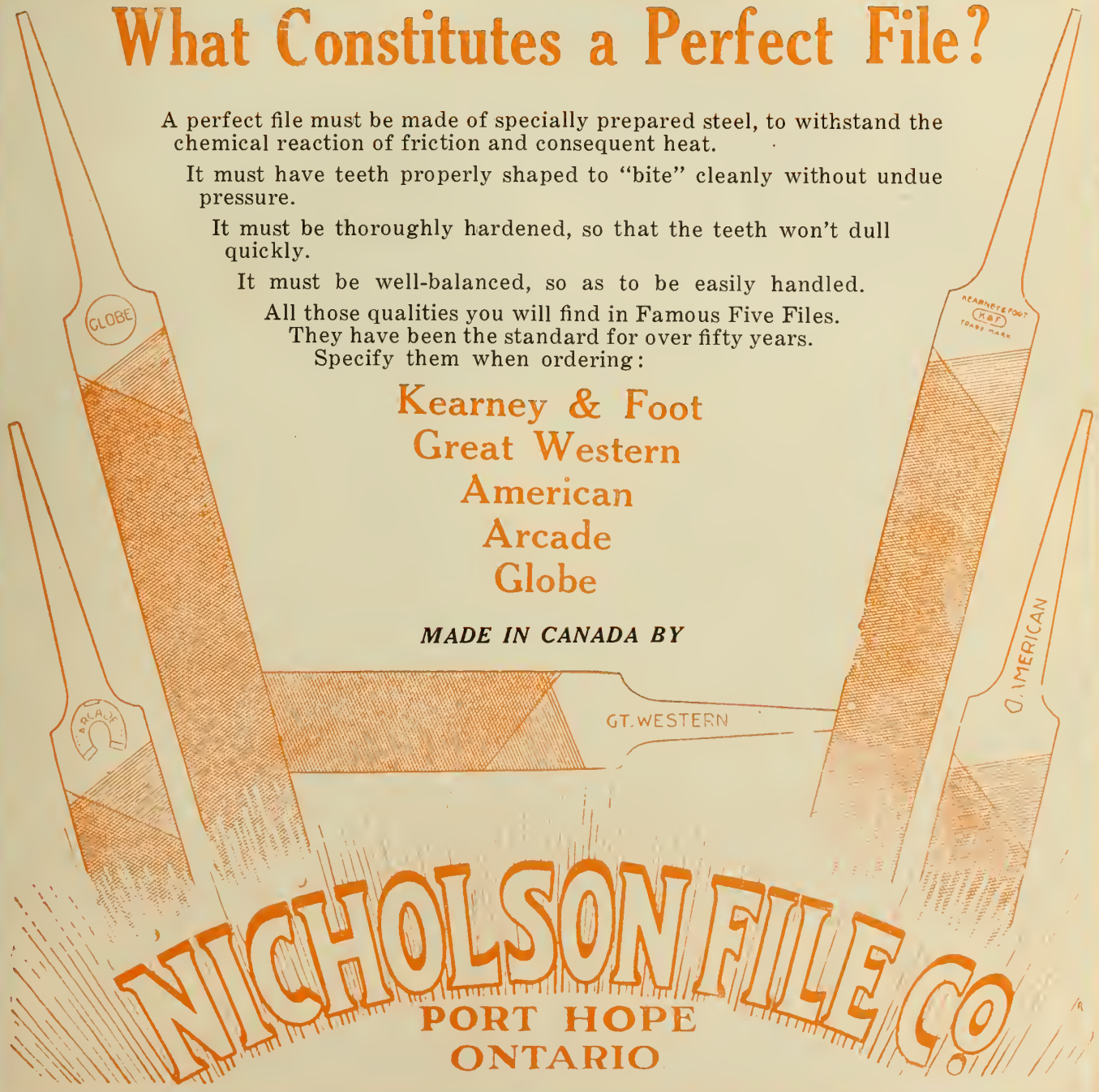

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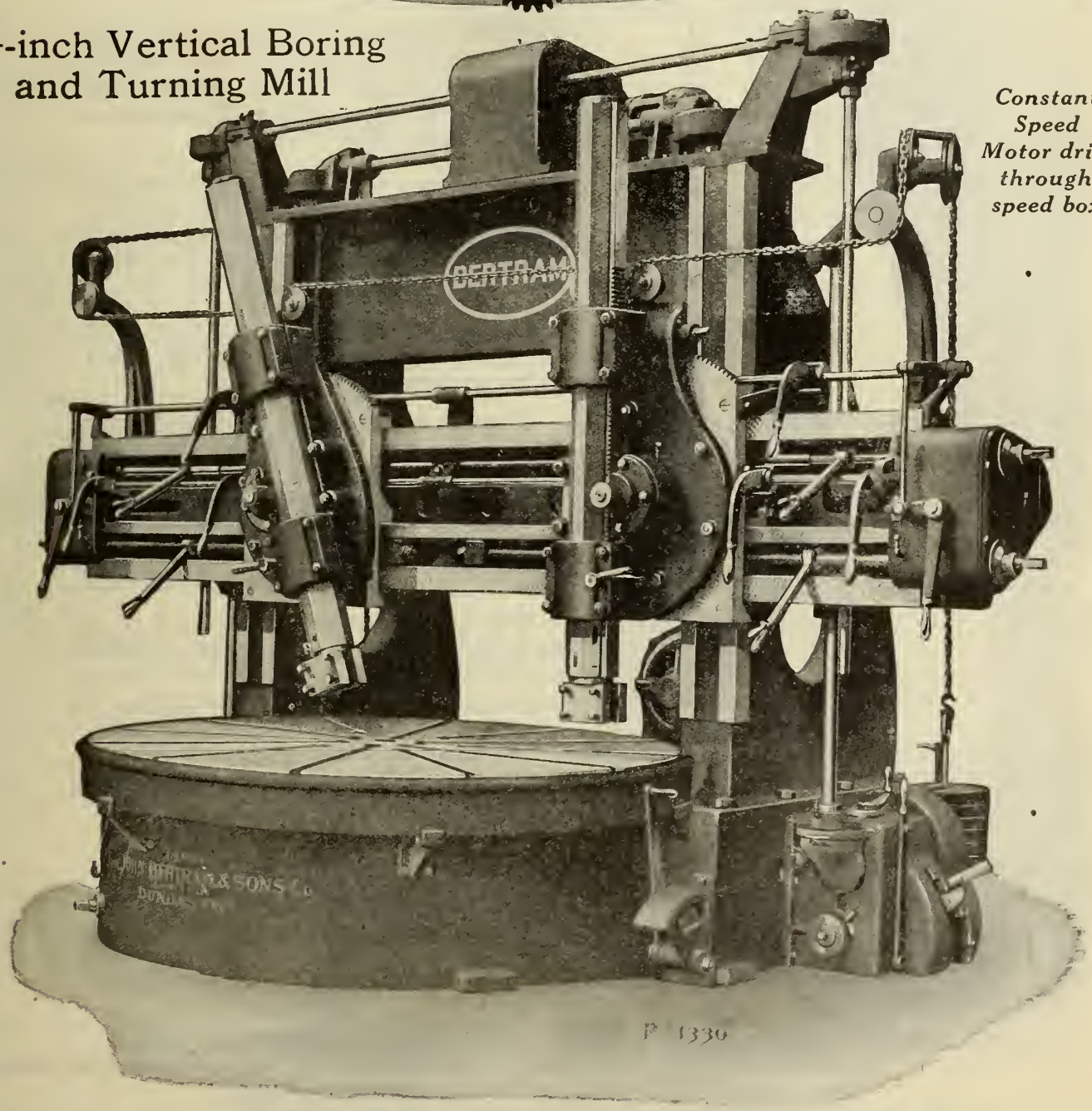

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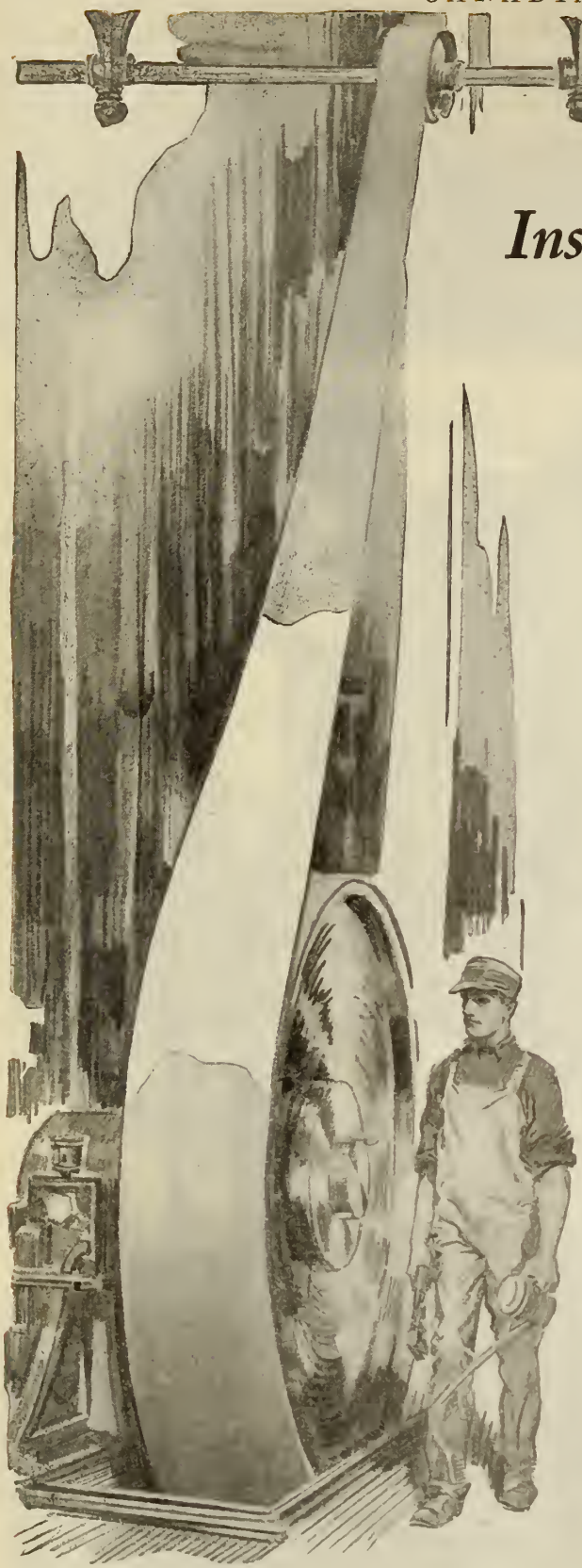

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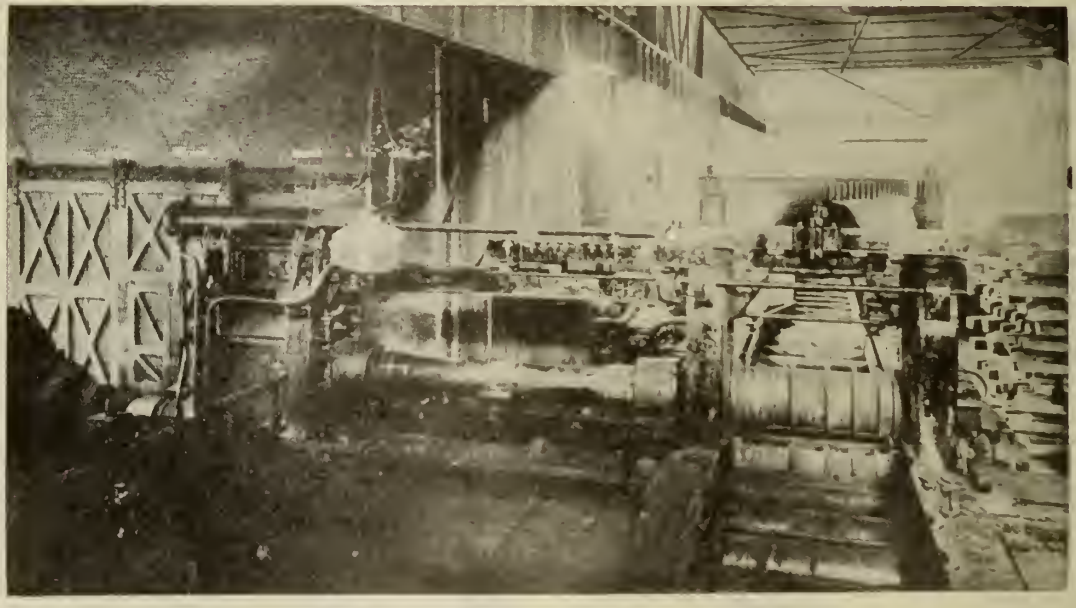


ALGOMA STEEL CORPORATION, LIMITED

SAULT STE. MARIE, ONT.

Sales Offices : Montreal : 606 McGill Building Toronto : Bank of Hamilton Building

WILT

HIGH SPEED AND CARBON TWIST DRILLS

REAMERS AND MILLING CUTTERS

boost production, cut the costs and give superior satisfaction compared with any ordinary make of tools. Many manufacturers have proved this in the past and others are proving it to their lasting benefit to-day. This is no mere theory—it is an established fact.

They have **exceptional strength** and stand **heavier feeds** and **greater speeds** than the average drill.

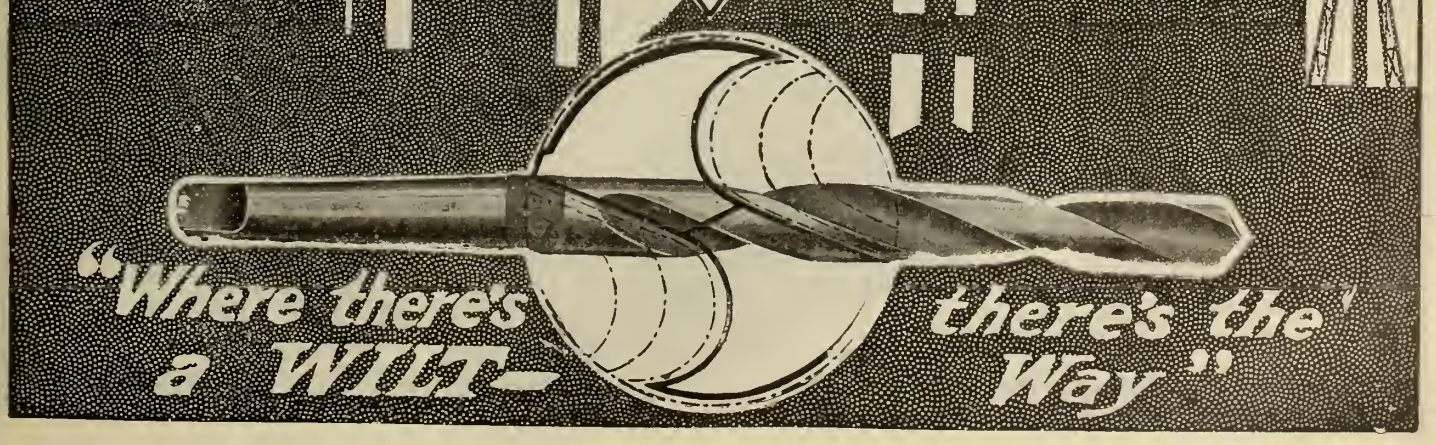
Let **WILT** be your choice in your next order—and then you will know that **WILT** is synonymous with **QUALITY.**

WILT TWIST DRILL CO.
OF CANADA, LIMITED
WALKERVILLE - ONTARIO

London Office Wilt Twist Drill Agency,
Moorgate Hall, Finsbury Pavement,
London, E.C. 2, England.

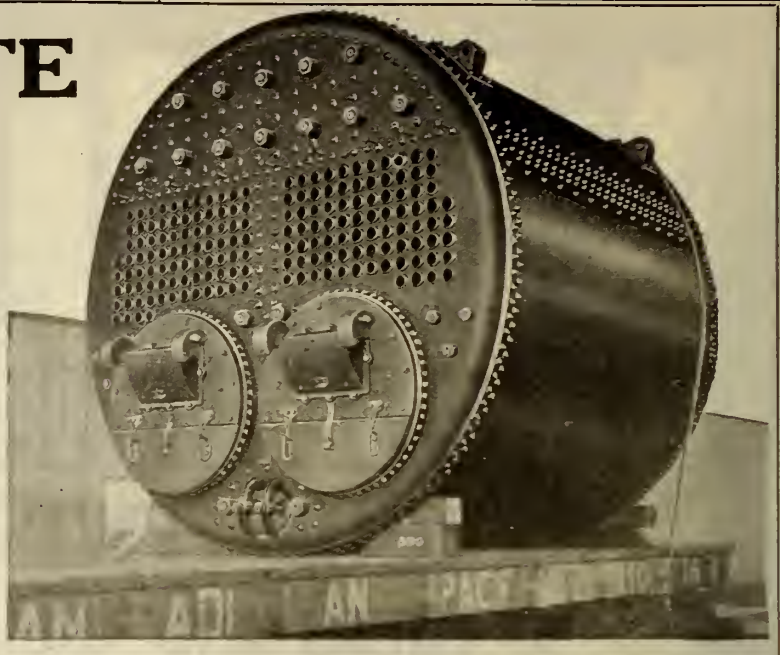
Made in Canada

Trade WILT Mark



STEEL PLATE
and
STRUCTURAL WORK

Vertical, Horizontal or Elevated Tanks, Packing House, Pulp Mill and Chemical Tanks, Steel Transmission Towers, Roof Trusses, Columns, Girders, Fire Escapes, Stairways, Crane Runways, Bridges, Breechings, Self-Supporting and Guyed Stacks, Penstocks, Flumes, Wheel Casings, Elbows and Special Shapes, Refuse Burners, Ore Buckets, Cars and Skips, Etc.



We have the facilities and equipment for handling this class of work quickly and economically. Estimates and quotations on any work that you may have in view will be promptly submitted, on request.

Canadian Ingersoll-Rand Company Limited

Sydney Sherbrooke Montreal Toronto Cobalt Winnipeg Nelson Vancouver

STEEL *for*
Every Commercial Purpose

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.

Nova Scotia Steel and Coal Co., Limited

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Western Sales Offices:
Room 14 Windsor Hote
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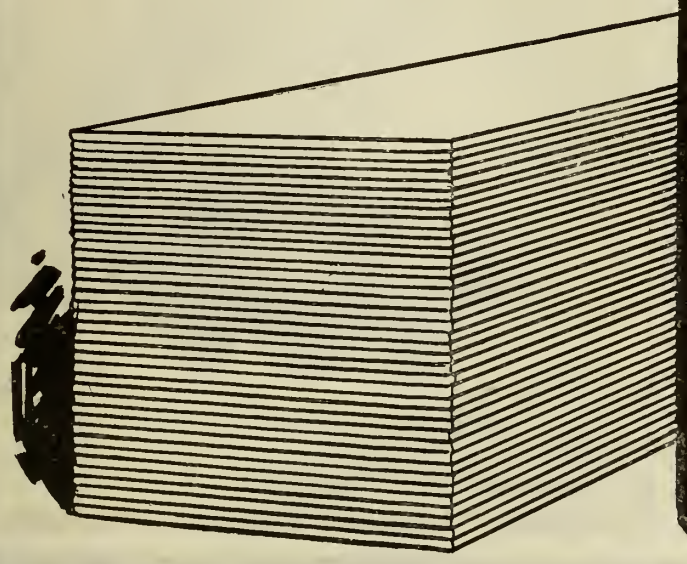
Steel Ingots *by the* **HARMET** Liquid Process

Deep Drawing Plate



WE manufacture plates of various drawing qualities for such work as

AUTOMOBILE FRAMES
CRANK CASES
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and
PRESSED STEEL PARTS
of all descriptions

DOMINION FOUNDRIES
and STEEL, LIMITED
HAMILTON, ONTARIO

Your formula of

BABBITT METAL

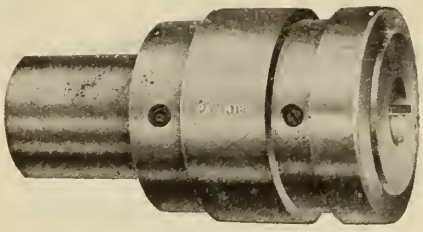
will give longer wear if you have it alloyed under the

Stanley Process

Send us your enquiries

BRITISH SMELTING & REFINING Co. Limited.
Drummond Building Montreal.

THE JOHNSON FRICTION CLUTCH



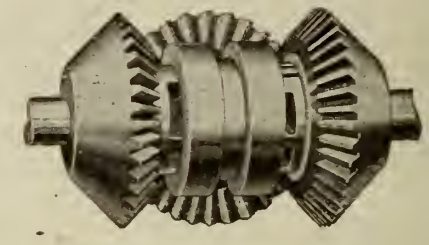
Single Clutch

Better Clutch Service
And More Of It

There is one big reason for the wide adoption of the Johnson Clutch—that is, its record of dependable service. Other features recommend it for many situations. In compactness, simplicity and adaptability it is unequalled. But what appeals to its users more than anything else is its superior durability.

The Johnson Clutch is made in eight sizes, from ½ to 4 H.P. per 100 R.P.M. For overhead transmission it offers a compact clutch of excellent quality, perfectly balanced for any speed. No other type is so readily adaptable to special conditions. The Johnson Clutch in special designs is serving on all types of machinery. Our booklet, "Clutches as Applied to Machine Building," shows many of its possibilities.

Write for our Yellow Catalog



Double Clutch Between Bevel Gears

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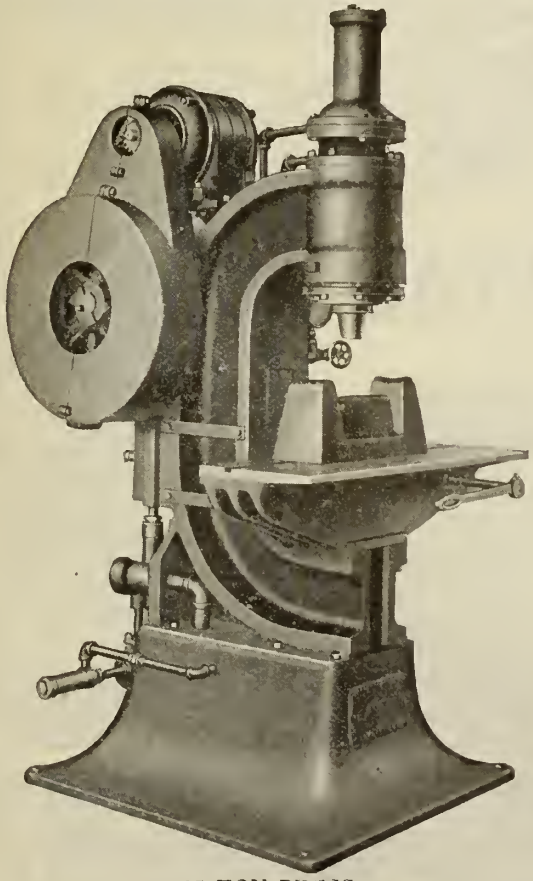
THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.



15 TON PRESS

A Simpler Hydro-Pneumatic Press

Complications in the construction of our High Speed Hydro-Pneumatic Press are so few that its operation is more readily understood than that of a more intricate machine.

Straightening, Forcing, Broaching

Particularly adapted for straightening cam, crank, pinion and wheel shafts, axle tubes, pinion tubes, assembling differential housings, assembling bearings in hubs, bushings in spindles and wheel rims, testing springs front and rear, broaching brake levers.

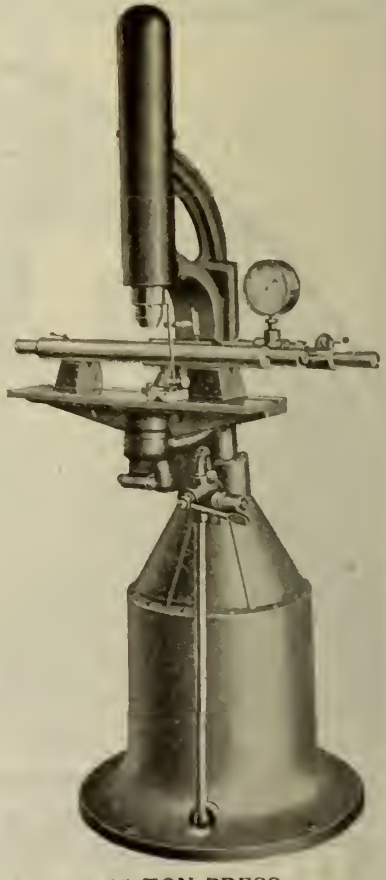
EASTERN PRODUCTION COMPANY

137 LEIB ST., DETROIT, MICH.

Branch: 120 Wisconsin St., Milwaukee, Wis.

Canadian Representative:

F. F. Barber Machinery Co., Limited,
Foy Building, Toronto



15 TON PRESS

TRACKWORK

FOR STEAM AND ELECTRIC RAILWAYS

Manufacturers of Balkwill Articulated Manganese Steel Crossings

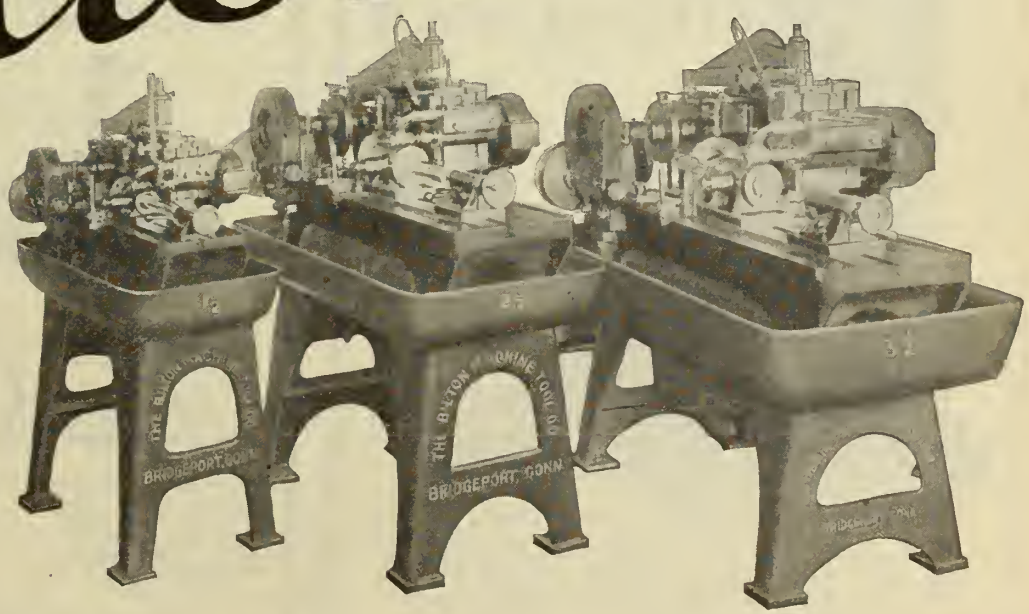
Complete layouts of built-up, rail-bound hard-centre or solid manganese steel construction.

TRACKWORK ACCESSORIES

CANADIAN STEEL FOUNDRIES LIMITED

Transportation Building, Montreal

Bilton GEAR MILLERS



Fully Automatic

Their adaptability is almost unlimited on small work—such as cutting spur, bevel, miter, angle gears, saws, ratchets, sprockets, cutters, knurls, taps, cylinders, form cutting, manufacturing, milling, etc.

A big time saver, as indexing takes place during return stroke of cutter — which is removing metal 90% of the time.

Write us for Catalog 30-6

Over 500 leading manufacturers now use the Bilton for high production on accurate work

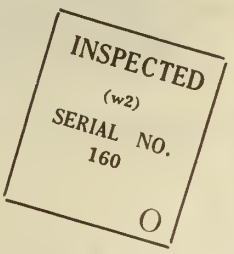
Bilton Machine Tool Co. Housatonic Avenue **Bridgeport, Conn., U.S.A.**

Foreign Agents: Alfred Herbert, Ltd. Chas. Churchill & Co., Ltd.

If interested tear out this page and place with letters to be answered.

Inconspicuous *but* Significant

This little hall-mark of quality is stamped on the Ford-Smith Miller by the inspector—*after the machine has passed every-one of the exacting tests imposed.*



These tests cover every detail of construction. There is no "skimming through." Each is passed in a thoroughly efficient manner, then, and only then, are these letters allowed to appear on the miller.

This is why the mark is significant. It is your guarantee that the miller is as accurately and honestly made as human skill can make it.

Any information with regard to Ford-Smith Millers will gladly be furnished.

The Ford-Smith Machine Co., Ltd., Hamilton, Canada

Foreign Agents:

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The

NAZEL AIR HAMMER

NOTED FOR ITS BLOW AND CONTROL

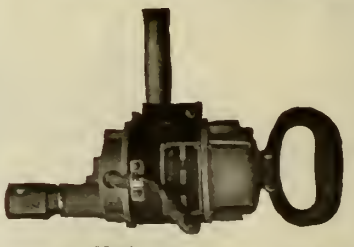
A self-contained unit, HAMMER AND COMPRESSOR COMBINED, built in three types, six sizes arranged for BELT OR DIRECT MOTOR DRIVE, with capacities up to 7 inches square, for all manner of jobbing, manufacturing and certain classes of drop forgings.

Nazel Engineering & Machine Works

Dept. F., Philadelphia, Pa.

U. S. Electric Drills and Grinders

Save Time, Labor and Money



They can be attached to any lamp socket.

For drilling in metal they are superior to any other kind of portable drill. Cost 50% less to run than air drills.

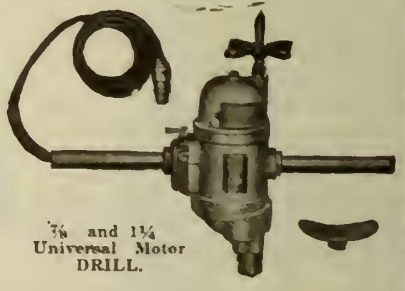
3 SIZES

3-16 in., W.G.T., 6 lbs.
¼ in., W.G.T. 9 lbs.
⅝ in., W.G.T. 12 lbs.

All motors wound for 110 or 220 volts.

Direct or alternating current.

Try a few of our Electric Drills and Grinders and you'll send us an order for more. Our guarantee protects you.



⅞ and 1¼ Universal Motor DRILL.

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The Canadian Fairbanks-Morse Co., Limited

Montreal, St. John, N.B., Toronto, Winnipeg, Calgary, Vancouver

THE UNITED STATES ELECTRICAL TOOL CO.

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"WACO"

THE HIGH SPEED STEEL

MARSHALL, SON & BUNNEY
39 Richmond Street East TORONTO, ONT.

SOLE CANADIAN AGENTS FOR
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SHEFFIELD - - ENGLAND

ALL SIZES
IN STOCK

Crucible
AND
Open Hearth Steel
Tool Steel
"ARGO" BRAND *HIGH-SPEED* STEEL

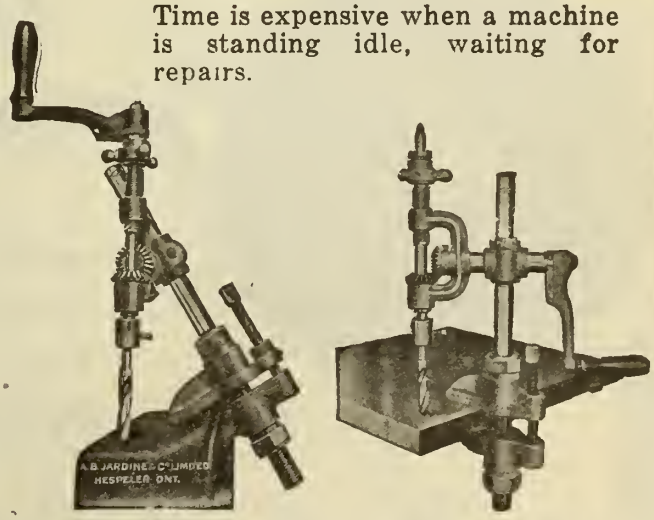
The John Illingworth Steel Co.
1856

Frankford, Phila.
New York Office 217 Broadway

RALPH B. NORTON, AGENT
124 Craig St. W.
Montreal, Canada

Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.



On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, $26.50 net.
Sold by all Machinery and Supply Houses

A. B. JARDINE & CO., Limited
HESPELER, ONTARIO

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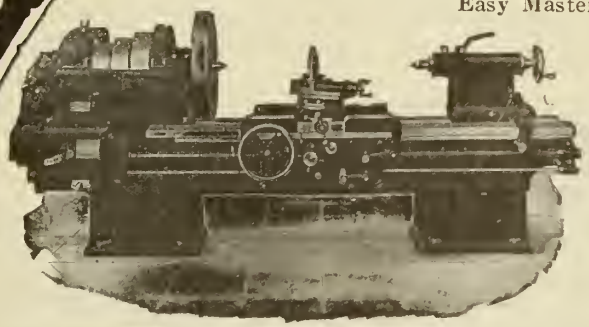
SIDNEY

for SERVICE

Heavy Duty Lathes

The 25-inch Heavy Duty Quick Change Sidney shown below is the last word in lathe construction. Every possible improvement will be found in this late model. Bed lengths available are 10, 12, 14, 16, 18 and 20 feet. Also built with a 27-inch swing.

Easy Master of Big Jobs



Regardless of the severity of work, dependence put on Sidney Lathes has never been misplaced. The Sidney line has made good—with a vengeance. New Bulletin just issued on 25-inch machine. Write to-day!

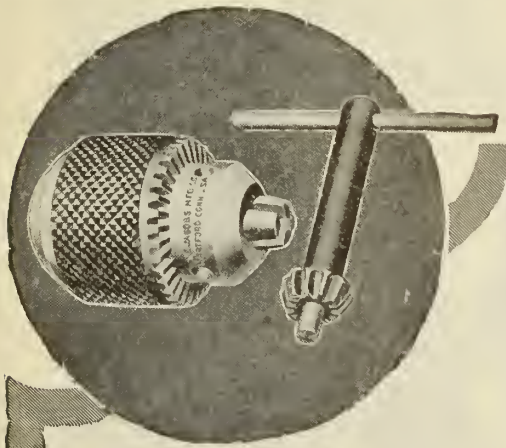
The Sidney Tool Company

SIDNEY, OHIO

CANADIAN AGENTS:

Yeates Machinery & Supply Co., Montreal, Quebec
H. W. Petrie, Limited, Toronto, Ontario

JACOBS CHUCKS



Defective chucks cause broken drills and loss of time and money. The wise manufacturer uses Jacobs Chucks exclusively because he is sure of their reliability.

You can buy Jacobs Chucks from dealers everywhere.

Address Dept. C.M.

THE JACOBS MFG. CO. HARTFORD, CONNECTICUT, U.S.A.

MINISTRY OF MUNITIONS G R

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Buyers should instruct their representatives in the United Kingdom to communicate with D. B8 Canadian Export Department, Ministry of Munitions, Whitehall Place, London, S.W.

Cable Address:
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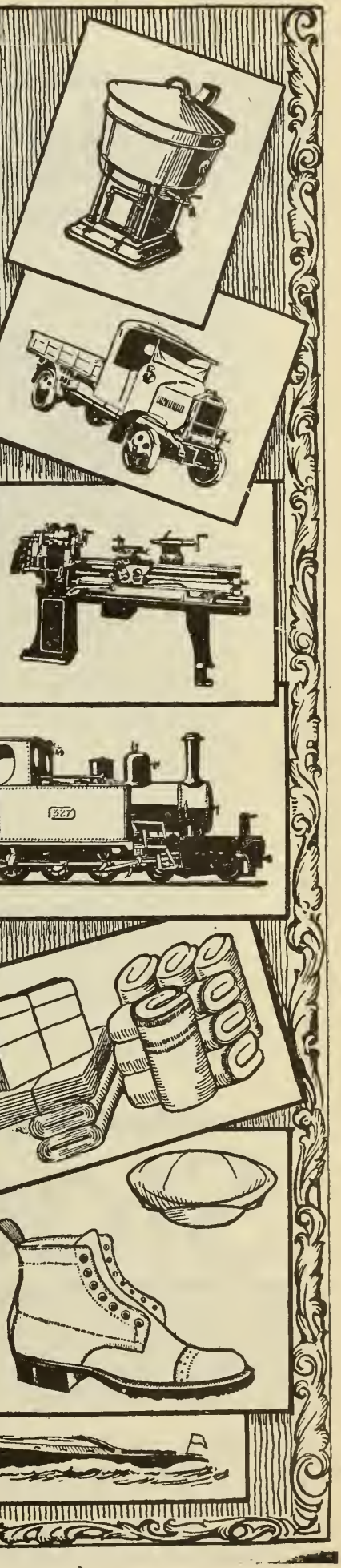

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Made with the Help Of

STANDARDIZATION

In England and America, but many years, the thought of standardization has been closely linked to the name Cadillac.

The two have been almost convertible terms.

Now, the war has given to the phrase and to the principle of standardization, a new and a wider significance.

Every nation has a wonder-working word.

In that word is implied or expressed the special genius of its people.

Is it not possible that that word, in America, is standardization?

Standardization is a peculiarly American principle.

It is the capacity to think in large volume—*and execute in close, fine measurements.*

It is characterized by a noble bigness, on the one hand; and a scrupulous smallness, on the other.

Standardization dreams large dreams—*and works them out with minutest accuracy.*

It is not afraid of big figures when thinking in terms of materials, or machines, or markets, or money.

But it is mortally afraid of big figures when part is fitted into part.

Standardization laughs at millions—and worries over a loose bolt.

To the unthinking, it seems to talk in the language of the spendthrift.

The initiated know that in execution, it is the very essence of economy.

Standardization can be applied to base ends—but, in America, it should not be.

When it seeks volume alone, it is merely the apotheosis of brute force—the perpetuation of cheapness.

But when standardization and quality are wed—the fruit is a product superlatively fine.

Standardized ships and guns and aeroplanes and motor cars are speeding across the ocean to save the world.

War has shed new lustre on America's wonder-working word.

. . . . .

We feel that we may with propriety point out that this wonder-working word has also been the watchword of these works since the Cadillac business began.

CADILLAC MOTOR CAR COMPANY, DETROIT, MICHIGAN

Starrett Tools

for forty years have insured the accuracy, the quality and the utility of the products of America's more skilled machinists.

STARRETT HACKSAWS CUT QUICKER & LAST LONGER — STARRETT TOOLS

42-73

Starrett Tools

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

Little Giant No. 32 Air Drill
(Non-Reversible Type)

Little Giant balanced piston valves

"Long-wearing and leak-proof" defines Little Giant Air Drill *balanced* piston valves.

They have no pressure holding them to their seats. Being balanced in all directions, they require none. Moving but 1-20th of their length and devoid of rocker arms and gears, they require no appreciable power to operate. Faster drilling and smooth, positive operation results from their perfect timing, increased area and short ports.

Balanced piston valves and other distinctive features make Little Giants the most efficient and dependable air drills yet developed.

Judge Little Giants after a try-out. Prompt delivery can be made from large stocks now carried at the Company Branches listed below.

2 other Little Giant Economy Features

1—3-point ball-bearing suspension. Prevents crankshaft distortion and breakage. Insures frictionless operation. Lengthens drill service. Increases drill efficiency.

2—Toggle with renewable liner. Quickly replaceable without dismantling drill. Prevents scrapping entire toggle when only the bearing is worn.

Sales Representatives

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Sales and Service Branches: TORONTO, 342 Adelaide Street, West WINNIPEG, 150 Princess Street VANCOUVER, 81 Pender Street P-62-H

Canadian Factory: Canadian Pneumatic Tool Company, Montreal

BOYER PNEUMATIC HAMMERS · LITTLE GIANT PNEUMATIC AND ELECTRIC TOOLS
CHICAGO PNEUMATIC AIR COMPRESSORS · VACUUM PUMPS · PNEUMATIC HOISTS,
GIANT OIL AND GAS ENGINES ROCK DRILLS · COAL DRILLS

GIANT ENGINES

Dependable Power at *Less Cost Per Hour*

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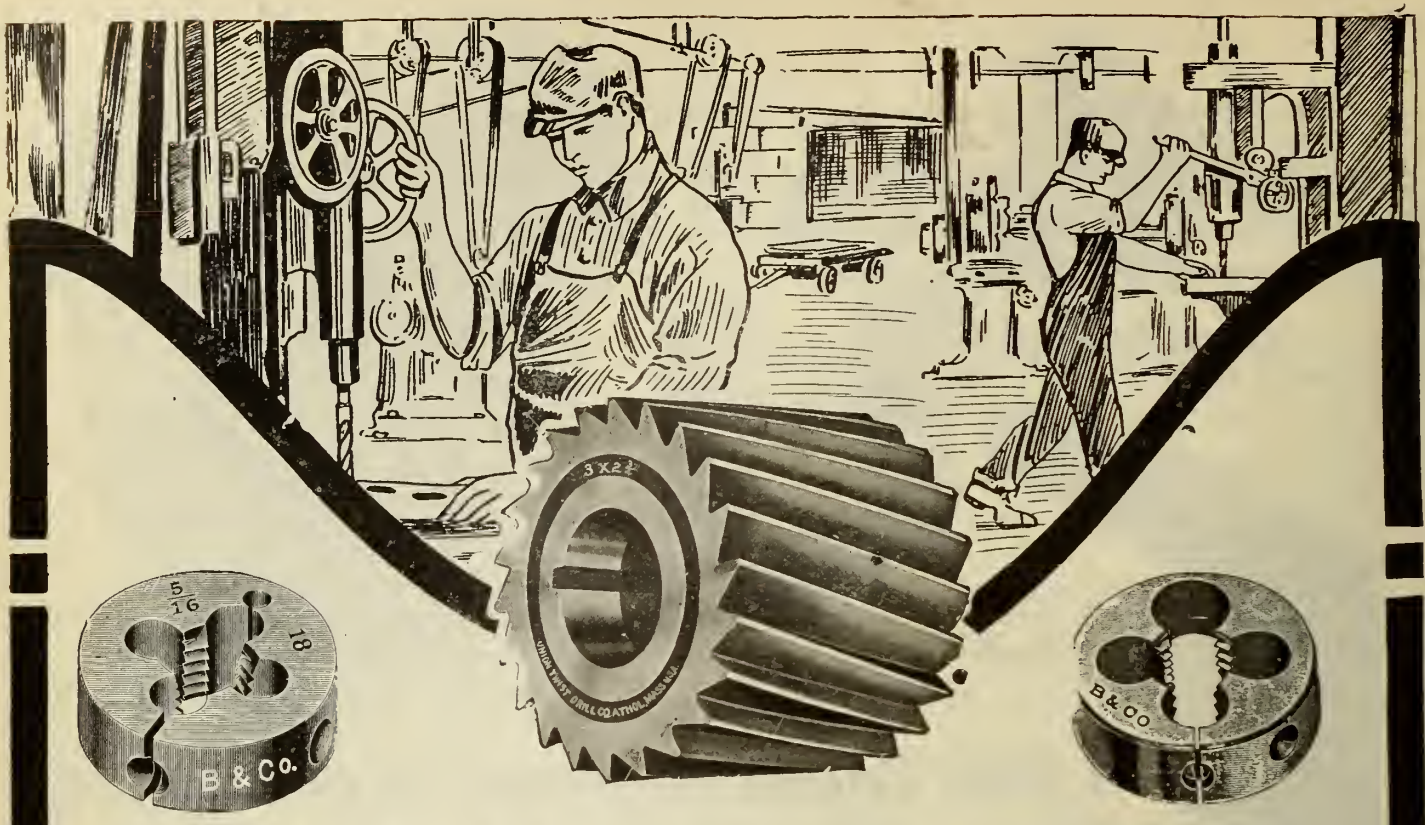


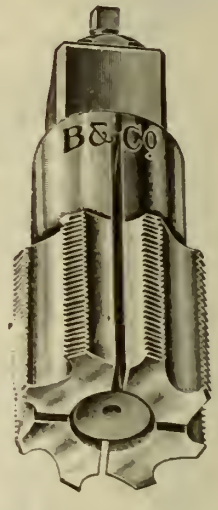
BUTTERFIELD

TAPS, DIES, REAMERS, DRILLS AND MILLING CUTTERS

In making **Butterfield** Tools nothing is left to chance. That the design, quality of material and workmanship are right, results have proved. Experts test in the most critical manner, all materials used. Every Butterfield workman is highly skilled, each in his own particular way and all work together. Finally, before any Butterfield tool is allowed to leave the factory it receives a careful inspection.

The results of these efforts become apparent as soon as the tools are used—in minimum wear and breakage!

For the satisfaction of ALL—order Butterfield!



BUTTERFIELD & COMPANY DIVISION

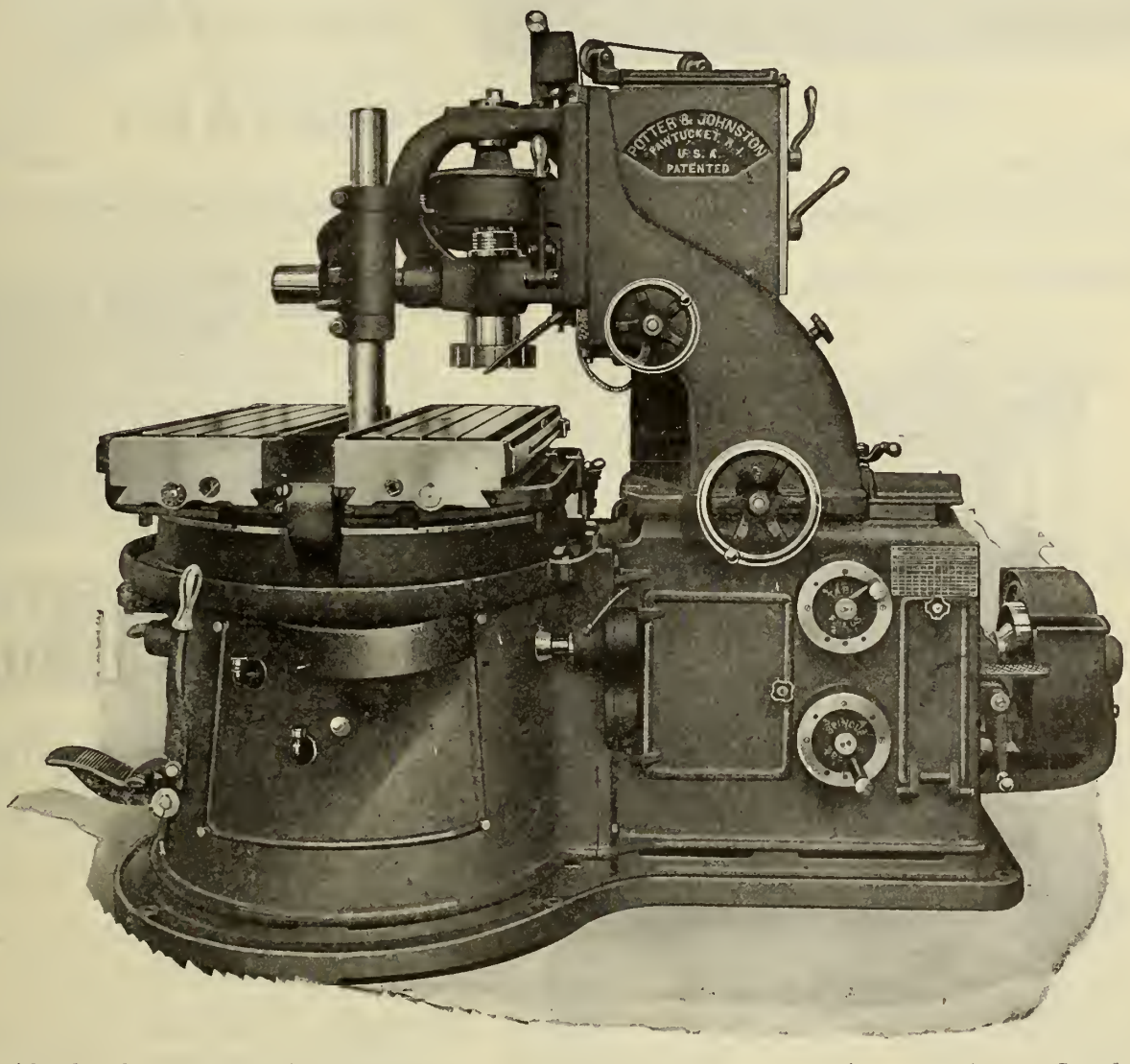
Union Twist Drill Co.

ROCK ISLAND - QUE., CANADA

Toronto Office: 220 King St. West

FOREIGN REPRESENTATIVES: Great Britain, Geo. H. Alexander, 83-84 Coleshill St., London, England; France, Italy, Belgium, and Switzerland, Fenwick Freres, 8 Rue de Rocroy, Paris; Sweden, Norway, and Denmark, Ab. Sigfr. Anderson & Co., Malmo; Spain, Casamitjana Hermanos, Barcelona; Japan, Abe-Kobei & Co., Yokohama; Greece, Stephen C. Stephanson, 11 Lycourgan St., Athens; Netherlands, Wynmalen & Hausman, Rotterdam; Greece, Stephen C. Stephanson, 11 Lycourgan St., Athens; Netherlands, Wynmalen & America, Charles Dreyfus, B. Mitre, 785, Buenos Aires, R. A.

No Delay on a P & J



Absolutely no waste time. This P and J Automatic Milling Machine was made expressly to eliminate machine idleness between cuts. No lost time returning table by hand and removing finished work from vise or fixture. No delay brushing chips out of vise and inserting new pieces.

Keep two tables going at a time. Load up on one while the cutter is milling work mounted on the other. With the exception of 10 seconds for indexing table direct, bringing work into alignment with cutter, and advancing table—Automatically—to cutting point—there's no lost time—no waste of power—big production—practically continuous milling.

Canadian Offices: POTTER & JOHNSON MACHINE CO.

Roelofson Machine & Tool Co., Limited

11 Wellington Street East, Toronto, Canada

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HOYT METAL COMPANY

MONTREAL TORONTO WINNIPEG

Production of Rare Quality at Lowest Labor Costs

There is unusual strength, accuracy, speed, convenience and range in

AURORA
Drilling Machines

You can use them to great advantage on any work in your shop that's suitable for a machine tool of this kind. The operating is easy and the labor cost comparatively low.

Drop a line for full particulars and specifications.
Stationary Head Sizes 20"—21"
Sliding Head Sizes 22"—44"

The Aurora Tool Works
AURORA, INDIANA, U.S.A.

Manufacturers:
The Sheffield Twist Drill & Steel Co.
LIMITED
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Telephones: London City 2660. Sheffield - 712. 710. Code ABC 5th. Edition
LONDON OFFICE: Suffolk House, 5, Laurence Pountney Hill, London, E.C. 4.
Telegraphic Address: "Proells, Sheffield" "Proells, London" "Proells, Paris"

HIGH SPEED TWIST DRILLS

High-class Drills with IRRESISTIBLE PIERCING FUNCTIONS that stand the WEAR and TEAR—in other words, the DRILLS that are EFFICIENT and ECONOMICAL—are the DRILLS with the "DORMER" Brand.

We are manufacturing SPECIALISTS—Carry large STOCKS—Give PROMPT deliveries, and rely upon our products for REPEATS.

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222 Craig Street West
MONTREAL CANADA

ARMSTRONG TOOL HOLDERS

THE WORLD'S STANDARD LATHE AND PLANER TOOLS

Machine shops the world over, for more than a quarter of a century, have recognized Armstrong Lathe Tools to be by far the Best in lathe tool equipment.

Refuse to use imitations. Insist upon being supplied with "Armstrong."

By using Armstrong Tool Holders in your shop you will make one pound of High Speed Steel do the work of ten pounds in forged tools, save all forging and 70% of grinding.

Write for our catalog

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
306 N. FRANCISCO AVE. CHICAGO, U.S.A.

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

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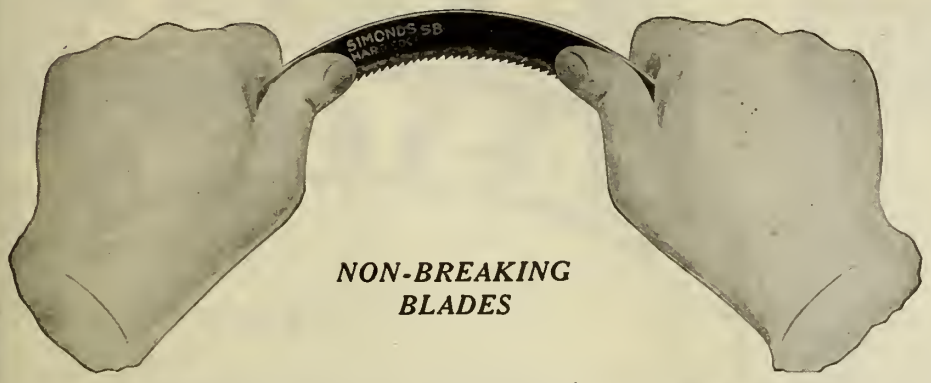
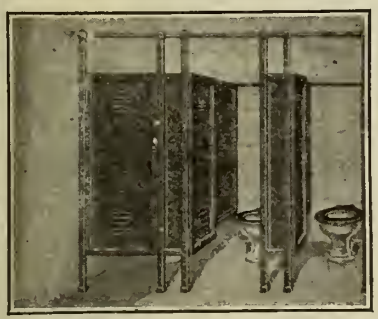
CUT CUTTING COST



NON-BREAKING BLADES

For Machine or Hand Use
Any Size or Length

Simonds Canada Saw Co.
LIMITED
MONTREAL
St. John Vancouver



Avoid Sickness—Efficiency's Enemy

You know what it means—some employee off here, another there—a broken link in the system of your plant that causes delay. Safeguard the health of your employees with

DENNISTEEL
Made in Canada

Steel Lavatory Partitions

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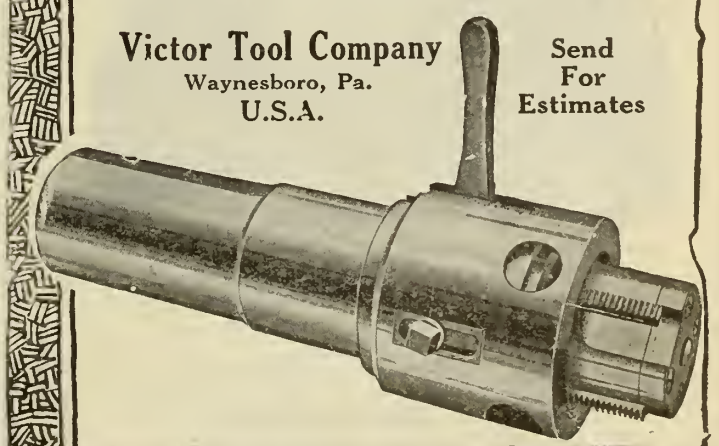

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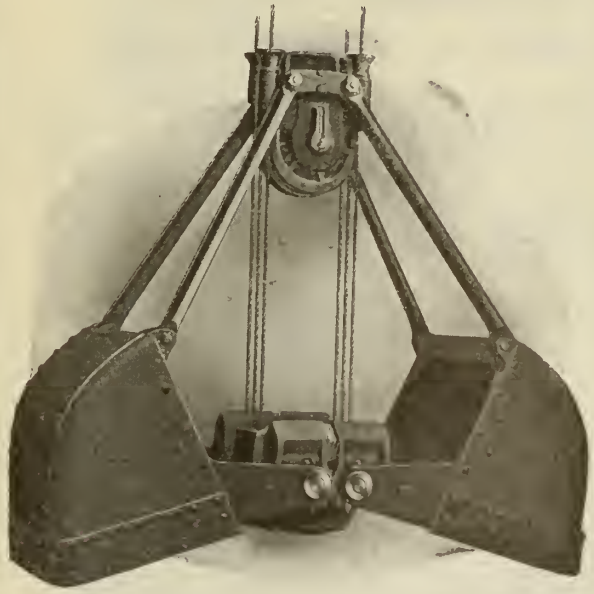

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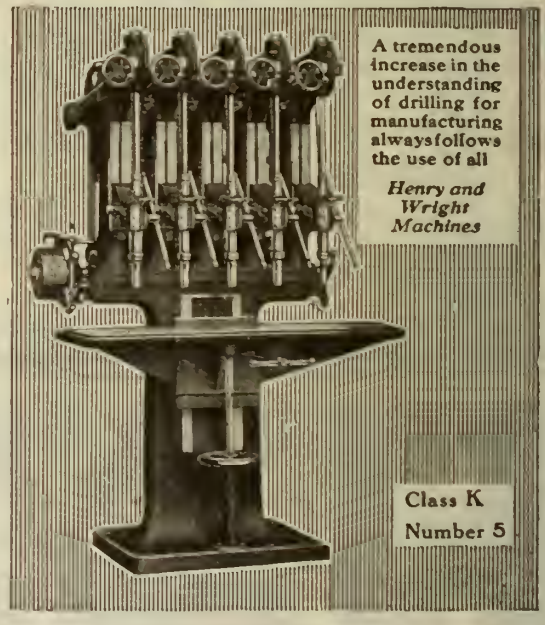
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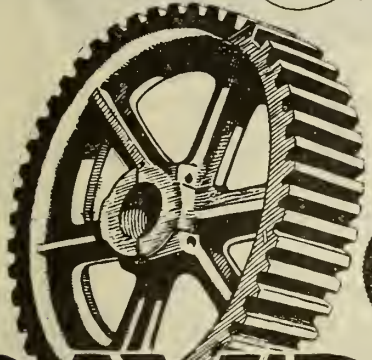

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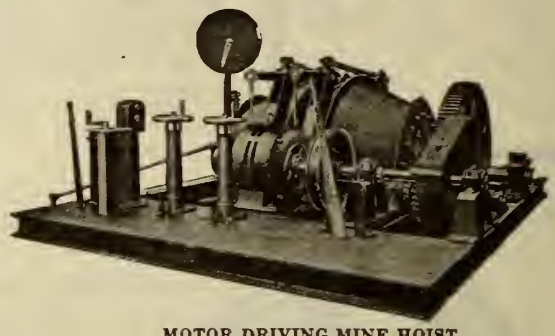

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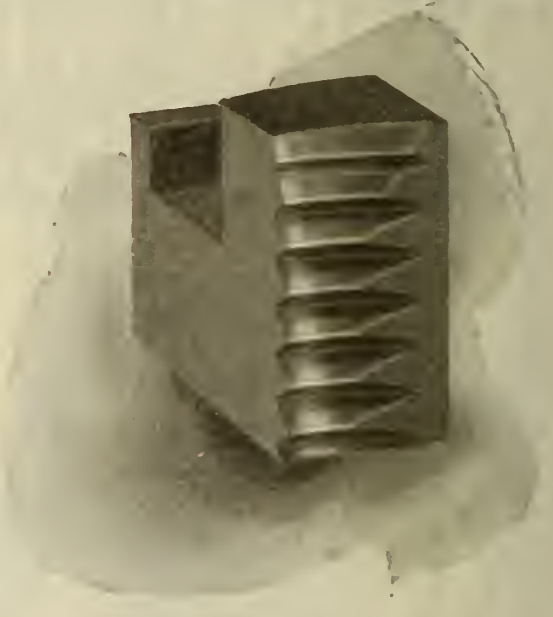

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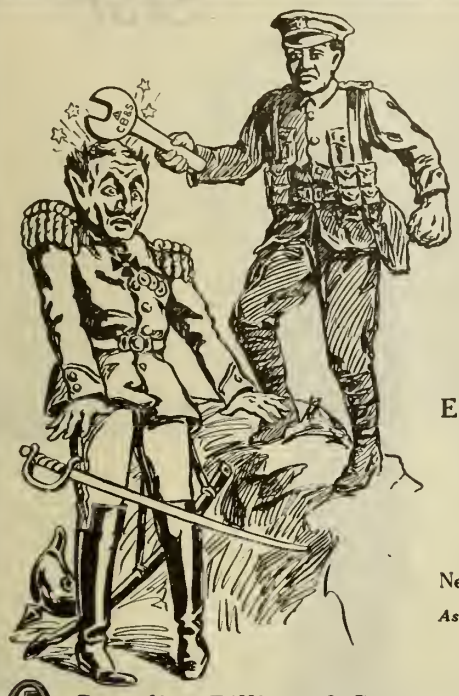

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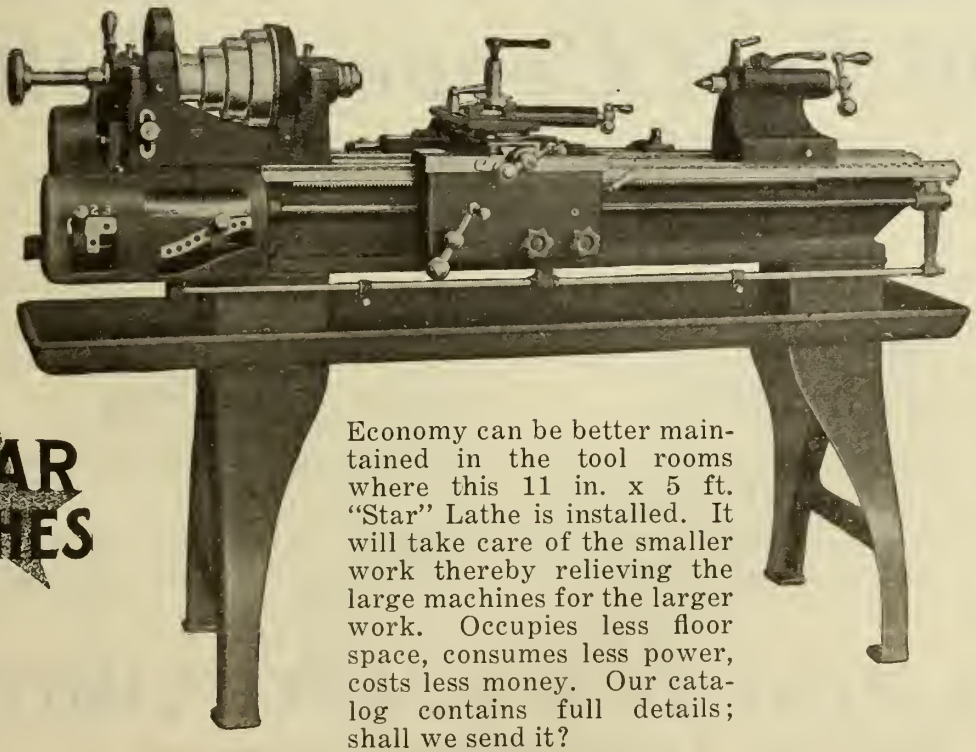

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Economy can be better maintained in the tool rooms where this 11 in. x 5 ft. "Star" Lathe is installed. It will take care of the smaller work thereby relieving the large machines for the larger work. Occupies less floor space, consumes less power, costs less money. Our catalog contains full details; shall we send it?

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Read these subway facts:

—Carries more passengers every day than all the steam railroads of the United States combined.

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—In 10 years carried 5,397,963,628 passengers—three times the total population of the world.

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The picture above shows an operator in the Federal Signal factory putting the final precise finish on the delicate contacts of an A. C. Relay, one of the electrical nerve centers of this system.

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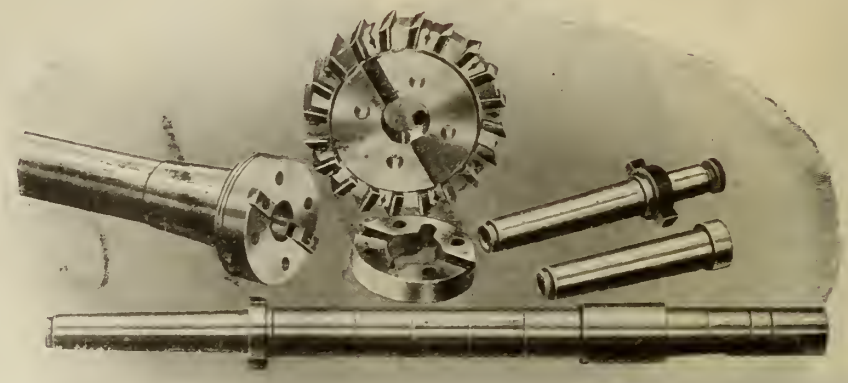

The Flanged Spindle

The flanged spindle of Milwaukee Milling Machines has proven ideal in every respect. The flange, forged on the end of spindle, carries well proportioned keys for driving large face milling cutters and the arbor drive collar. The latter has recessed notches to receive the dogs on the arbor. thus removing the strain of the cut from the taper hole in the spindle, which retains its original accuracy. The reverse for the spindle is self contained in the machine; no overhead apparatus is necessary.

The illustration below shows a Milwaukee Milling Machine milling a rack with twenty-one 4-pitch involute gear cutters.

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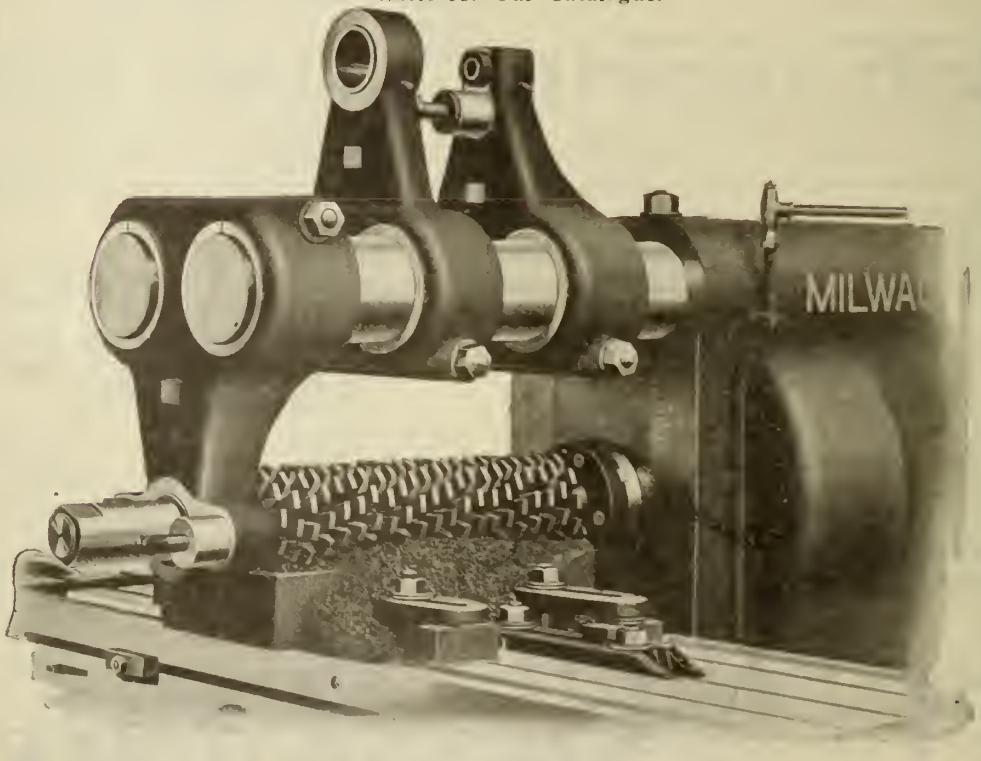

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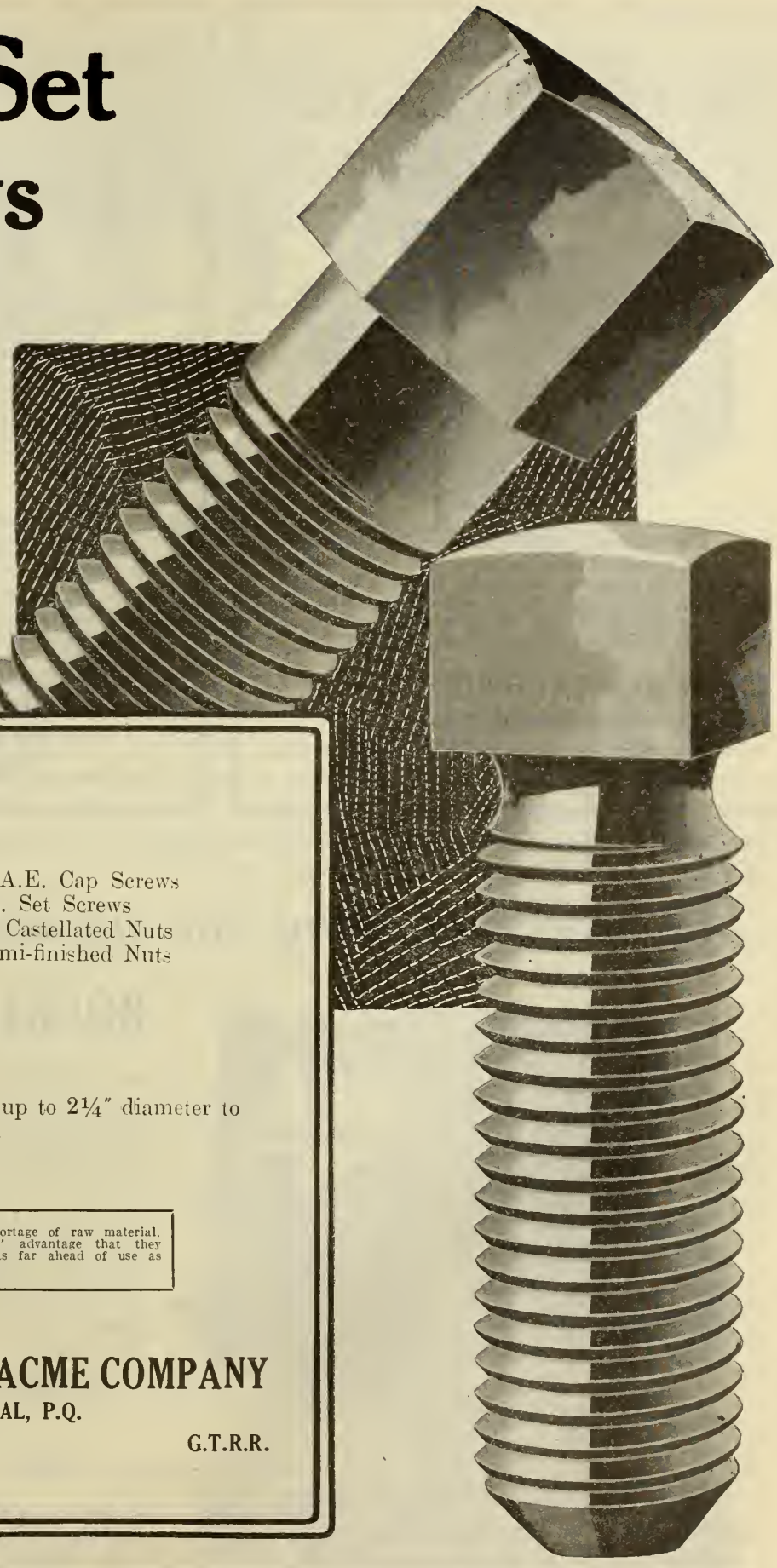

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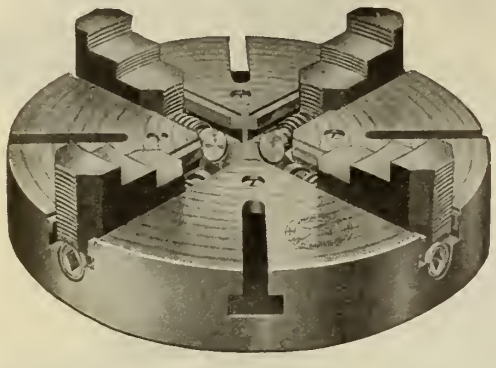

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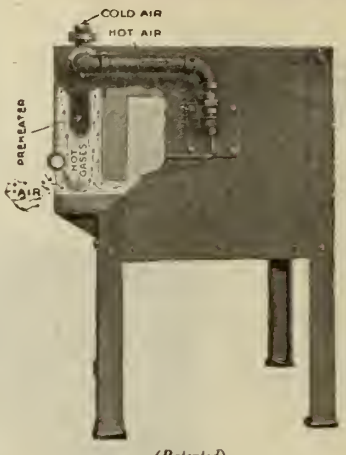

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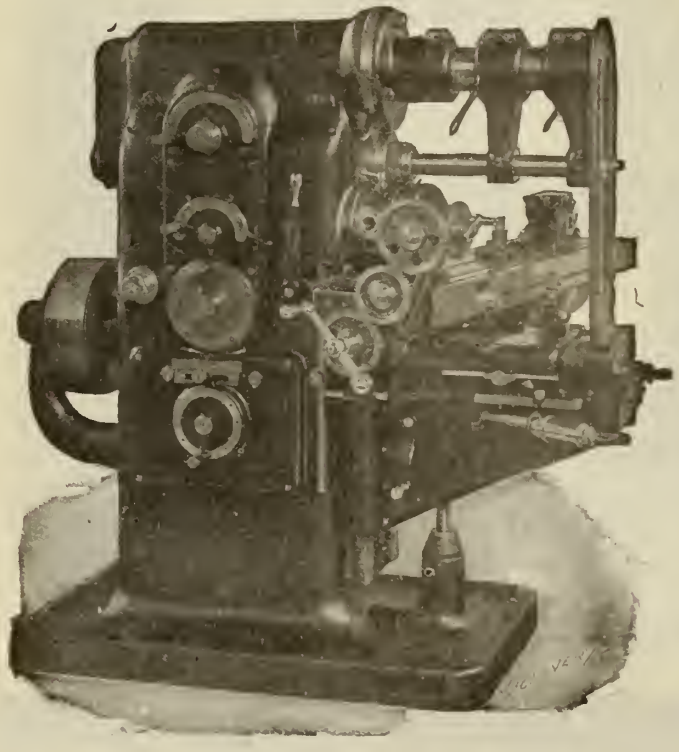

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have established an enviable reputation among prominent manufacturers for accuracy, simplicity in construction and ease of operation. That they have been able to do this is credited to the great care exercised in their design, and the high-grade workmanship used in their construction.

All feeds on the Rockford are controlled by one lever—the main spindle is instantly adjustable by a single nut, and the operator can complete a job without leaving the front of his machine. These are a few of the points that have made the Rockford a favorite with the men as well as their employers. We would like to tell you more about these machines. Write us for full information.

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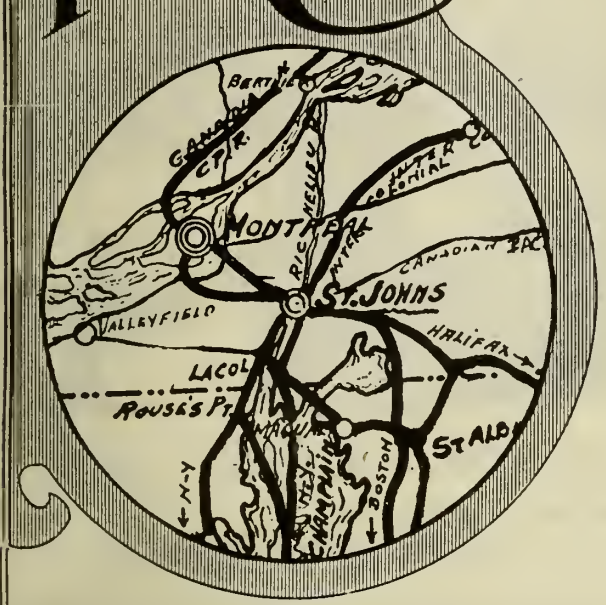

The location of an industrial plant has a vital effect on its prosperity

For every industry there is a logical location. It may be decided by labour conditions, by the location of raw materials and market, by demands for power or by special factors peculiar to the business.

It is therefore of utmost importance in selecting a location for your new factory that the relative advantages of the different sites be weighed carefully with keen appreciation for future demands and development.

St. Johns possesses such unusual advantages of great economic importance such as its commanding geographical location, unequalled transportation facilities, adequate fuel and power and labour supply that it should always be included in investigations before definitely deciding on the location of a new industry.

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No other locality can offer these combined advantages

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—Desirable factory sites with all public conveniences immediately available.

—Extraordinary inducements to new industries.

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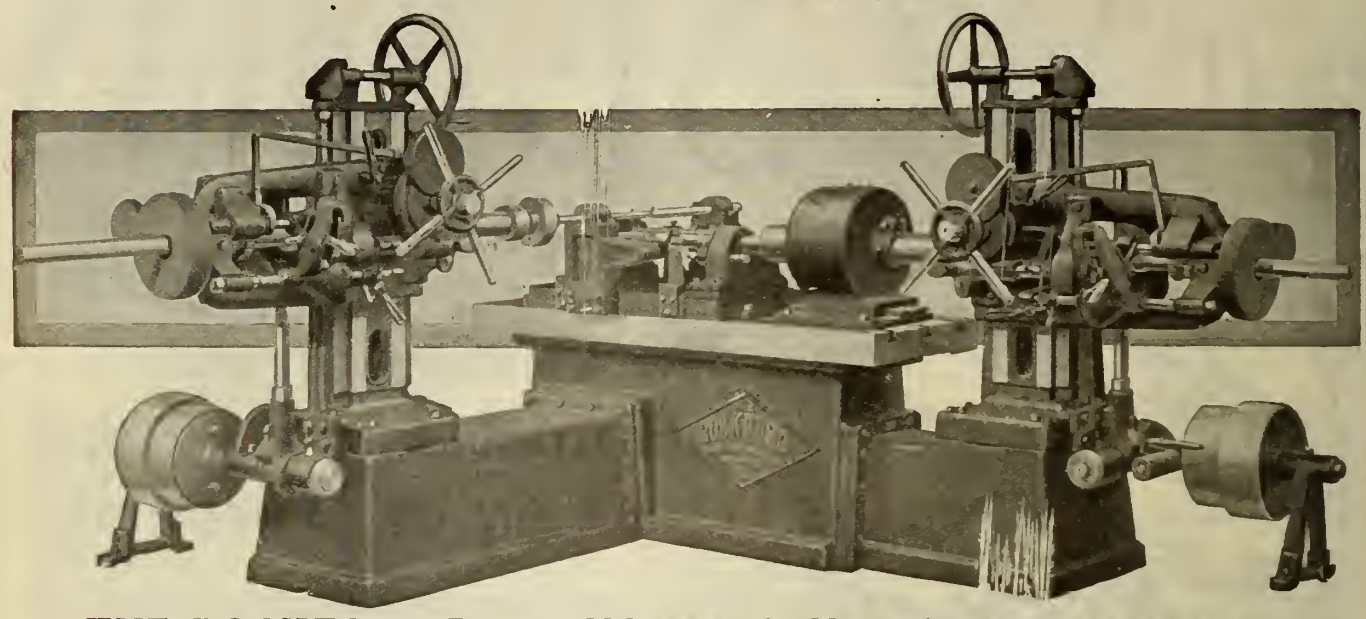
For Automobile Manufacture

This tool is unusually rapid and accurate in the boring of crank cases, transmission cases and rear axles. Has two heads at right angles to each other. Spindles bore longitudinal and cross holes in work simultaneously.

Send us blue prints of your boring work and we will give you figures on the "Rockford's" ability on it.



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McDougall Crank Shapers

16 and 20 inch

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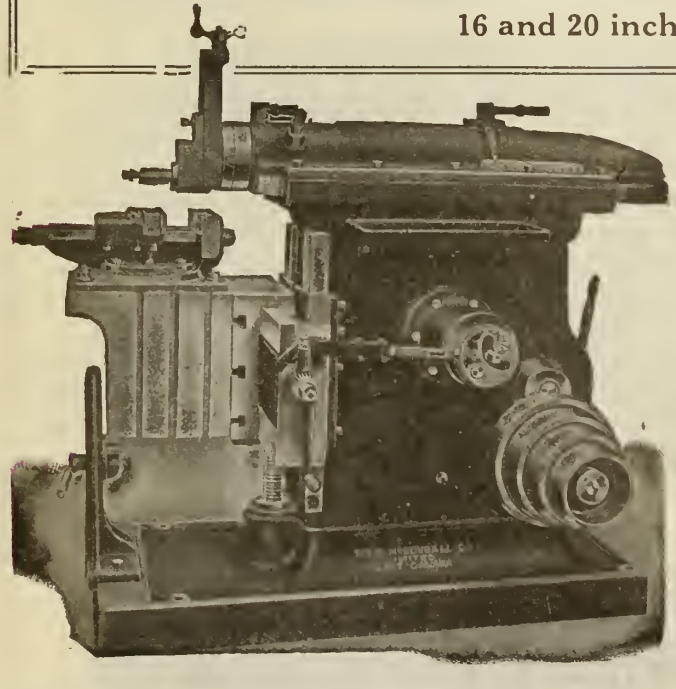

A Bigger Day's Work—

is made possible with McDougall Crank Shapers than with any ordinary Shaper because the McDougall is built on lines especially for this purpose. It embodies the most approved features of the most practical shapers on the market and care has been taken to exclude all non-essential parts.

The column is massive in construction, well braced and reinforced internally. Exceptional strength is also seen in the ram, which is semi-circular in form and of box type. It can be set forward by crank conveniently arranged.

Slides are square, accurately fitted and with broad bearing surfaces.

Have us explain the other salient points of this finely constructed machine. Full details on request.

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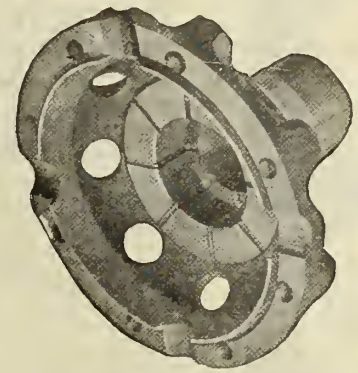
Savings for you

WHAT you *really* are buying is the finished work itself—the piece shown on this page and hundreds like it can be successfully handled with the Standard Chucking Tools at great savings in time and money.

Investigate the Gisholt method of doing your chucking work. Let one of our representatives help you.



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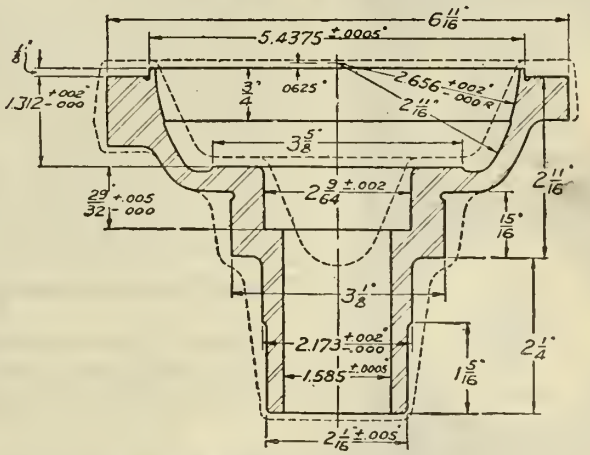

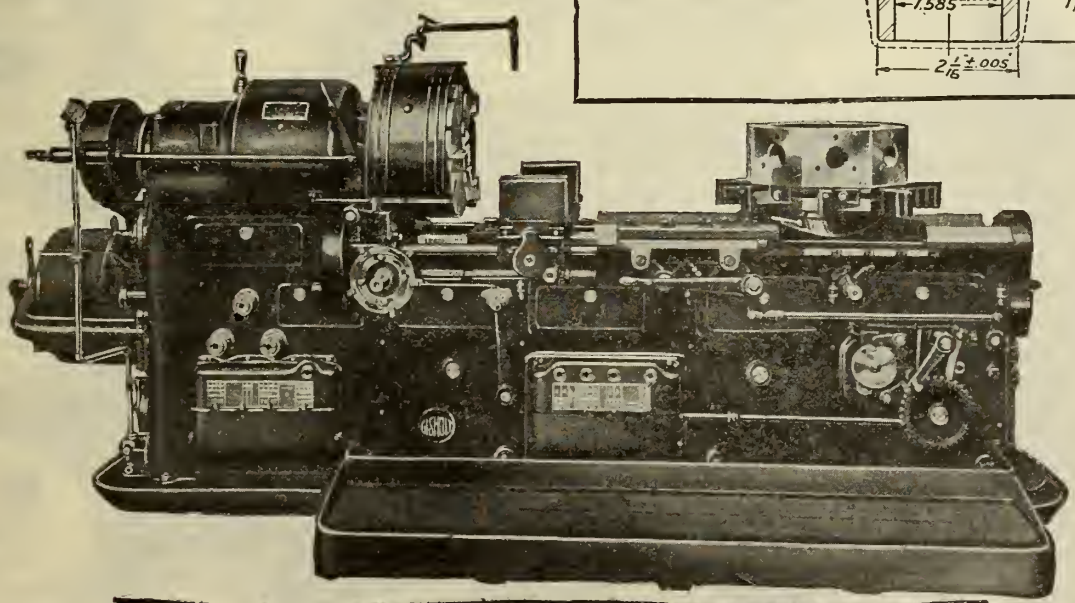

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Production Plus Quality

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CANADIAN MACHINERY
AND
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Making Up Part Lists for Machines in Sections

The Preparing of Part Tests for Standard Machines is Simple, but When Machines Are Built in Sections the Proposition Becomes More Complex — One Plant Prepared Their Tests as Shown

By F. SCRIBER

ONE of the quite prevalent customs in the building of machinery is to furnish for each machine or group of machines to be built a list of parts which go to make up the machine or group. This usually originates in the engineering department and is known by such names as "Lists of Parts," "Schedule," "Bill of Material," etc.

When the machines built are all similar the making of this list by one familiar with the particular machine is a fairly simple matter, but in some types of machines, most notably those made in sections, having variant numbers of units in a section or variant numbers of sections in a machine, the making of a suitable list is a much more complicated proposition. Types of machines in this class are multiple spindle drills and some forms of textile machinery.

The purpose of this article is to illustrate some suitable forms which have been found convenient for listing parts which must be included to make up machines of the latter class, namely, "machines requiring varying quantities to make one complete machine to order as regards size or number of units wanted."

The first list shown, Fig. 1, is a list complete with the exception of sundries such as cotter pins, screws, etc., for getting out parts to make a complete machine, and the first column at the left gives the piece number or drawing number of the various parts, the second column is for the number of parts wanted per machine, and in this connection it will be noted that where the quantity is common to all sizes of machines this is filled in, while a blank space is left otherwise, this to be filled in by the person who issues each individual list; the third column gives the name of each part, while the remaining three columns are a repetition of the others. This list is issued primarily for the finished stock department to issue stock to the assemblers, consequently no columns giving kind of material or size of stock are needed, although such is usually given in lists for the order and rough stock departments.

FIG. 1. PART LIST OF ALL CENTER PARTS INCLUDING TRAVERSE & DRIVING END FOR [redacted] SPINDLE BT — P.L. No. *14

PCE. No.	No. WTD.	NAME	PCE. No.	No. WTD.	NAME
BT-3		CENTER SUPPORT.	BO-230		HOOK-SWIFT WEIGHT.
BT-4		SPIDER.	BO-238		WEIGHT STRAP.
BT-5		SPINDLE BRKT. WITH TRAV. ROD BRKT.	BP-16		SWIFT BRACKET.
BT-6		SPINDLE BRKT. WITHOUT TR. ROD BRKT.	BP-17	1	BRACE.
BT-24	2	CONN. FOR TRAV. RODS.	BP-45	2	V BOARD BRKT. L.H.
BT-27	2	SLOTTED END PIECE.	BP-46	2	V BOARD BRKT. R.H.
BT-32	4	COUPLING FOR SPINDLE BRKT.	BP-47		CENTER V BOARD BRKT.
BT-42	2	CAP WASHER FOR PIPES	BP-64		WINDER PULLEY.
AK-11		CTR BEARING FOR 5/8" SHAFT.	BS-14		SWIFT BRACKET.
AK-32		TRAV. CAM 2 1/2" THROW.			

FIG. 1—PORTION OF COMPLETE LIST WITH EXCEPTION OF SUNDRIES.

FIG 2 — P.L. 2, AUG 8, 1919 — VARIABLE SPEED DRIVES. BT DOUBLER

SYMBOL	MATERIAL	NAME.	BP	AU	BV	BS	BT	BO
BT-218	C.R.S.	HANDWHEEL KNOB ("00 CINCINNATI)	2	2	2	2	2	2
BT-220	STEEL	THRUST BEARING - BALL. SEE DRAWING	2	2	2	2	2	2
BT-221	LEATHER	LEATHER DISC.	2	2	2	2	2	2
BT-217	STEEL	TRAVELER YOKE SCREW WASHER.	2	2	2	2	2	2
BP-205	C.R.S.	DISC SHAFT.	2	2	2	2	2	2
BW-1324	C.R.S.	SELF ALIGNING BEARING SET SCREW.	4	4	4	4	6	4
AN-202	R. IRON	INDEX FINGER.	2	2	2	2	2	2
BT-205	D" ROD	DISC KNOCK OFF PIN.	2	2	2	2	2	2
		HEX. HD. CAP SCREWS.						

FIG. 2—A PORTION OF SUNDRY LIST.

Referring to Fig. 2 this shows a list of sundries, the column at the left being the symbol number, or in the case of screws or other purchased parts the size of same, the second column gives the material used for making the various parts where this is desirable, and the third column gives the names of the various parts; at the head of the sheet the part list number is given and also the name of the machine and other general data of a quite obvious nature. At the right of this illustration are six columns, each of which are headed by two letters, these letters being symbol letters designating different types of machines, and in these columns are noted the necessary quantities for making the various machines, this type of list being one which can be made to cover quite a number of different machines having the same general characteristics.

A somewhat different type of sundries list, and one having some very commendable features is shown by Fig. 3. The first line at the top of this list gives the name of the machine, the second line is a general description giving the subject matter of the list, while the columns are divided into three groups each giving the following information, size of screw or part, "Number Wanted" column and column giving part name and purpose for which used.

Taking for instance the column headed A. at intervals along this column a sketch

of the type of screw wanted is made, and below these sketches are listed the size and length of screws wanted. In column C opposite each sketch is given the name of each type of screw, below the names in this column, and opposite the screw sizes are noted the purpose for which each screw is used. Column B, which is left blank, is filled in with the quantity number required to make the particular group of machines wanted, while the blank space at the head of the sheet is for indicating the number of machines being made.

This last list makes a very vivid presentation of what is wanted in the nature of screws, washers, etc., while all forms shown may be suggestive of an adaptation suitable for some of the readers' needs.

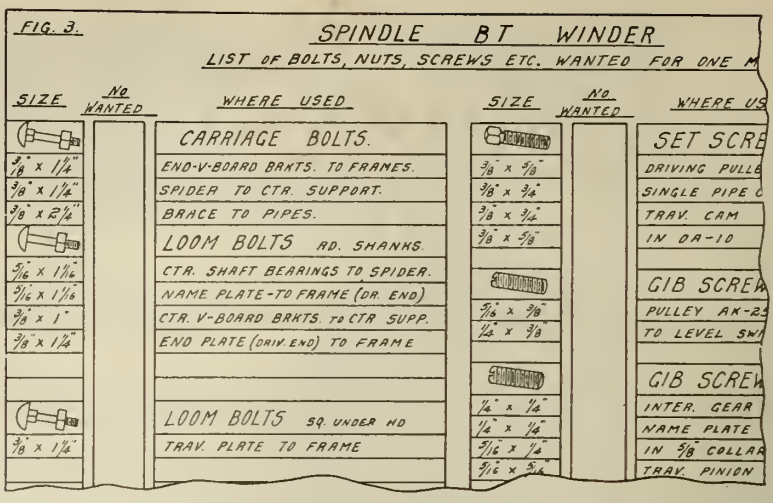
FIG. 3. SPINDLE BT WINDER

LIST OF BOLTS, NUTS, SCREWS ETC. WANTED FOR ONE M

SIZE	NO WANTED	WHERE USED
		CARRIAGE BOLTS.
3/8" x 1/4"		END V-BOARD BRKTS. TO FRAMES.
3/8" x 1/2"		SPIDER TO CTR. SUPPORT.
3/8" x 2 1/4"		BRACE TO PIPES.
		LOOM BOLTS RD. SHANKS.
5/16" x 1 1/16"		CTR. SHAFT BEARINGS TO SPIDER.
5/16" x 1 1/16"		NAME PLATE-TO FRAME (OR. END)
3/8" x 1"		CTR. V-BOARD BRKTS. TO CTR SUPP.
3/8" x 1 1/4"		END PLATE (DRIV. END) TO FRAME
		LOOM BOLTS SQ. UNDER HD
3/8" x 1 1/4"		TRAV. PLATE TO FRAME

SIZE	NO WANTED	WHERE US
		SET SCRE
3/8" x 5/8"		DRIVING PULLE
3/8" x 3/4"		SINGLE PIPE C
3/8" x 3/4"		TRAV. CAM
3/8" x 5/8"		IN DA-10
		GIB SCREW
5/16" x 3/8"		PULLEY AK-25
1/4" x 3/8"		TO LEVEL SW
		GIB SCREW
1/4" x 1/4"		INTER. GEAR
1/4" x 1/4"		NAME PLATE
5/16" x 1/4"		IN 3/8" COLLAR
5/16" x 3/4"		TRAV. PINION

FIG. 3—A VERY HANDY FORM OF SUNDRY LIST.

Stellite, Festel Metal and Stainless Steel

The Composition of Stellite, Together with the History and Properties of Stainless Steel, Are Presented in a Very Able Manner in This Article—Discussion of the Paper is Also Given.

STELLITE and stainless steel were the subjects of an interesting paper recently presented before the Engineers' Society of Western Pennsylvania, Union Arcade Building, Pittsburgh, by Elwood Haynes, president Haynes Stellite Co., Kokomo, Ind. The paper is given largely in full below:

The three metals, iron, nickel, and cobalt, are termed by chemists the "metals of the iron group." The reason for classifying them thus is the fact that their respective properties are all quite similar.

1. They are all distinctly malleable.
2. They are all distinctly magnetic.
3. They possess high tensile strength and high modulus of elasticity.
4. When pure they take a high polish and show a distinct metallic lustre.

They also resemble one another in their chemical properties.

1. Each is readily soluble in nitric acid.
2. Each form a monoxide with oxygen, as FeO, NiO, and CoO. Each also forms a sesquioxide, Fe_2O_3, Ni_2O_3, and Co_2O_3.
3. Aqueous solutions of their chlorides, when evaporated to dryness, are transformed into oxides.
4. Their oxides are all readily reduced by either carbon monoxide or hydrogen.
5. Their melting points coincide quite closely.
6. Their atomic weights are quite close together, that of iron being 56, and those of cobalt and nickel approximating 59.

When solutions of cobalt and nickel are mixed, it is difficult to separate the metals one from the other, owing to the fact that their behavior under most precipitants is practically the same.

Composition of Stellite

In 1899 the writer produced an alloy consisting of practically pure nickel and pure chromium by heating their mixed oxides with aluminum. This alloy, when polished, retained its lustre, even in the atmosphere of a chemical laboratory, and proved to be practically insoluble in nitric acid, even when boiling. It is also malleable when cold, and under proper annealing can be worked into sheets and wire.

Shortly afterward an alloy of cobalt and chromium was produced, which not only showed the same untarnishable properties as the nickel-chrome alloy, but possessed much greater hardness. The alloy could not be worked to any extent cold, but was found to be malleable at a bright orange heat.

It was not until 1906 that the alloy was produced in sufficient quantity to determine its properties fully. In 1909 a cutting blade was made of the alloy, which took an edge comparable to that of tempered steel. Later, tungsten or molybdenum was added, and the alloy thus produced was sufficiently hard to turn iron and steel on the lathe. Later experiments demonstrated that such alloys, when properly formed, would scratch any steel, and would stand up under much higher speeds on the lathe than the best high-speed steel tools. This fact gave the cobalt-chromium-tungsten alloy termed stellite (from the Latin word, stella—a star) a field of its own, and placed it in a class by itself as a material for high-speed tools.

Generally speaking, the cobalt-chromium alloys possess three distinctive properties, namely:

1.—They are untarnishable under all atmospheric conditions, and immune to nearly all chemical reagents.

2.—They possess great hardness.

3.—They retain their hardness up to visible redness.

Festel Metal

Some of the stellite articles for ordinary use are formed from alloys of cobalt and chromium only. This alloy answers well for table knives, spoons, etc. The harder edged tools, such as pocket knives, surgical instruments, etc., contain in addition to cobalt and chromium a certain amount of tungsten to give them greater hardness, while in other instances a certain amount of iron is introduced into the alloy to soften it so that it may be more readily worked. Such articles include table-knife blades, pocket-knife handles, certain dental instruments, etc. When iron is added to the alloy, the resulting mixture is termed "Festel metal," being made up from the chemical symbol for iron (Fe) and the first syllable of stellite.

This beautiful and easily workable alloy is well adapted to the manufacture of fine door latches, door-knobs, and high class sanitary fittings for bathrooms, lavatories, etc. It is not malleable except at a bright red heat, but when a certain portion of nickel is added it may be worked cold on the lathe or under the file. By suitable means it can be given a beautiful stippled surface, resembling that of frosted silver, and it is needless to add that under all conditions it retains its lustre in the most satisfactory manner.

Some of the later stellite alloys have shown most remarkable resistance to chemical reagents. One of these, possessing quite high chromium, takes a magnificent polish, resembling that of burnished silver. This alloy retains its lustre perfectly in boiling aqua regia, and is not affected in the slightest degree after immersion in that liquid for a period of 14 days. It is slowly attacked by cold hydrochloric acid, but is practically immune to cold, strong sulphuric acid, and nearly immune to the same acid in the diluted form. It is strictly immune to nitric acid of all strengths.

Balance weights made of this material retain their lustre under the most trying conditions. They present a beautiful appearance, owing to their superb lustre, and are so hard that their loss from ordinary wear will be perhaps unweighable for several years.

History of Stainless Steel

In the year 1911, I made some experiments on alloys of iron and chromium with a view to ascertaining definitely their properties. I quote from my notes as follows. [Mr. Haynes gives memoranda from his notebook, made in 1911 and 1912, of tests of alloys of varying quantities of iron and chromium.]

The experiments recorded above distinctly show that the non-corrosive qualities of chrome-iron and chrome-steel alloys were not only discovered by the writer at the time specified, but that their physical properties were also fully demonstrated. The discovery rests not on the possibility of adding to the steel other elements which may render it more or less immune to corrosion, more or less easily workable, but upon the fact that immune chrome-steels must contain more than 8 per cent. chromium, though for certain purposes they may contain much more than that amount, even up to 60 per cent.; that such steels are distinctly workable and useful, whether subjected to heat treatment or not; furthermore, that the proportion of carbon may be raised as high as 2 per cent. without materially interfering with the untarnishable qualities of the alloy, though such alloys are, generally speaking, more easily worked if the carbon is below 1 per cent.

Numerous metals may be added to stainless or rustless steel, and some of these may contribute slight benefit, while others may be slightly detrimental. Among these are nickel, cobalt, vanadium, silicon, boron, tungsten, molybdenum, titanium and tantalum. It is evident that an indefinite number of alloys could be thus formed, some with and some without the above elements, but none would be stainless unless it contained the proper amount of chromium, which is the essential element to be added to nickel, cobalt, or iron to produce a stainless alloy.

About two or three years after the discoveries recorded above Harry Brearley, of Sheffield, England, discovered practically the same properties in chrome-steel, and I am practically certain that the melting point, even in the presence of any discoveries made by me.

Immediately after making the discoveries recorded above, I applied for a patent, but my application was not at first granted, on the ground that chrome-steels were not new. Without going into details, I will say that I later made a second application, and that about fifteen days later. Mr. Brearley filed an application for practically the same thing. The United States Patent Office granted a patent to Mr. Brearley on the ground that his application contained a provision that it was necessary to polish and harden the steel in order to render it immune. This, however, was later found not to be correct, and in May of this year practically all of the claims in the application of the writer were granted by the Patent Office.

A personal service corporation was formed in this city, to which both the Haynes and Brearley patents were assigned, and licenses have now been granted to the principal steel makers for the manufacture of stainless steel under these patents. This corporation is the American Stainless Steel Co., with offices at present in the Oliver Building, Pittsburgh.

Properties of Stainless Steel

Stainless or rustless steel consists essentially of an alloy of iron and chromium, containing usually from 0.1 to 1 per cent. of carbon, though the latter element may be present up to nearly 2 per cent. without interfering seriously with the working qualities of the steel.

Owing to the high percentage of chromium and its tendency to oxidize at the melting point, even in the presence of carbon, it has been found advisable to melt the steel either in crucibles or in the electric furnace. After melting, the metal may be poured into ingot molds in the usual manner, and the ingots thus obtained may be forged or rolled into bars or sheets. If the ingots are of comparatively small size, they will be found to be very hard after casting, especially if they have been stripped hot and allowed to cool rather rapidly in the air. Indeed, small bars thus produced are likely to be almost file hard.

If a small piece of the steel thus produced be placed in a beaker with a piece of ordinary steel and covered with nitric acid, the ordinary carbon steel will be dissolved with great violence, while the chrome steel will remain utterly unchanged, thus proving that its immunity is primarily due to its composition. This is true whether the steel contains carbon in large or only minute quantities.

Cold chisels cast in iron or graphite ingot molds are sufficiently hard, without tempering to cut ordinary iron or steel.

By heating cast bars to a bright orange temperature, they can be forged pretty readily into various forms. After the forging is completed, the metal may be allowed to cool in the air, and will be found to possess remarkably fine grain and good cutting qualities.

Quenching in water enhances the hardness to a considerable degree, particularly if the steel contains more than 0.4 per cent. carbon. It is best, however, to use oil for quenching, in order to avoid local contraction stress in the finished article, which might cause it to break under a slight shock or jar.

Notwithstanding the comparatively high temperature of working this steel, the bars show almost no scale during the forging operation, and when finished are covered with a blue-black "skin" consisting of a thin film of oxide.

Owing to the absence of deep oxidation and resistance to deformation at comparatively high temperatures the alloy is admirably suited for casting engine valves and distilling apparatus, and for many other purposes of like nature. When ground and polished, the alloy resists tarnish to a remarkable degree It is superior in this respect to brass, copper, and nickel plate, and far superior to any other steel yet produced. Axes, hatchets, saws or chisels made from it, not only will not rust in the atmosphere, but are unchanged when exposed to salt water or salt air. It will likewise doubtless find a large use in the manufacture of propeller blades for steamers, since its modulus of elasticity is much higher than that of bronze, and it resists the action of both fresh and salt water perfectly. Its great strength and comparatively high elastic limit are likewise in its favor. It will doubtless also have a large application in the manufacture of pump-rods, cylinder linings, pump valves, etc.

It is slowly attacked by dilute or strong sulphuric acid, and also by hydrochloric acid; but nitric acid has little or no effect upon the polished surface of the metal. When properly made it is impervious to practically all the fruit acids, including strong vinegar.

The alloy will fill a long-felt want among carpenters and others using wood cutting tools, since its freedom from rust, together with its capability of taking a keen cutting edge, renders it admirably suited for wood working tools. As noted above, it has been made into auger bits, and these have remained bright for years under all sorts of atmospheric influences.

Discussion Then Followed

In answer to a question as to the tensile properties of stellite, Mr. Haynes stated that "a good representation of malleable stellite would be 80,000 lb. elastic limit, 110,000 tensile strength, and with an elongation of 9 per cent."

Relative to the use of stellite during the war, he said: "We have no definite record, but our men claim that stellite was used in the rough turning of three-fourths of all the shrapnel made in this country during the late war. The last year of the war we delivered about three million dollars' worth of stellite for war purposes principally."

In answer to a question as to erosion on stellite from the effects of abrasion, such as the wear from water rapidly passing over the surface of the parts of a pump runner, Mr. Haynes explained that "it is very satisfactory. In the first place it is harder to grind than any steel, because steels do not resist erosion or abrasion to any remarkable extent. The hard alloys do not show as high scleroscopic or Brinell tests as the high-speed steels, but they work very much better because their abrasive hardness is very great. These two properties are not always fully understood. Some of us have thought that if we put a bar of steel under the scleroscope and it shows a high test, it is an extremely hard steel which would resist abrasion. A steel of that kind has a high elastic hardness, but not necessarily a high abrasive hardness. A vanadium steel of moderately high carbon and hardness will throw the hammer very high and the scleroscope test may show a hardness of 90, but at the same time you can take a file and file it with ease. Stellite alloys are just the reverse. They show a low elastic hardness and a very high abrasive hardness."

Power Transmission

The start of a series covering various styles of transmission. The chain drive and examples of its installation are shown.

By
J. H. Moore

THE question of proper power transmission is perhaps one of the most important met with in the modern industrial plant of to-day. In order that readers can have an opportunity of studying this matter for themselves, we are preparing a series, of which this is the first, on the different styles, and phases of transmission.

Through the courtesy of the Link-Belt Co., of Chicago, we are able to present the following illustration on chain drives as applied to transmissions. We feel some readers will appreciate the opportunity of noting where this style drive can be used to advantage, so suppose we ask ourselves the question, "What style drive shall we use, and what requirements shall we look for in the drive we decide upon?"

Points to Be Remembered

There are numerous points to be considered before deciding on the style of drive to be used, but perhaps most important of all is the question of loss of power due to slippage. One can readily understand that the moment any slip occurs, a certain percentage of power is going to waste, so that whatever system is adopted, ascertain if that system will ensure against such loss.

We are all aware that gearing is positive in its action, for, as the teeth mesh with each other, there is a positive drive which cannot slip. It is this fact which makes gearing the ideal driving power for automobiles, and so on.

We can readily realize, however, that it is quite impossible to use gearing for all transmission purposes. Apart from the high cost of cutting the teeth, the space the gears would occupy, the difficulty of securing proper ratio, and the noise accompanying the running of a huge train of gears, especially at high speed, would soon prove its not being the proper methd. Having been convinced upon these basic points, suppose we ascertain if the chain belt system will meet in with the non-slip requirement.

In referring to its construction, we note that the chain consists of a series of leaves or plates, the joints of which consist of segmental case-hardened liners, or bushings, and case-hardened steel pins. These liners, which are removable, extend across the entire width, which makes for a double bearing surface, and halves the bearing pressure on the joints. This, of course, means that the chain wears uniformly and keeps round. It runs upon a sprocket with teeth somewhat after the style of a gear, although they are shaped different, owing to the construction of the links. From these few points, we find that by transmitting power by means of a chain we are practically accomplishing the same result as if we were driving direct by gears, with the added advantage that we get away from the difficulty of ratios.

If we look at a chain drive closely, we will discover that there is actually more working contact in a chain drive than

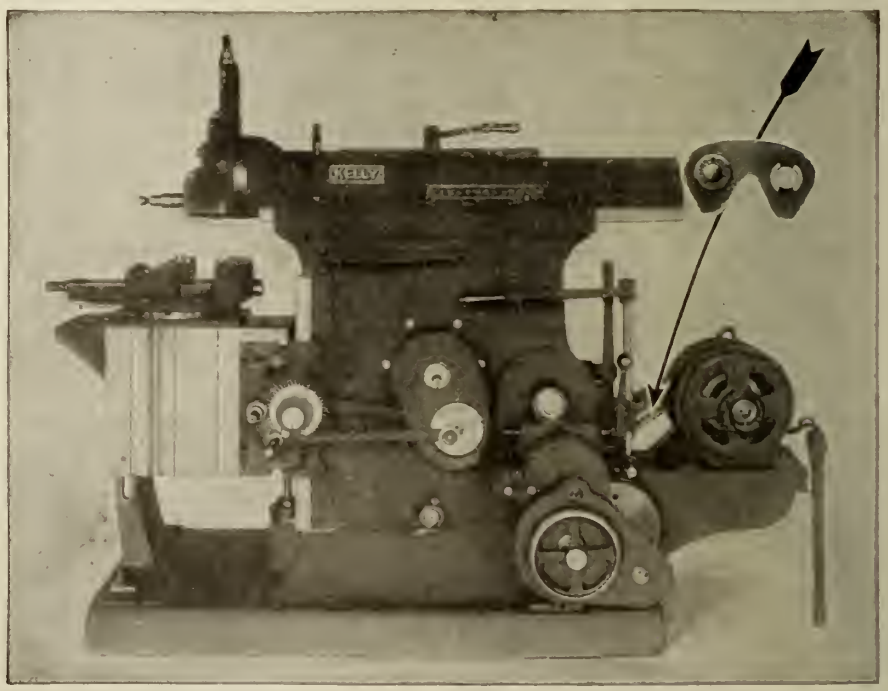

FIG. 2—5 H.P. CHAIN DRIVE OPERATING 24" BACK GEARED SHAPER

even in a gear drive, so that we can, with safe assurance, look forward to a longer life drive, together with smoother action. This smooth action would tend to answer the unspoken question regarding what noise can we expect from a drive of this nature, for if we have smooth action we naturally overcome throbbing, uneven motion, vibration, and other disadvantages which go to make up that one word, noise.

Another big point to be looked into is the matter of space, or in other words, what space is necessary to install a chain drive? Once more the answer is satisfactory, for the distance between centres can be made to suit your individual conditions. Gears require fixed centres, even to the thousandth of an inch, but with a chain installation you can make your centre distance meet in with your requirements.

There is also the question of ratios, or to put it more plainly, speed reduction. In gearing it is not always practical to step down at once to the desired speed, which means that intermediate reductions are necessary, but with the chain drive this becomes unnecessary, which naturally is a big point in its favor.

So far it would appear as if the chain drive was coming up to our requirements, so next we ask ourselves the question, "How about the power required to operate any machine? Can we, by using a chain drive, save any of that power?"

The practical mechanic knows that it is impossible to avoid some variations in the cutting and setting of gears, also that in proper meshing and wear, will increase the power required to operate a machine. These drawbacks are overcome in using a chain drive, as for example:

A certain machine required 7½ horsepower to drive it by the regular method,

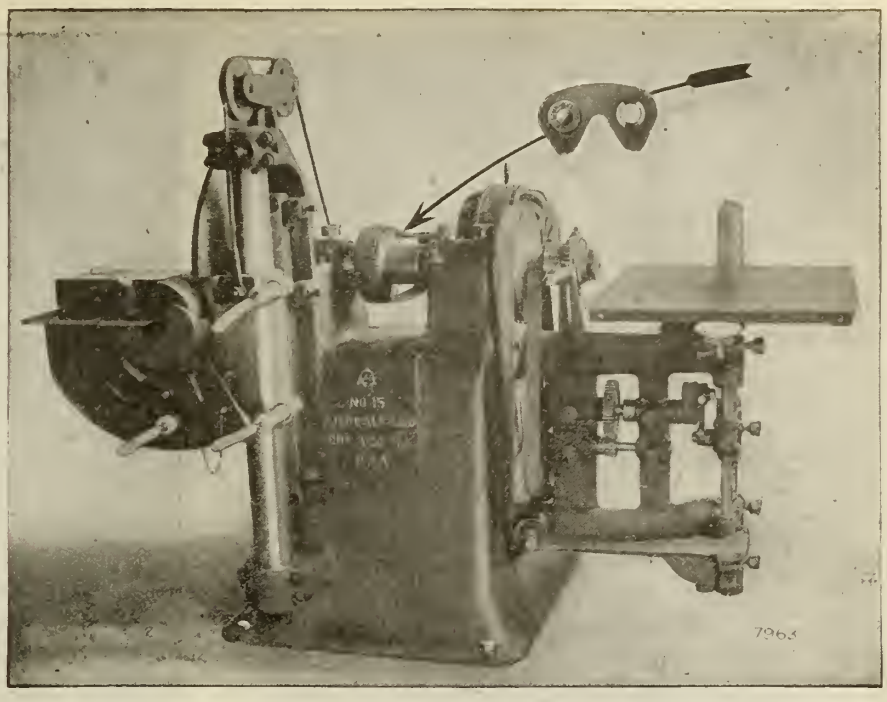

FIG. 3—15 H.P. CHAIN DRIVE OPERATING PATTERN MAKERS' DISC GRINDER.

but on it being equipped with individual motor, and chain drive, 5 horsepower proved efficient. This shows a clear saving of 2½ horsepower in this particular case.

Other Features of Interest

There is also the question of tool upkeep to be considered. From tests made, it has been proved that where conditions were exactly alike, with the exception of the drive, a greater and a better output was possible by the use of the chain drive. The effect on the tools was very noticeable, one case showing that only two sharpenings of a drill was necessary in place of ten, after the chain drive had been installed.

This feature of longer life of tools means less expense, not to speak of the time saved, for without question, it is a serious matter, the removing, sharpening, and replacing of the various tools. The driving force of a chain is positive, yet elastic, and is equal at each instant to the force required to do the work at the rate of feed and speed as set. The result is a uniform character of work. There is no tearing or chattering, and a better and more uniform product is produced.

It is claimed by manufacturers that in the average case a chain drive can help to obtain 20 per cent. greater output, save 20 per cent. in power, give from four to ten times the service on cutting tools, with the consequent saving of time of operation for grinding, re-setting, etc., give a better finish to work, make less wear on the bearings and rotating parts, and larger and heavier work can be accomplished on the same machines.

To suggest where chain drives can be used to good advantage, is almost impossible, for their field of usefulness is practically innumerable. Cement plants, paper making plants, textile mills, rubber mills, machine tool plants, in fact every industry can use them to good advantage.

Another point which we have so far omitted to mention is that of the safety feature of a drive of this nature. A chain installation is always easily protected, and if enclosed in a dust-proof oil-tight casing, the result is, of course, perfect, for such a procedure guarantees ample lubrication and protection from dirt.

In looking over the various illustrations in this article we suggest you not only look, but study them. Run over, in

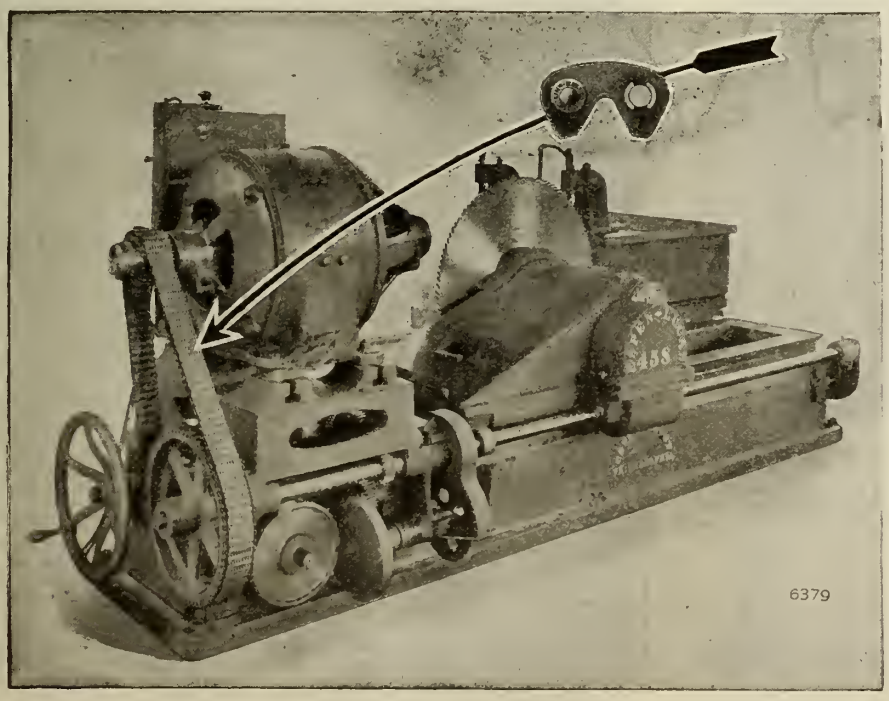

FIG. 4—15 H.P. DRIVE WITH SPECIAL SLIP PINION TO TAKE CARE OF OVERLOAD.

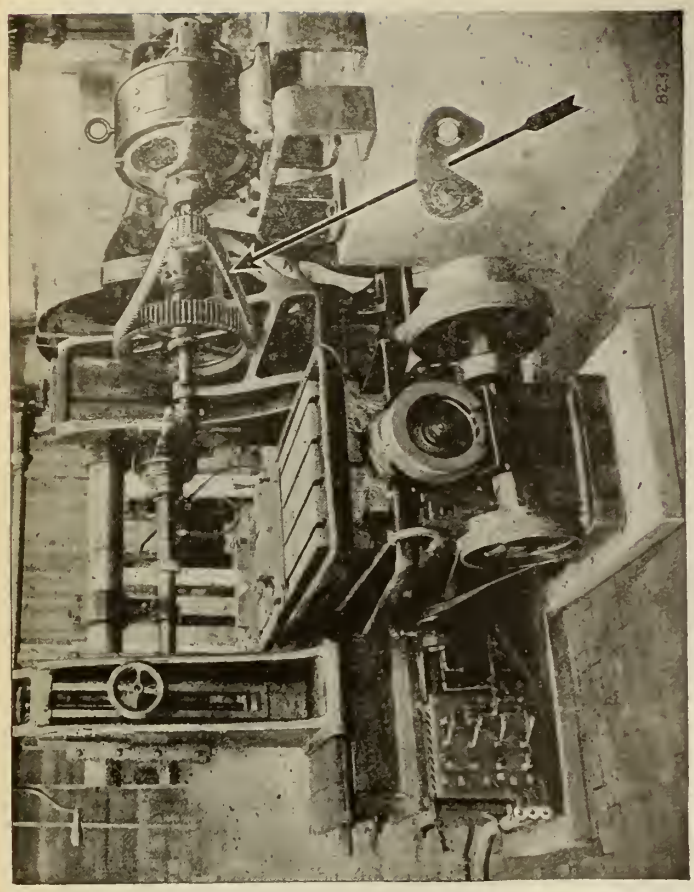

FIG. 5—A 7½ H.P. CHAIN BELT OPERATING MILLER PREVIOUSLY OPERATED BY MECHANICAL DRIVE.

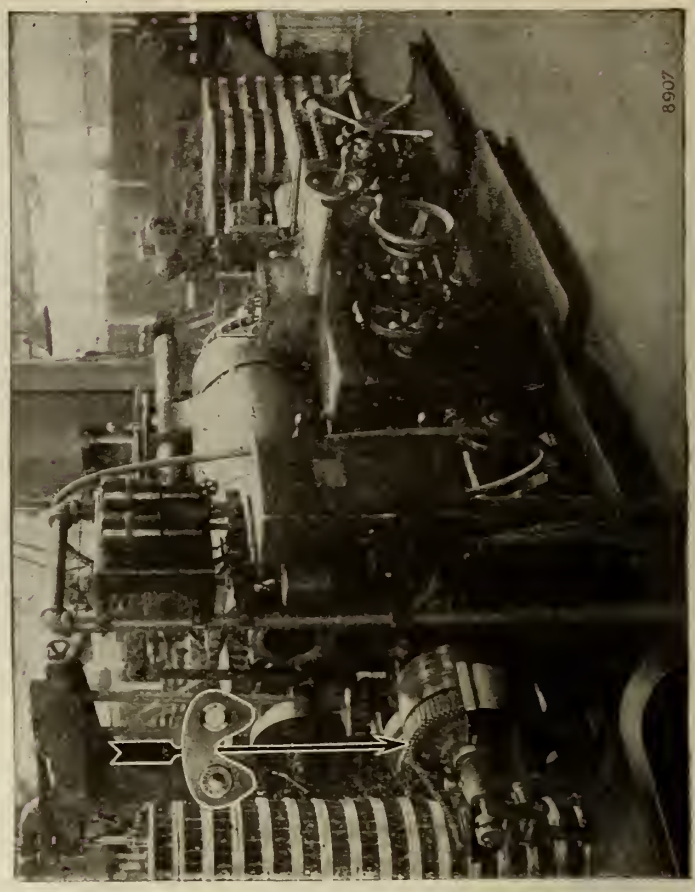

FIG. 6—A 5 H.P. DRIVE ON A STEINLE TURRET LATHE.

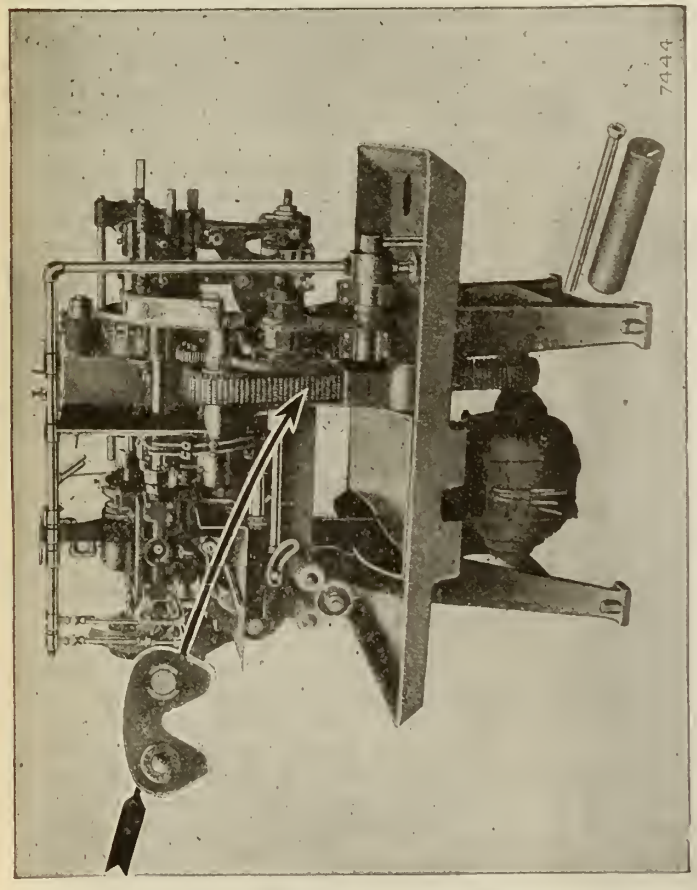

FIG. 7—3 H.P. DRIVE OPERATING MULTIPLE AUTOMATIC.

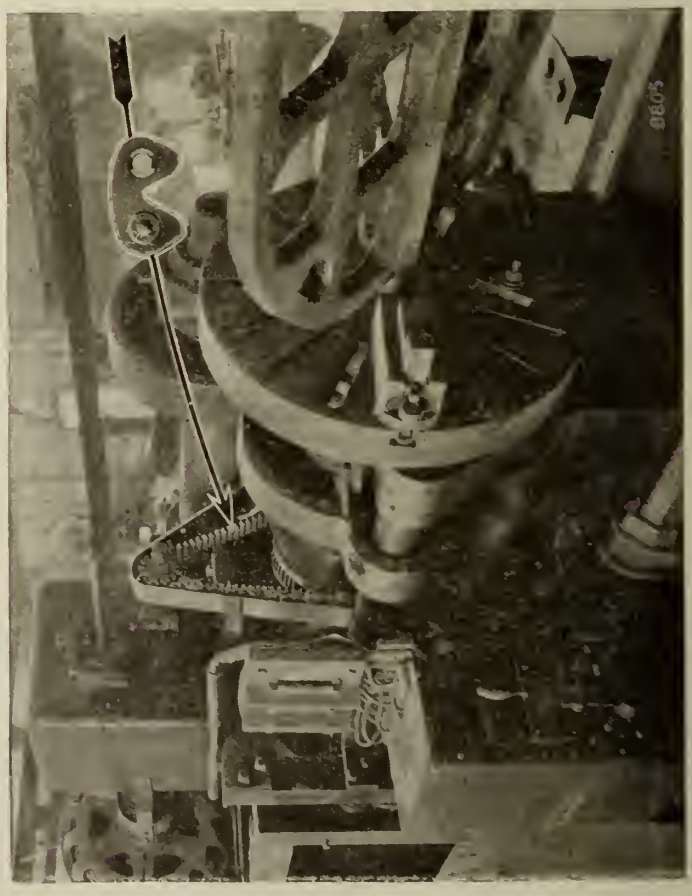

FIG. 8—7½ H.P. DRIVE OPERATING LATHE. CHAIN SHOWN IS ⅝" PITCH AND 4" WIDE

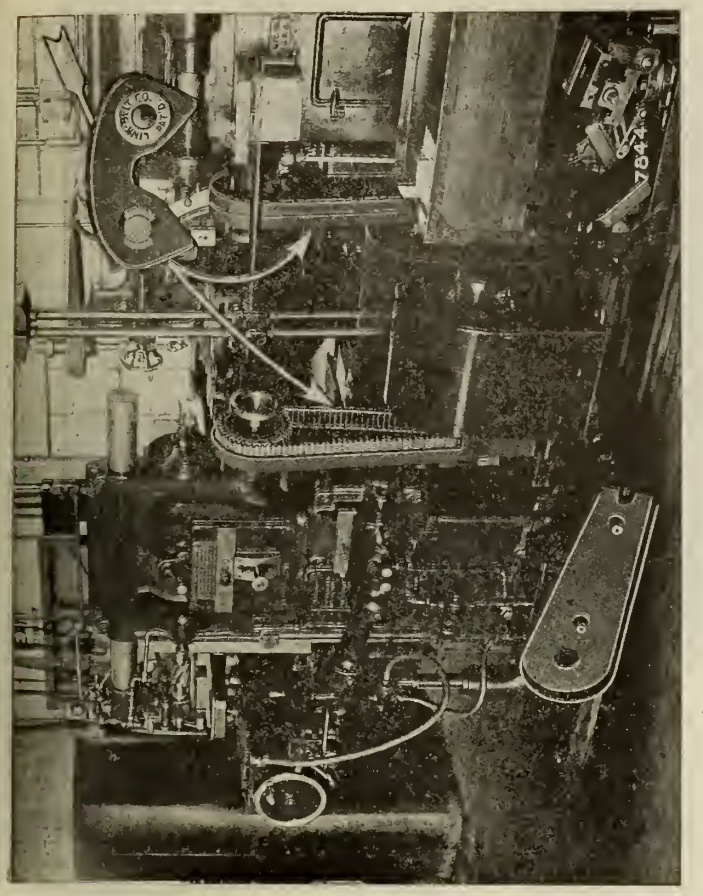

FIG. 9—5 H.P. DRIVE FOR BROWN & SHARPE MILLERS.

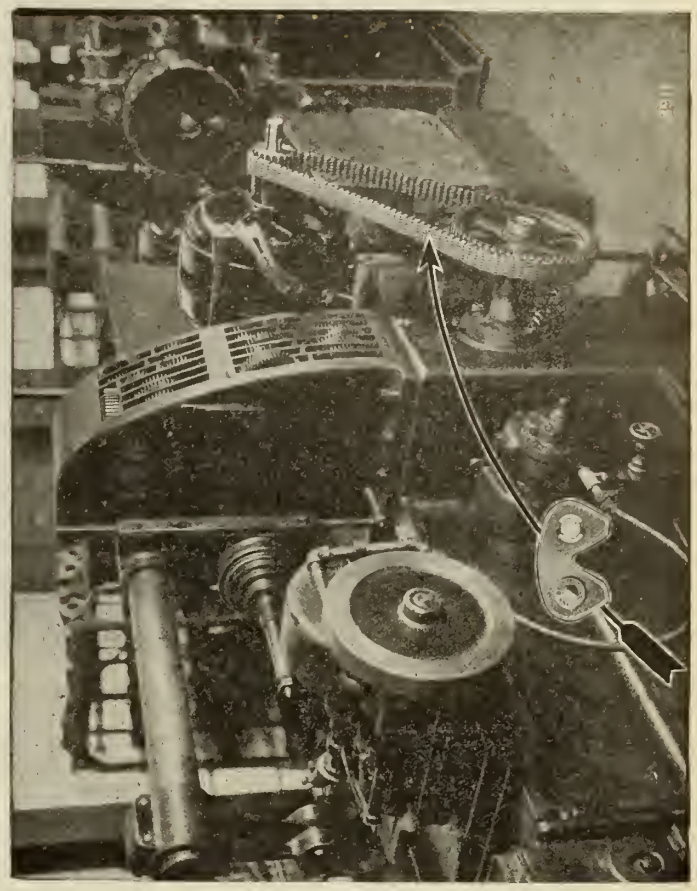

FIG. 10—CLOSE UP VIEW OF DRIVES SHOWN AT FIG. 15.

FG. 11—A BATTERY OF GEAR CUTTERS DRIVEN BY CHAIN FROM LINE SHAFT UNDER FLOOR.

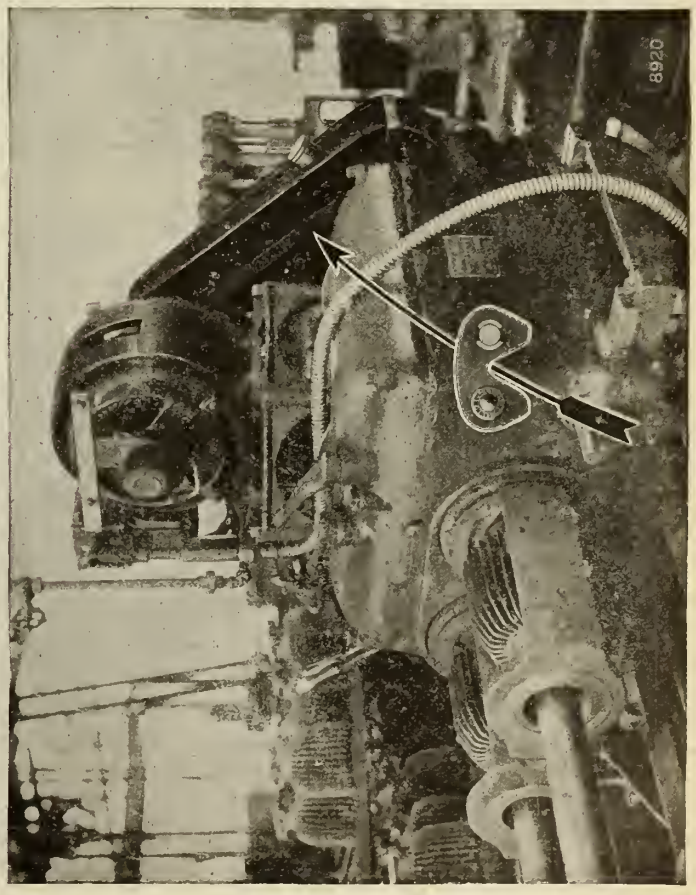

FIG. 12—A 3 H.P. DRIVE OPERATING A JONES & LAMSON TWO-SPINDLE LATHE.

your mind, if there are speeds, feeds, or drives in your plant, which could be improved by such a change. If you follow out this suggestion, then the article will really have accomplished its purpose, namely, proved itself of practical value.

As this is strictly a machinery journal we have confined ourselves to that field, believing that readers will be more interested in machine tool installations than in any others.

Some Interesting Installations

Take for example, Fig. 1. Here we have a main drive of 400 horsepower. The installation shown is that of one of the main drives at the Latrobe Electric Steel Co., Latrobe, Pa. It will be noted that the casing has been raised in order to show the chain. One cannot help but remark on the compactness and business-like look of this drive. It has been said that a chain drive of the nature shown is flexible as a belt, and positive as a gear. These claims are readily understood after a glance at the photograph.

Our next illustration, Fig. 2, shows a Kelly shaper equipped with individual motor and chain drive. Again we note the compactness of the arrangement. The drive is 5 horsepower and the chain 5-8 of an inch pitch, by 1½ inches wide.

Fig. 3 demonstrates once more the ease with which one can connect a machine by chain drive. The machine is of course recognized as a Besly Pattern Makers disc grinder, and the drive is 15 horsepower.

The installation shown at Fig. 4 is somewhat out of the ordinary. The machine is an Espen-Lucas saw equipped with a 15 horsepower chain drive, with a special slip pinion to take care of overload. The need of the slip pinion is of course obvious, so we need not comment on this point, except to say that the possibilities of chain drives are wider than often realized.

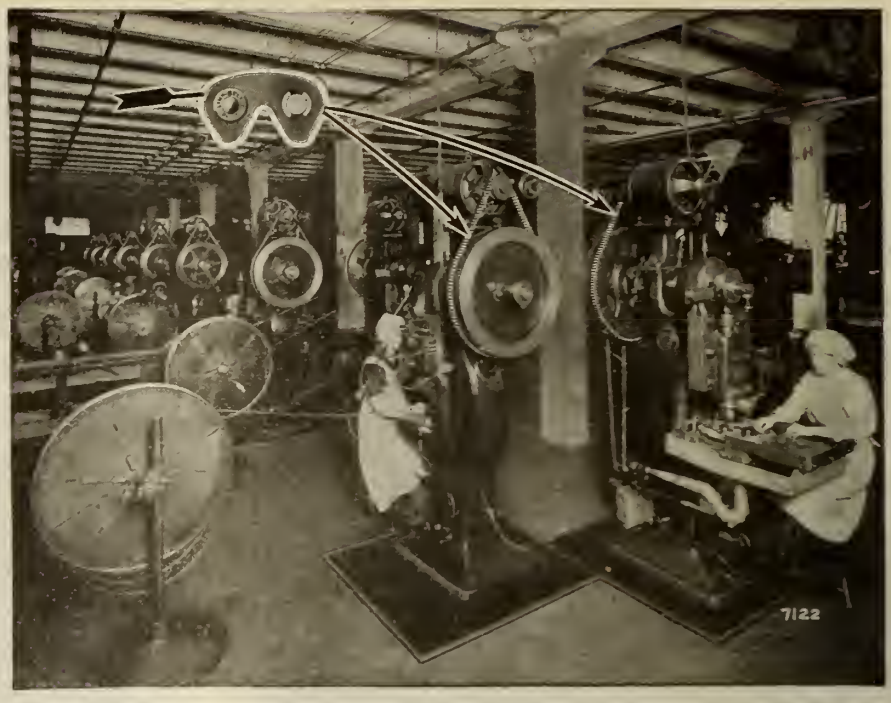

FIG. 13 - 5 H.P. DRIVES OPERATING PUNCH PRESSES NOTE THAT TEETH ARE CUT DIRECTLY IN FLY WHEEL.

The next installation, Fig. 5, shows an adapted drive on the spindle of a Lincoln type miller which was previously driven by mechanical drive.

The drive shown is 7½ horsepower. The motor is run at 1,150 r.p.m., and the shaft centre is 31⅜ inches. Here is a case, not only compact, but ingenious in its adaptation.

Next in order comes Fig. 6. Here we have a compact drive installed on a Steinle turret lathe. The neatness of the arrangement is at once apparent, and following are the data of installation: The motor runs at 1,150 r. p. m., the driven shaft at 285 r. p. m., and the centre distance is 18 inches. This latter figure emphasizes the advantages of such a drive.

The multiple automatic opens up a good field for chain drives. The machine shown at Fig. 7 is one made by the Davenport Machine Tool Co., New Bedford, Mass., and the motor is 3 horsepower. Note how the motor is placed underneath the bed, and how compact and dependable the drive looks. Installations such as shown speak best for themselves.

Fig. 8 illustrates a 7½ horsepower chain drive operating a large sized lathe. The chain used is 5-8 inch pitch, and 4½ inches wide. At Fig. 9 is shown a No. 2B Brown & Sharpe miller equipped with chain drive. A 5 horsepower motor provides the power and the neatness of the installation is obvious. It will be noted that various machines, part of which are shown in the photograph, are likewise equipped.

A Barber-Coleman gear hobber next demands our attention. This is illustrated at Fig. 10, and the casing has been removed in order to show the drive to the best advantage.

Fig. 11 illustrates a battery of Brown & Sharpe gear cutters driven by chain from a line shaft under the floor. It will be noticed that the operating levers come up through the floor so as to be handy to the operator.

At Fig. 12 is shown a 3 horsepower drive on a two spindle Jones & Lamson lathe. Once more one cannot help but note the compactness possible with a drive of this nature. The motor runs at 1,150 r.p.m., the driven shaft at 800 r. p. m., and the centres are 2½ inches.

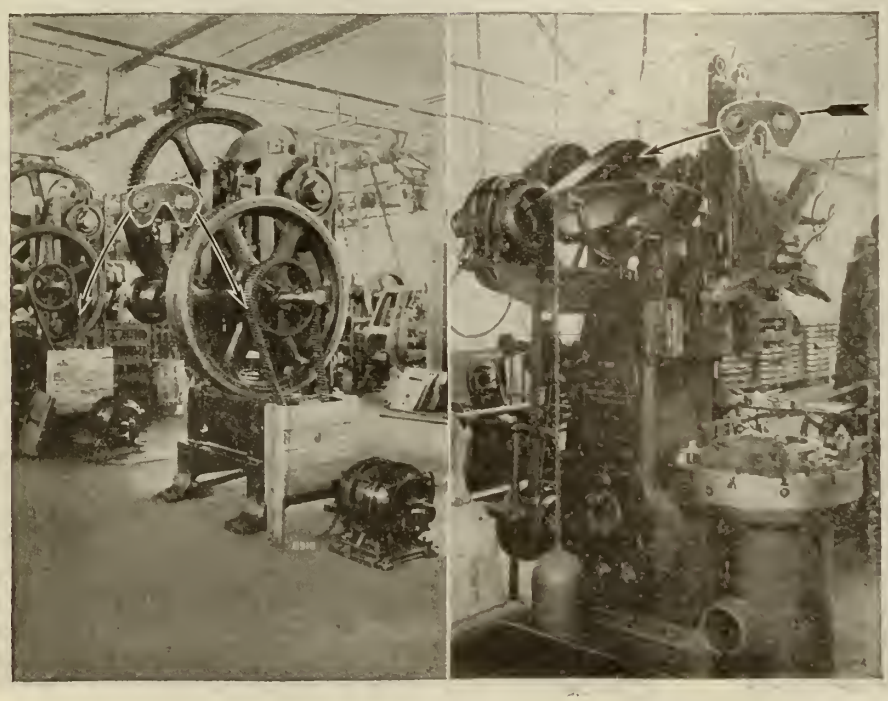

FIG. 14 LEFT VIEW SHOWS 5 H.P. DRIVE OPERATING A BLISS PRESS, WHILE RIGHT HAND VIEW ILLUSTRATES A 3 H.P. DRIVE TO A BORING MILL.

It will be noticed that a neat motor bracket is arranged on top to suit the motor.

Fig. 13 illustrates some very compact and serviceable installations of chain drives operating punch presses. The motors are 5 horsepower in each case. Note the fact that the teeth for the chain to engage with, are cut directly in the flywheel.

At Fig. 14 is shown two different installations. The one to the left is a 5 horsepower drive on Bliss presses. The motors run at 1,150 r.p.m., the driven shaft at 230 r.p.m., and the shaft centres are 42 inches. The view to the right is a 3 horsepower drive operating a King boring mill. The motor also runs at 1,150 r.p.m., the driven shaft at 185 r.p.m., and the centre distance of shafts is 18 inches.

Our last illustration at Fig. 15 shows an extremely neat and efficient drive system on a group of twelve Barber-Coleman gear hobbers. Note the compact drive, and the safe chain guards, and the general neat appearance of the complete installation. Everything of a moving nature is enclosed. No danger exists from getting caught in moving parts, and in fact from all points of view the advisability of an arrangement as shown is self-apparent.

The various illustrations which have been shown and explained do not by any means cover the field of the chain drive. Volumes could be written on the subject, but we have at least covered a certain amount of ground in the machine shop field. When considering a transmission drive remember that you should look for the following requirements in the drive:

First, it must be efficient with the best economy of power. Your speed, reduction, etc., should be carefully considered, also the fact of protection against overloads. Do not forget that space saved, means more room for additional equipment, which in turn means added production. The safety feature should also be considered carefully, for this is a very important point in these days of speeding up production.

In the next article we will present the belt system of transmission, and discuss drives of interest in this style of transmitting motion.

FIG. 15—A GOOD ILLUSTRATION OF COMPACT CHAIN DRIVES. THESE DRIVES OPERATE A GROUP OF GEAR HOBBERS.

Some General Observations on Valve Motion

This Paper, Read at the Canadian Railway Club Meeting, Should Be of Especial Interest to Our Railroad Readers—It Gives Some Valuable Hints on the Economical Distribution of Steam.

By F. WILLIAMS

THIS subject was ably presented by the above author, who is mechanical designer of the Canadian National Railways, Moncton, N.B., at a recent meeting of the Canadian Railways Club, Montreal. To anyone interested in the construction and adjustment of locomotive valve gears, we can readily suggest a careful perusal of this material.

Mr. Williams commences as follows:

"The duties which a locomotive valve gear has to perform are exacting in the extreme, as it has to control the distribution of steam to the cylinders with almost perfect precision through a wide range of cut-offs in forward and reverse direction. There is no apparatus on a locomotive upon which the economical working depends so largely, and when we consider that at diameter-speed the movement of the distribution valve is reversed 672 times per minute, we can appreciate with what care the design must be undertaken.

"From the point of view of economical steam distribution, valve motion design has to-day reached a point where it cannot be greatly improved upon, and the chief attention of the designer has for the last few years been taken up with questions of accessibility and low maintenance cost, his aim being to apply

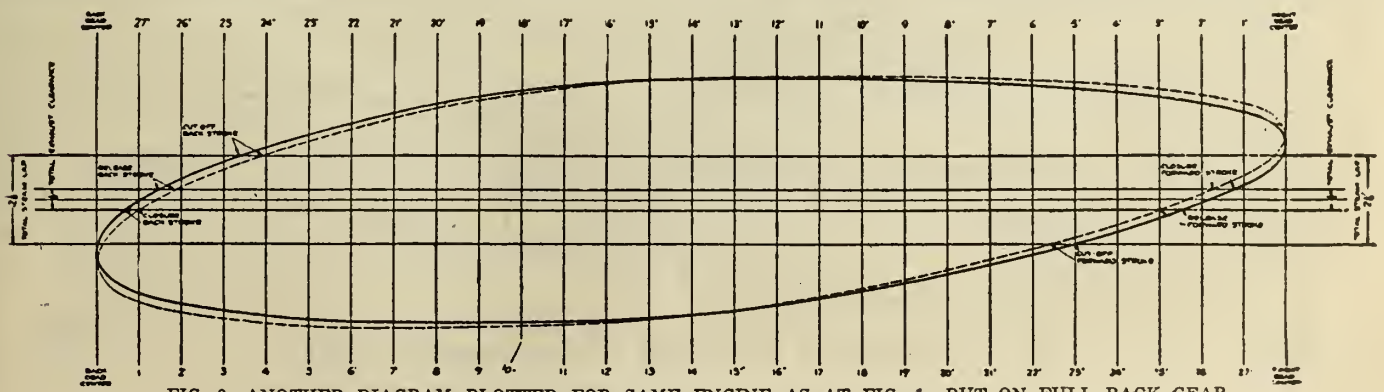

FIG. 2—ANOTHER DIAGRAM PLOTTED FOR SAME ENGINE AS AT FIG. 1, BUT ON FULL BACK GEAR.

a gear which would run and keep square from shopping to shopping with the minimum of attention.

"Considered from the standpoint of steam distribution alone, I doubt if a well-designed and properly set Stephenson gear has ever been excelled, but owing to inaccessibility, high maintenance cost and its great liability to get out of square due to the springing of parts and development of lost motion, the Stephenson gear has become a back number, and I shall only refer to it for purposes of comparison.

"For several years past practically every locomotive built in this country has been equipped with an outside gear, the vast majority with Walschaerts', and to this gear I shall devote most attention.

'The simplicity of the gear lies in the fact that the valve receives its motion from two sources, first from the crosshead through the combination lever, and second from the eccentric through the link, and each of these sources of motion can be dealt with separately without considering the influence of the other in designing and setting. The motion derived from the combination lever is equal to the steam lap plus the lead and it attains its maximum travel when the engine is on the dead centre. It is not affected in any way by the reverse gear, but remains the same in all positions of the lever.

"The motion derived from the link is simply a symmetrical motion front and back of the centre line, and is increased or decreased according to the distance of the link block from the centre of the link.

"When the link block is exactly in the centre of the link there is, of course, no motion from this source and as the block gets by the centre the motion is reversed. When the engine is on the front or back dead centre the link assumes such a position that the reverse lever can be moved backward and forward through the entire travel without imparting any motion to the valve, and the distance that the valve is off the centre is entirely due to the position of the combination lever which is at its maximum travel at these points.

"The length of the combination lever from the radius bar connection to the union link connection must bear the same proportion of its length from the radius bar connection to the valve steam crosshead connection as does half the stroke of the piston to the lap plus the lead plus 1/64 in. The 1 64 in. is added to the lap plus the lead to take care of the lost motion. Care must be taken that the length of the combination lever adopted will bring the lower end of the lever to the correct level to connect up with the union link, especially if the union link is connected directly to the wrist pin, which is the practice generally adopted.

"The radius of the link slot centre line is, of course, determined by the length of the radius bar, and the preferred location of the link support bearings is such that the horizontal centre line is on a level with the radius bar connection to the combination lever. This location may be varied within reasonable limits without affecting the valve events to any appreciable extent; for instance, on a locomotive with a very large cylinder the steam chest centre line and the cylinder centre line are of necessity quite a distance apart and in this case the link support is sometimes lowered an inch or two to bring the link tail nearer to the horizontal centre line of the axle.

"The angle through which the link rocks should not exceed 45 deg., and if it can be kept lower, so much the better. The eccentric rod connection to the link tail should be kept within 3 or 4 ins. of the horizontal centre line of the axle in order to keep the angularity of the eccentric rod within limits and owing to this angularity of the rod, it will be found necessary to offset the tail connection of the link in order to give it the same angular travel on either side of the central position. I have heard men with a good deal of experience state that an approximately correct offset is all that is required, but as it is just as easy to make this offset correct as otherwise, I always prefer to make it dead right.

Points to Watch

"The eccentric crank must be set so that it brings the link dead on its central position when the engine is on either front or back dead centre and the throw of the eccentric pin must be such that, acting in combination with the radius of the link tail, it will give the required angular travel to the link.

"The reverse shaft location, length of arm, and swing link are very important considerations, and unless great care is exercised in the arrangement of these details the efficiency of the motion may be considerably reduced. The arc which the reverse shaft arm describes should be so arranged as to reduce the link block slip to a minimum in all positions of the reverse lever, special attention being paid to the running position in fore gear.

"It is impossible to avoid link block slip altogether, but it can be kept pretty low, and if this is not carefully looked after the effect will be seen in the valve events and also in the wear on the link and link blocks. The steam chest centre line should be outside the cylinder centre line far enough to permit of bringing the whole motion into practically a straight line, thus eliminating the necessity for rockers and doing away with the twisting effect and lost motion which the use of rockers involves.

"Engines equipped with the Walschaerts valve gear should be so arranged that the link block is in the bottom half of the link for forward gear, the

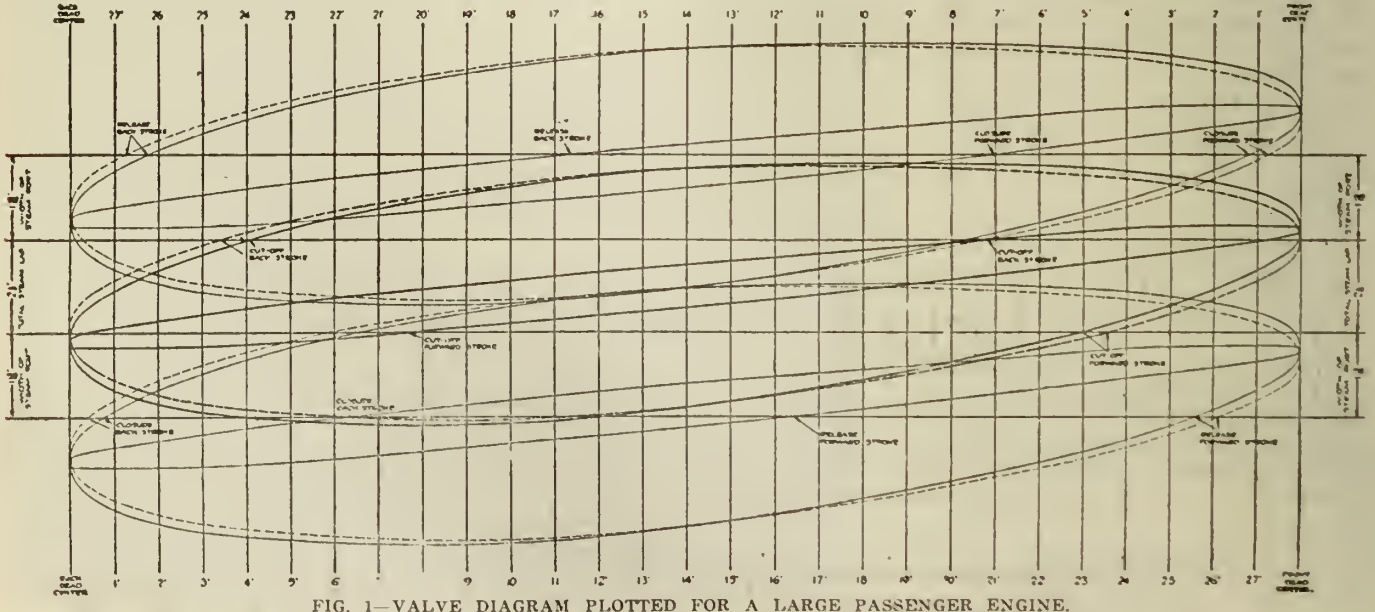

FIG. 1—VALVE DIAGRAM PLOTTED FOR A LARGE PASSENGER ENGINE.

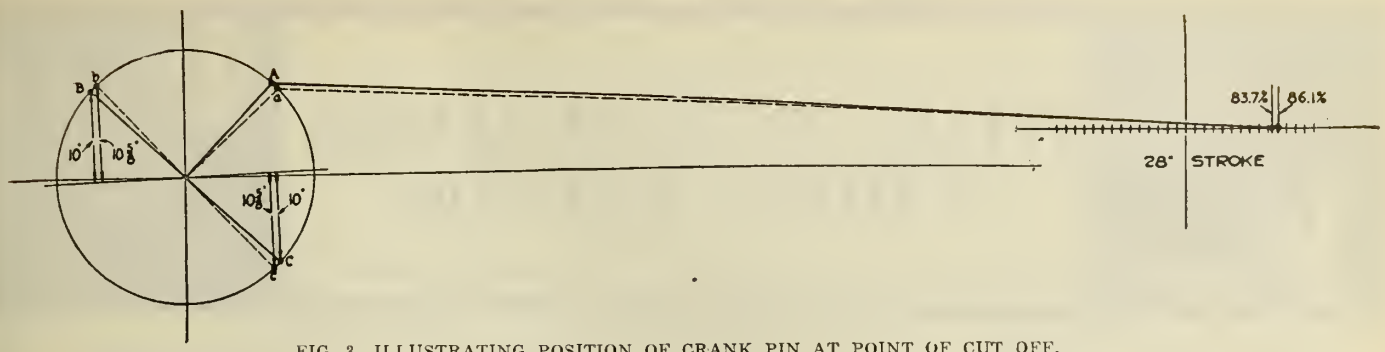

FIG. 3—ILLUSTRATING POSITION OF CRANK PIN AT POINT OF CUT OFF.

eccentric, of course, following the crank pin. The advantages of this arrangement are that the wear in the link support bearings is diminished and the link block slip in running position may be kept very small, as the swing link describes an arc which is very similar to the arc struck by a point in the bottom of the link, the concave side of both these arcs being uppermost.

"It is very important that the design of this gear should be as good as it is posible to make it, for if it is faulty, it is impossible for the valve-setter to correct its faults. If the design is good all the valve events naturally come within very close limits of being square, but if they do not there is practically nothing that the valve-setter can do to correct them. A perfect steam distribution will, of course, give a perfect exhaust, but a perfect sounding exhaust does not necessarily mean a perfect steam distribution. The steaming properties of the boiler and the fuel economy depend very greatly on the evenness of the exhaust, and if the exhaust is ragged the vacuum in the smoke-box is unsteady and the fire is soon pulled in holes, resulting in a great waste of fuel. The designer therefore endeavors to obtain a perfect exhaust by giving as nearly as possible a perfect steam distribution, the valve-setter has to get an even exhaust at all costs.

"The usual setting of a Walschaerts gear is square on dead centres, with a constant lead in all positions of the reverse lever, but the main object of lead is to give an unrestricted supply of steam to the cylinder when the piston begins its stroke, and with the preadmission down to about 1/64 in. it is impossible that the steam admitted to the cylinder can exert any appreciable turning movement on the axle until the crank pin has gone over the centre.

Various Diagrams

"Fig. 1 shows a valve diagram plotted for one of our large passenger engines. This engine has 24 in. by 28 in. cylinders, a 14 in. valve, 6 in. steam travel, ¼ in. constant lead, 1/16 in. steam lap and ¼ in. clearance. The broader ellipse in the centre shows the valve travel in relation to the piston travel on full forward gear, and the narrow ellipse inside it shows the same thing with the lever notched up to 25 per cent. cut-off. The distance from the steam edge to the exhaust edge on the valve over the packing rings is 2¾ in., therefore the similar ellipses which are plotted 2¾ in. above and below the centre ellipse with lighter lines must represent the movement of the exhaust edges of the valve. The three ellipses shown in dotted lines represent the movement of the valve set with no lead in full fore gear. Picking out the valve events we find that with the ¼ in. lead setting we have the cut-off at 23 in. and 23⅞ in., the release at 25 9/16 in. and 26¼ in., and the closure at 26 13/16 in. and 27¼ in. Set with no lead, however, we have the cut-off at 23 9/16 in. and 24⅝ in., the release at 26⅛ in. and 26¾ in., and the closure at 27¼ in. and 27⅝ in., so that the net result of adopting this latter setting is to delay the cut-off from 83.7 per cent. to 86.1 per cent., the release from 92.6 per cent. to 94.5 per cent., and the closure from 96.6 per cent. to 98 per cent., an improvement in the starting position of 2.4, 1.9 and 1.4 per cent. of the stroke respectively.

"The valve diagram shown in Fig. 2 is plotted for the same engine on full back gear, the ellipse shown in dotted lines representing the valve movement with a variable lead setting, which setting is made possible by the lead slightly increasing in the forward motion, with a corresponding decrease on the backward motion. In this case there are two lines ¼ in. above and below the centre line representing the amount of the exhaust clearance. These lines will determine the release and closure points in the same way that the outside edges of the steam parts did in Fig. 1.

"Fig. 3 shows the position of the crank pin of this engine at the point of cut-off, the full line indicating position with normal setting and the dotted line with variable lead setting. It is evident that when the engine is standing in this position we shall have the minimum starting effort, as all the turning movement has to come from the other crank, which will be either at Bb or Cc, according to whether Aa represents the right hand crank or the left. The effective length of the crank, which is doing the work, is 10 in. for normal setting, and 10⅝ in. for the variable lead setting, or a difference in favor of the variable lead of 6.25 per cent., so that the minimum starting effort of this engine is increased by 6.25 per cent. by this setting. The maximum traction effort is not affected in any way. As soon as the engine has turned a wheel the advantage almost entirely disappears.

"Fig. 4 shows a diagram plotted for one of our Mikado engines. This engine has cylinders 27 by 30 in., 14 in. valve, 6½ in. valve travel, ⅛ in. constant lead, 1 in. steam lap, and no exhaust clearance. The reduction or total

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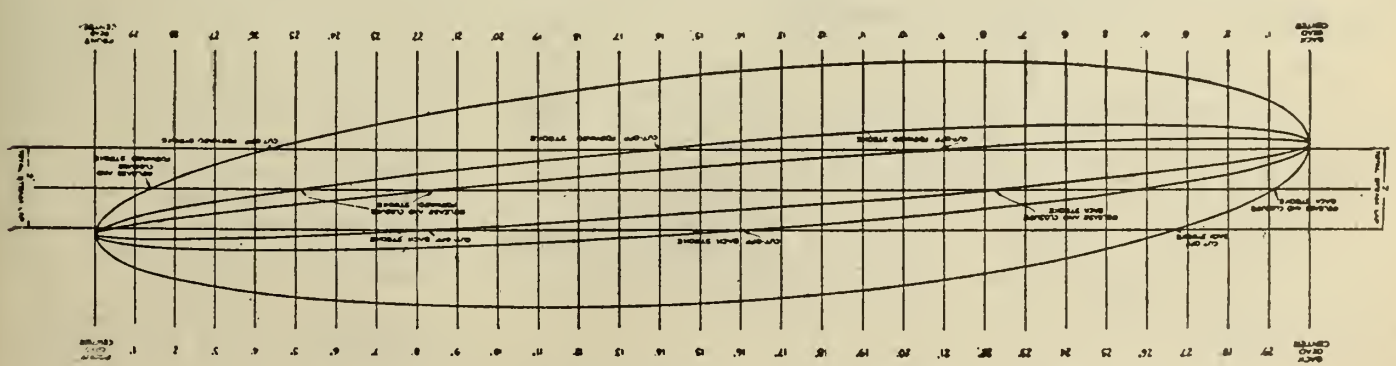


FIG. 4—DIAGRAM PLOTTED FOR A MIKADO ENGINE.

WHAT OUR READERS THINK AND DO

HANDY MILLING FIXTURE

By G. Blake

The sketch illustrates a milling fixture designed by the writer for slotting the piece of work (brass) shown in the sketch. A is the body with a tongue let in for locating in the slot of the milling machine table. The clamping bar, B, is pivoted with a pin G. The sectional view shows the method of locking eccentric shaft E, with a lever D pinned on, accomplishing the work The fixture is open when the lever D is in a vertical position

The spring F is for raising the clamping bar B to allow the work to be placed in position, a stop piece (not shown in the sketch) locates the work so that the slot is in exactly the same position on every piece milled.

By pressing the lever D down in a horizontal position, it locks the work securely by means of the cam on the shaft E. The setting plate C, (cast steel hardened), is for setting the milling cutter to the required depth of the slot. The shaft E, and bar B, are of mild steel casehardened at the working parts. The body A, is of cast iron.

AN EXCEPTION AND ITS ANSWER

In our volume XXIII., No. 22, we published an article on Repairing a Double Throw Crankshaft, by W. R. Green. One of the readers, G. Durham, on perusing this article, felt he had a few things to say on the subject himself and wrote us as follows:

"I wish to take exception to some of the figures in Mr. Green's article. His workmanship in turning shaft and sleeve must have been excellent and I believe the best method possible, outside of electric and oxy-acetylene welding, but why the long 1½-in. hole, or how long was the hole? Then he says for shrinkage was given 5-32-ins. on a 7-in. diameter shaft. This figure is, I believe, impossible. It is about all the steel would expand at a red heat, and would burst when cooling. 13-64 for the 10-in. is also too much, to my mind. I have found from practical experience that 1-80 part of 1 inch of 1 ft. is far better than guessing the limit of expansion that the metal will allow. I will admit that machine steel is quite elastic and will stretch quite a large amount, but you are not getting any benefit by so doing as you are only straining the metal.

"For comparison I give the following figures, based on 1-80 part of 1 inch of 1 ft:

Mr. Green's figures.	My conception.
7" diam. 5/32"=.156".....	=.007"
10" diam. 13/64"=.203".....	= .01"

"By using the 1-80 basis it is not necessary to get the shrink so hot, consequently it is easier to handle. I might also add that any good handbook will give about half of my figures for shrinking as standard."

On receiving this data we forwarded it to our correspondent, Mr. Green, and asked his viewpoint, after reading the letter. Here is what we received:

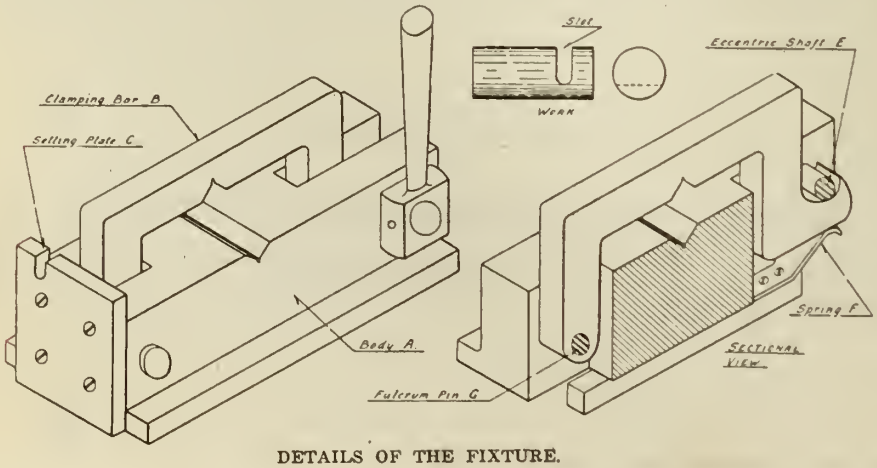
June 8th, 1920.

"Your letter with enclosure received to-day. I will answer same to the best of my ability. First: the long hole was drilled to stop or head-off a further possible crack, which might have been caused by turning off the outer part of shaft and so changing the tension of the steel. Whether it did any good or not, I cannot say. It was the order of the foreman. The hole extended beyond the outside crack limits.

"Second: As far as I can remember about the shrinkage problem, the smith and myself consulted the head moulder, with regard to the necessary amount to allow for shrinkage. At that time, what books on engineering I possessed only gave tables for castings shrinkage and for lineal expansion for steel and iron (rolled). These were no good for what I wanted to know, but I may possibly have made a mistake in my diary when putting down the figures, but I do not think so. I do know that the flange buckled a little when cooling, but there was no sign of a burst sleeve, which would surely have been the case when being finish turned if the expansion had been excessive.

"I wonder if Mr. Durham knows that a shaft with a bored hole in it will very seldom warp or twist when working. It is a fact, and if a large shaft shows spline cracks in angle of spline or keyway, a small hole bored in centre of shaft will frequently save changing the shaft. I have learned these tricks of the trade in out-of-the-way places, where new material was generally hard to get, and the average machine tender was NOT a tradesman and therefore would frequently tighten down bearings till they squealed, thereby putting great torsion on the shafting and causing cracks to start.

"I will try and find out from a friend of mine who is working near the place where this engine was, whether the same shaft is still at work or not. If he writes to me in answer I will pass his letter on to you."



DETAILS OF THE FIXTURE.

STANDARDIZATION OF PLAIN LIMIT GAGES

A sectional committee of the American Engineering Standards Committee has just been organized to undertake the standardization of plain cylindrical gages for general engineering work, under the sponsorship of the American Society of Mechanical Engineers. The immediate occasion for undertaking the work was a request of the British Engineering Standards Association for co-operation on the subject. The committee held its organization meeting on June 11th. It is understood that this committee will recommend to the American Engineering Standards Committee that the scope of the work should be broadened so as to

cover all plain limit gages for general engineering work.

The present personnel of the committee is as follows:

E. C. Peck, chairman, gen. supt. Cleveland Twist Drill Co.; L. D. Burlingame, chairman, industrial supt. Brown & Sharpe Manufacturing Co.; H. W. Bearce, secretary, Gage dept. Bureau of Standards, sec'y National Screw Thread Commission; P. W. Abbott, Lincoln Motor Company; John Bath, president John Bath & Co., Inc., engineer of standards, Pratt & Whitney Company; Fred H. Colvin, assoc. editor, "American Mechinist"; W. A. Gabriel, chief draftsman and designer Elgin National Watch Co.; F. O. Hoagland, vice-pres. and works manager, The Bilton Machine Tool Co.; Edward H. Ingram, works manager, The Cleveland Drilling Machine Co.; J. O. Johnson, office of Chief of Ordnance War Department; A. W. Schoof, gage enginer, Greenfield Tap & Die Corp.; G. T. Trundle, consulting engineer, Engineers Building, Cleveland, Ohio; H. L. VanKeuren, The VanKeuren Company.

VALVE MOTION

Continued from page 57

elimination of the exhaust clearance lengthens the period of expansion by delaying the release, and this in itself is a good feature, but it has also the effect of advancing the closure point and the question naturally arises as to why it should be permissible to eliminate exhaust clearance and thus advance the closure point on freight engines and not on passenger engines. The first reason is that in running position the passenger engine is generally notched up to a much earlier cut-off than the freight engine,—about 25 per cent. of the stroke instead of 50 per cent.—and the second that the piston speed of the passenger engine averages much higher than that of the freight engine.

"The passenger engine under consideration has a piston speed of 1,136 per hour, or over 40 per cent. higher than that of the freight engine at 30 miles per hour, and the higher the speed the higher the compression will be, provided that all other conditions are equal. By giving this engine exhaust clearance we not only delay the closure point, but also give a greater exhaust part opening, thus allowing the exhaust freer access to the atmosphere, and the result is a freer running engine. It may be imagined that when the engine is working at a short cut-off less steam is admitted to the cylinder, and, therefore, the piston has less to sweep out on the return stroke, but the exhaust begins with the release, and by the time the return stroke has begun there is very little difference in the amount of steam left in the cylinder, whether running on long or short cut-off.

"From the point of view of economy the question of steam consumption per unit of power developed, the higher the compression the greater the economy, provided we do not run the compression higher than boiler pressure. This is on account of the clearance volume, and we can readily understand that the higher the compression the less steam has to be supplied from the boiler to build up the initial pressure, and if the compression reaches boiler pressure there is no steam drawn from the boiler until the piston actually starts its working stroke. The next thing to consider is the power required, as it is no use trying to run on a very fine thread of steam if we cannot get the tractive effort necessary to keep the load moving.

"If we compare Figs. 1 and 4 we find that the closure takes place at 76 per cent. of the stroke for the passenger engine in running position; with the freight engine running at the same cut-off the closure takes place at 73 per cent., but if we eliminate the exhaust clearance on the passenger engine we shall advance the closure point from 76 per cent. to 68 per cent. of the stroke, which is a marked advantage in point of economy.

"This goes to show how much the closure point is affected by the amount of exhaust clearance. For my own part I do not think the actual closure point is of very much importance, but that the exhaust port opening has a great deal more influence on the compression than the actual position of the closure point. I contend that if we pay proper attention to the exhaust port opening the closure point will take care of itself. There is no purely mathematical means of determining the most desirable exhaust port opening, and this, like to many other problems in locomotive work, has had to be determined by practical experiments.

Passenger Versus Freight

"It is here that we find the chief difference between passenger and freight engine setting, and, still referring to Figs. 1 and 4, we see that the maximum exhaust port opening in running position for the passenger engine is just over 1⅝ in., whereas that of the freight engine is just over 1 9/16 in. when running at a 50 per cent. cut-off, while if we notch up the freight engine to the same cut-off as the passenger engine we have a maximum exhaust port opening of only 1¼ in.

"This maximum port opening is only maintained for a few inches of the stroke, and it is easy to understand that when this port opening begins to narrow down it will form quite a choke for the exhaust at a high piston speed, and will build up quite a little compression before the closure point is reached. We all realize that a locomotive exhaust has to be choked to a certain extent to obtain a high velocity jet up the stack, which will induce a proper draft through the grates, but this choking should be done by the exhaust pipe tip and not by the valve. The area of the exhaust pipe on the passenger engine under consideration is about 23 sq. in., and on the freight engine 29 sq. in., and the valve displacement necessary to give a part opening equal to the area of the tip will be approximately 11/16 in. for the Pacific engine and ⅞ in. for the Mikado. This 11/16 in. port opening is maintained for 53 per cent. of the stroke on the Pacific engine, but on the Mikado the ⅞ in. port opening is only maintained for 36 per cent. of the stroke when notched up to the same cut-off as the Pacific. When the Mikado is running at 50 per cent. cut-off, which is approximately the running position, the ⅞ in. exhaust port opening is maintained for 58 per cent. of the stroke, which compares favorably with the Pacific. This gives us the chief reason why the Pacific setting is found to be more suitable for high speeds and short cut-offs, while the Mikado setting is better on the slower speeds and long cut-offs. From these comparisons we can see that the passenger engine setting has been developed to give a smart and free running engine at high speeds and short cut-offs, while the chief consideration with the freight engine setting is to obtain the greatest possible traction effort at moderate speeds and to run on comparatively long cut-offs with the greatest economy by delaying the release point as far as possible."

British engineering firms are showing remarkable skill and enterprise in developing new types of internal combustion engine. One of the latest and most interesting of these types has been designed to meet the demand in steel works for large slow-speed gas engines. Continental practice has favored the horizontal engine, which is huge enough to fill a church, but the new British engine referred to is of the vertical design, which takes up only a fraction of the space filled by the horizontal engine. Most vertical engines have previously been high-speed machines, but this one runs at only 125 revolutions per minute. This result is achieved by arranging the cylinders in pairs, one above the other, and placing a pair on each side of the crank. Thus four cylinders combine in driving a single crank. The mechanical arrangements are so admirable that although an engine of 1,000 horse power is about 20 feet high, hardly a tremor can be noticed at the extreme top even when the engine is running on an overload. An engine of this power is now working successfully in a leading British ironworks, being used for generating electricity.

According to Wireless World there are three wireless direction-finding stations being erected at the mouth of the Mississippi River for the purpose of directing ships to New Orleans. Eight stations of this nature are also in course of construction along the Pacific Coast from San Diego to Alaska. One station, that on the Farralone Islands, is nearly completed. The sites of the other seven are at Pt. Reyes, Bird Island, Pt. Montara, Pt. Hueneme, Avalon, Pt. Firmin, and Imperial Beach.

DEVELOPMENTS IN SHOP EQUIPMENT

HEAVY DUTY SHAPERS

The Columbia Machine Tool Co., Hamilton, Ohio, have placed on the market a varied line of heavy duty shapers. These machines are made in various sizes ranging from 16 ins. to 28 ins., and are of complete new design, having certain features which ensure exceptional efficiency in operation.

The outstanding feature is their strong, rugged construction. All parts are carefully fitted, practically all parts being made to jigs and templates, on the interchangeable basis. The alignment of vise and table with ram is held within a limit of .001, within their full length. This is only one example of how they are kept to close limits.

The various movements of these machines are controlled from the front or working side. There is a quick change feed, and a single lever for locking cross rail to the column. The table support is placed at front of table, where it is most accessible, and ring-oiling bearings are provided.

The quick change feed, as already mentioned, is particularly valuable as it adjusts itself automatically to position of cross rail, and is graduated to show the amount of feed. It also has bevel gear reverse which automatically insures feed taking place on return stroke. Two levers control all feed changes, one for amount of feed, the other for direction of feed. Changes can be made instantly while machine is running.

The illustrations depict the 20 in. extra heavy type with speed box, friction clutch and brake.

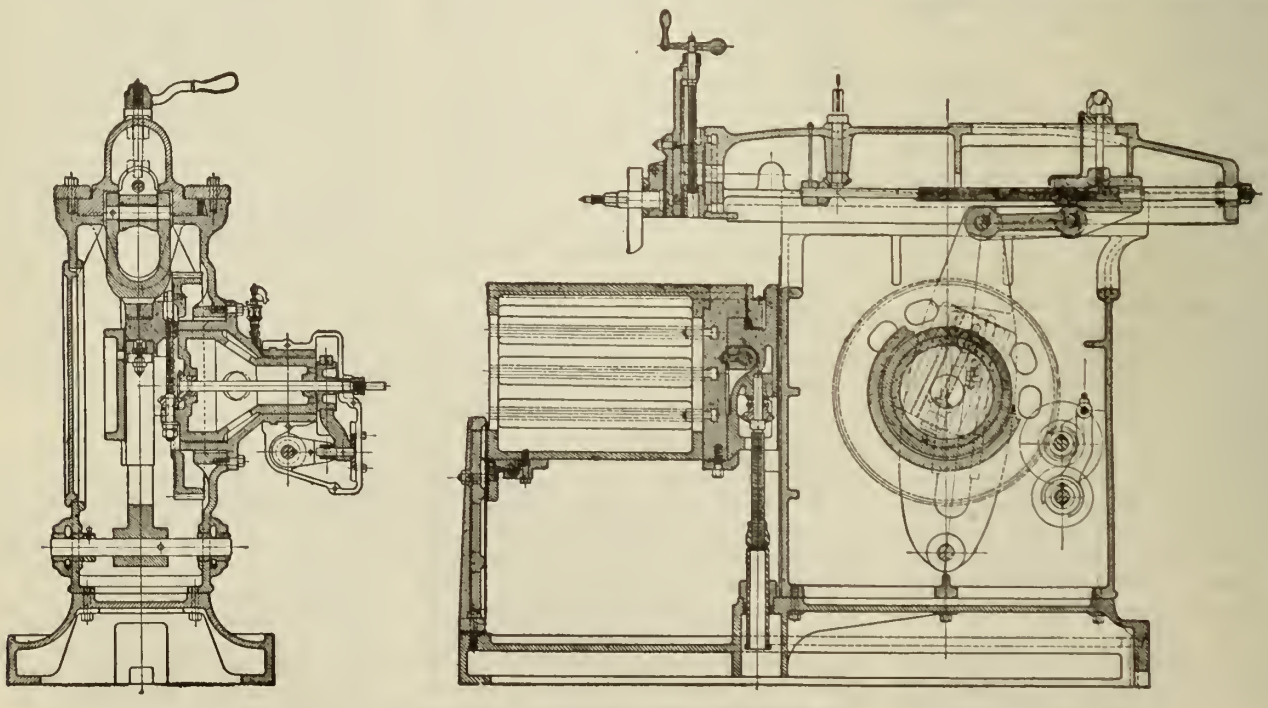
The speed box is of the selective gear type, strong, substantial and convenient to operate. The gears are semi-steel, affording strength for the heaviest service. Shafts are ground and run in ring-oiling and bushed bearings. The cover is marked to show the proper position of the two operating levers for each speed. The hand wheel on side of speed box is for making hand adjustments when required.

A powerful friction clutch and brake is placed between the driving pulley (or motor) and the speed box, operating by the curved lever at side of column, within convenient reach of the operator, permitting quick starting and stopping at any point of the stroke.

The crank gear is very liberally proportioned and is carried close to the rocker arm, in bearing of extra large diameter, preventing torsional strain. The machine is powerfully back geared, which, in connection with the four-change speed box affords eight changes of speed; the speeds have been carefully calculated to afford the proper range and increments, being in geometrical progression as required by the best practice. The rocker arm is exceptionally heavy, the sides being joined by a strong central tie. It is connected to the ram through a heavy link, which affords a direct pull on the ram.

The rocker block is a steel casting, with large bearings, provided with taper gib for adjustment. The driving shaft bearings are ring-oiling, with renewable cast-iron bushings. Other cylindrical bearings are bronze bushed, all shafts are ground, and every provision is made for strength and durability. Liberal oiling facilities are provided.

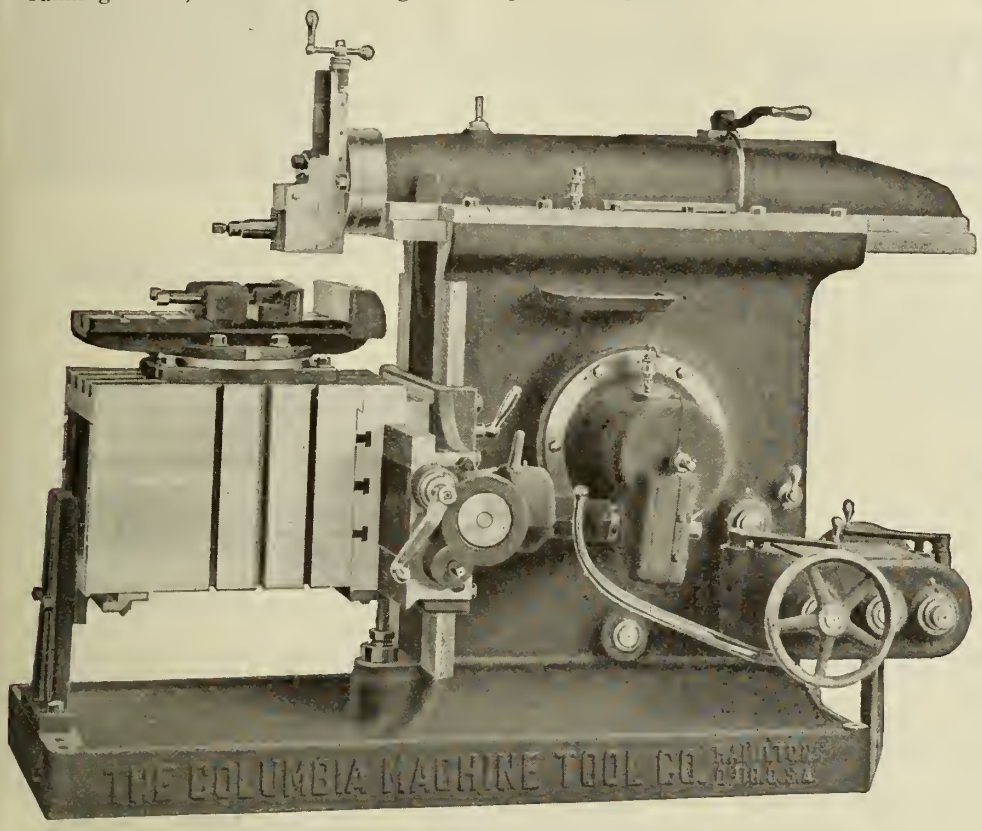
The feeds are produced by a substantial feed box. It will be noted that this is designed as part of the machine, not as an attachment. A range of feeds is provided sufficient for all classes of work, eight on the 16- and 20-inch shapers, twelve on the 24- and 28-inch. They are operated by merely shifting a small handle, conveniently located, and can be made while the machine is running. The arrangement is such that the feed takes place only on the return stroke and the mechanism automatically adjusts itself to the position of the cross rail. A small lever is provided—located just back of the cross rail—which controls and in-



SECTIONAL VIEW THROUGH THE MACHINE.

dicates the direction of the feed; this lever can also be operated without stopping the machine. A safety friction is provided to guard against breakage. The feed gears are of steel, hardened and running in oil, and the arrangement throughout is compact, durable and extremely convenient.

The other parts of these machines are in like proportion of strength and convenience, and further details can be procured by those interested.



GNERAL VIEW OF THE SHAPER.

NEW THINGS IN MACHINE TOOLS

PNEUMATIC TOOLS

The Ingersoll-Rand Company have added several new tools to their pneumatic lines, and will be known as the "Little David." Included in these tools will be a small size of close-quarter drill, two types of small high-speed grinders, and a lightweight drill in two sizes.

DRILL CHUCK

The Scully-Jones Company of Chicago, Ill., are now manufacturing a new drill chuck or collet that is designed to hold a straight shank drill in a taper hole of the drilling machine. The only operation necessary to use an ordinary straight shank drill in this chuck is to grind a flat on one side of the shank. One advantage claimed for this collet is that closer spacing can be made when used in connection with multiple drilling. These collets are made in a wide range of sizes

MULTIWHIRL OIL COOLER

For the cooling of oil used in lubrication of turbine bearings and reduction gears, or the quenching oil used in heat treatment, the Griscom-Russell Company of New York has manufactured a special apparatus, that provides for constant circulation of the oil through the cooler, and maintains the oil at a fixed temperature, and permits the continual use of the original quantity of the oil and its maintenance at the proper viscosity. Helical baffle plats cause the oil to take a whirling path as it passes through the machine. The shell is of cast iron and the tubes of seamless brass or copper tubing.

CYLINDER GRINDING MACHINE

The Sutherland Machine Shop, of Omaha, Neb., are now making a machine of special design for the boring and grinding of automobile cylinders. The device is made in the shape of an attachment that may be secured to the ordinary lathe, the head being independent of the head of the lathe. The fixture that carries the cylinders is fastened to the carriage of the lathe. The holding brackets may be adjusted to support cylinder blocks of various sizes. Micrometer adjustment is provided for bringing the different cylinders into alignment. The wheel spindle is carried within the outer slow-running spindle which is used for operating the boring tools. Micrometer adjustment is provided for regulating the eccentricity of the tool or wheel movement.

GAGING DRILL RACK

The Peerless Machine Company, of Racine, Wis., are placing on the market a drill rack of interesting construction. It provides for the placing of the drill with their points downwards, the holes in the stand being drilled clear through, each hole having two diameters. The holder acts as a limit gauge, inasmuch as a drill of the size intended for the hole will enter the top portion but will not pass through the second, and a drill that goes into the lower diameter is obviously in the wrong location. These racks are made in seven sizes, the largest size being used for drills from 41-64 to 1⅝ inches in diameter.

RIGHT-LINE RADIAL DRILL

The Niles-Bement-Pond Company, of New York, are placing a new type of drilling machine on the market. This machine is of the radial type and is built in 5 ft. and 6 ft. sizes. The special feature is the design of the column, which permits of a simplified drive. The entire mechanism is controlled from the head, and the clamping of the column is performed electrically. The column is of special box construction and swings with the arm so that all bending stresses due to the drilling operations are always taken in the same plane. The base of the column is supported on ball thrust bearings and is likewise provided with roller bearings for the rotating motion. When in a position for rotating, the column is raised slightly from the pedestal by means of flat springs, but when in a working position the action of the clamp pulls the column down on to the flange of the base. This clamping of the column is accompanied by a ring that is operated through a worm-wheel driven by a small electric motor. An automatic stop is provided that prevents accident should the arm be run beyond the limit of its travel in either direction. The motor for driving is located on the back of the arm saddle, the horizontal shaft passing through the column and giving a direct drive. A maximum distance of 68 inches is provided between the spindle and the base. The spindle has a traverse of 18 inches, with 28 speeds ranging from 20 to 400 revs. per min.

PISTON BLASTING MACHINE

A blasting machine that has been adapted for the cleaning of the insides of pistons is now being manufactured by the Gray Machine Tool Company of Buffalo. The general principle is the same as that adopted for the cleaning of shells. The piston is located in the machine with the open end downwards, and when lowered to a certain position by means of a hand lever, automatically starts revolving. The sand blast is operated by a quick-acting valve and the nozzles can be placed in any position desired. The machine is of the duplex type, so that one piston may be placed in and removed while the blast is operating on the other. The air consumption will approximate 40 cu. ft. per min.. at a pressure from 70 to 90 lbs. per sq. in.

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Leaning on United States

FOR several months now Canada has been witnessing the spectacle of fuel controllers and various civic officials from this country making sporadic excursions to the coal-bearing areas of United States. And following these excursions there invariably comes the statement that the "situation is very serious," "Canadians should make every effort to get as much coal as possible from whatever source is available to them," etc.

Now this has been going on for some years. There is nothing new in the situation, and it varies only with the varying ability of the different official tourists from this country to tell a hard-luck and cold winter story on their return.

And the very next day we can probably turn to some prosy Government report, or some peppery booster material from Western municipalities, and read that Canada has some sixteen or seventeen per cent. of the known coal reserves of the world.

Where is the meeting point between these two situations? There must be some plane where these conditions find common ground. If there is not, and if there is no prospect of such in the near future, the sooner we put the everlasting quietus on our talk about owning coal reserves, the sooner will we cease to be laughing stock.

In round figures we produce in Canada thirteen million tons of coal per annum, and in that same time we want about thirty million tons, and so we send our tourists scurrying all over United States to see if they can scratch around and find us that other seventeen million tons.

Right now United States wants every ton of coal it can secure. Industries and householders there are short—away short.

Were it not for the attendant loss, inconvenience, and suffering it might be a good thing for Canada to spend a winter of cold feet and frozen ears. We have been told for years that the haul is too great to bring coal from either West or East to the central portion of the Dominion. In such a policy the railroads are short-sighted. It is time we began to see that if coal is not forthcoming in plentiful quantities there will be nothing to take away from the factories and the workshops of the industrial centres. It is a matter of self-preservation for the railroads of the country that there should be a good supply of coal in every workshop of the Dominion. Railroad figures of the distance East or of the distance West must not scare our people into throwing up their hands in that miserable attitude of "It can't be done."

The people of this country should also get it firmly established in their minds that United States is using coal at the rate of 700,000,000 tons annually, and her supplies are not inexhaustible. Then they must recognize that every industrial squabble that stirs in United States, is felt in Canada in a very short time. A coal strike in United States is in effect, if not in reality, a coal strike in Canada, and more and more we are becoming the victims of all the strikes that outlaw leaders and loud-mouthed agitators are pitchforking onto the industrial life of the Republic.

A self-contained Canada is the solution and the only way out. It is time that we advanced from the academic discussion of this question to putting some real national sweat into its solution.

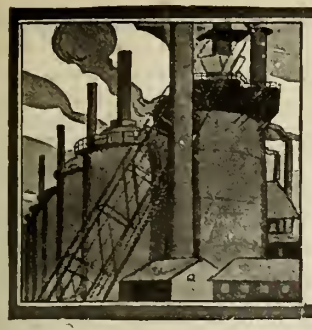
The Week in Passing

REPORTS from London, Eng., indicate that the Canadian Exhibition there was not a success, and that it did not attract very large crowds. Members of the Krassin party from the Soviet Government in Russia were visitors. One London manager of a Canadian firm offers the following as an explanation of the lack of success: "There is not enough of any one class of merchandise in the exhibition to attract anyone to it. Those Canadian firms wanting to exhibit should send their hardware to our hardware exhibitions, their engineering plant to our engineering exhibit, their grocery goods to the foodstuffs exhibition, and their agricultural machinery to our agricultural exhibition. A mixed exhibition such as this was bound to be a failure no matter how well it was worked." The whole thing was a bid on Canada's part for export trade. Experimenting is one sure way—perhaps a bit costly—to find out the best way to get our goods before the British or Continental buyer.

LAST week reference was made in Canadian Machinery to the high prices that were being paid in Scotland by the ironmasters there for several grades of steel and iron scrap. The prices were very much higher than those quoted locally or in United States market. The suggestion that Canada should sell into that market came readily. Frankel Bros., of Toronto, have made several attempts to ship in to this market and have offered as high as $20 per ton for shipping space, but have been unable to secure accommodation. So far as any advantage to Canadian trade is concerned, it will have to be extracted from the rather unsatisfactory reflection that the thrifty Scot can turn in his old steel axles at £15 per ton, against $20 that is offered here by dealers, who are none too anxious to buy.

COMPLAINT is made, and apparently with good reason. of the slowness attending the return of our freight cars sent with shipments to United States. At the first of February this shortage was up to 16,000 cars, and on April 15 the figures stood at 21,000. While these cars are across the line they are of no use to the shippers here, and they are doing poor service there as far as Canadian trade is concerned unless they are being used to bring back to this country some shipments of much-wanted raw or semi-finished materials.

THE Niagara district is taking a new way of getting its advantages before manufacturers looking for sites. The association is holding a three-day congress, when a tour of the peninsula will be made and its advantages pointed out. There is something to commend this idea of publicly going about this work in an open way. In too many cases municipal promotion work has consisted of a poorly-concealed auctioning of a much pedaled proposition, the municipalities being the willing and apparently open-eyed victims, with open-mouthed simplicity swallowing all sorts of bonused and doctored cripples in the hope of some day grabbing a real one out of the deluge.



MARKET DEVELOPMENTS

Believe Premium Market is Near an End Here

Some Sales Being Made at Better Prices From the Buyer's Standpoint—Can't Ship Canadian Scrap Metal to the Old Country Market—Railroads Looked to as Best New York Buyers.

CERTAIN of the Canadian steel merchants are firmly of the opinion that we are facing a better steel market from the standpoint of the consumer, and they look for the disappearance of the premium dealer as the first move in this direction. They point to actual cases where they are buying from the same firms at better prices than they could hope for a few weeks ago. Sheets, for instance, were held up for $8 per hundred, while now $6.50 is gladly taken. The protracted helplessness of the American railroads to tackle the traffic situation across the line and straighten it out helps to keep the market at a higher level, and there are good reasons to believe that with good transportation facilities we would be now dealing with a normal steel market.

Power and fuel problems are troubling Canadian industry in no small degree. In a plant where there are hundreds of employees, the great majority of them depending on power to get reduction, it is a serious matter Shops in many cases are finding that they have to pay for a good many hours in the course of a month for which they receive no return.

Old Country ironmasters are paying high prices for scrap material, much higher than are quoted in Canada or United States. Canadian dealers would like very much to get a chance to ship to that market, but they cannot get shipping space. One Toronto firm has offered as high as $20 per ton—as much as some of the metal can be sold for here—for shipping space to reach the Old Country market, but there has been no response, and there the matter rests.

Bar mill material is much needed, especially in the industrial centres of Ontario at present. The agricultural trade needs flats, while the building and contracting interests are after rounds for reinforcing purposes.

MONTREAL PLANTS NEED COAL AND LACK OF IT KEEPS BACK BUYING

Special to CANADIAN MACHINERY.

MONTREAL, Que., July 8.—A condition that may have an early and serious effect upon industry in this district, is the increasing difficulty experienced by many manufacturing concerns in getting delivery of coal in sufficent quantities to maintain normal operations. Not only do these adverse circumstances have a direct bearing on plants affected, but the curtailment is naturally reflected in other directions. The general relaxation that becomes effective during the midsummer season makes the shortage of coal less noticeable, but unless adequate relief is given to the coal situation during the next two months, the outlook for the fall and winter is none too promising. One would suppose that with less cars being used for the transportation of fuel that better delivery of other commodties would be in order, but the reports do not indicate that any material improvement has been made in this regard. Coal requires cars of special construction and it is just possible that few of them could be utilized for any other purpose.

Increased activity is noted in some of the local metal working plants, and this is largely due to many of the district foundries resuming operations after a period of enforced idleness. It was stated by one manufacturer here, that a few weeks back he had to refuse orders owing to the inability to obtain the necessary castings. Metal-working shops are quite busy, but seldom in a position to give definite promise of completion of orders, owing to the prevailing uncertainty of material shipments.

Little Change in Steel

"No change to speak of. We were hoping for some relief but this has not developed. Production has not been aided by the lack of coal, so that we are still in a position of watchful waiting." This statement by a dealer seems to reflect the general situation, as the quiet tone of the market would appear to indicate a decline of industrial activity that is more than seasonable. The midsummer period is frequently marked by business depression, but in comparison with previous activity, the present is a time that carries with it more than the usual uncertainty. The volume of business is not so pronounced but dealers seem quite satisfied with the average turnover, as this, invariably, is well balanced by the prices that prevail. Apart from the possible effect of fuel scarcity, the impression is growing that the return to normal conditions will only be a matter of a few months. The fact that some domestic industries are becoming affected by the falling off in demand, has acted as a sort of brake to other activities, and steel dealers reluctantly assume that these conditions will eventually react in a general way.

Machine Trade Quieter

The customary seasonable falling off in the machine tool movement is becoming a feature, as reports would indicate that the demand is lighter and requirements less pronounced, or buying deferred until after the holiday period. There continues to be a fair volume of supplies passing through the hands of the dealers, and the same applies to used equipment, although sales of the latter are less active than formerly.

Downward Tendency in Steel Scraps

The listless condition of the old material market continues and dealers report a quiet week. There has been a slight betterment in the trading of

machinery scrap, owing to the renewed activity of local foundries. This, however, has not been marked, but small as it is, it retains the feature position. "There is little demand at present," remarked a dealer, "and the trend is apparently moving in an easier direction. Non-ferrous scraps are moving quietly and prices are comparatively firm, but dullness in irons and steels may eventually develop a weaker condition and a decline in quotations," Little scrap is coming in, and this is partly due to the attitude of dealers, as they are evidently reluctant to carry any more yard and warehouse stock than conditions warrant.

OFFERED $20 TON FOR OCEAN RATES

Local Dealers Would like to Sell Into the Old Country Scrap Market at High Prices

TORONTO—A great deal depends on power, and supplies, as far as the industrial life of this district is concerned. Many of the shops are constantly in trouble with the shutting off of their power. When this takes place the shop generally has to pay the men, as it is no fault of theirs that there is no juice on hand. Expenses go on just the same but there is no output. When this takes place many times in a plant where there are some hundreds of employees it becomes a serious matter. Add to this the shortage of material, and the shortage of coal, and it makes a condition that is none too favorable to getting ahead with the work.

But in spite of all these things there are buyers in the market, and there are inquiries and prospects, which, if only a fair percentage of them turn out to be good, will mean a nice booking for the early fall.

One of the leading makers of machine tools in the United States has announced a further increase this week. It has been some days since any advances have been made, and dealers have come to regard the machine tool market as more stable, and if anything have been anticipating some marking down.

Deliveries are reported by several firms as having shown quite a decided improvement during the week, and shipments are coming in from points now that have been particularly affected by the strike on United States roads.

Old Country firms are also getting better treatment in this matter of getting their goods over here, and one firm has opened a warehouse with the assurance that it will have a good line of material to show under power.

Several sales have been made recently owing to the placing of better machinery in certain plants, and it is likely that this will account for several more sales. Where the salesman can show how a shop operation can be turned out more efficiently, and where time and expense can be saved by the placing of new machinery, he can always get an audience, and there is undoubtedly a disposition on the part of plant executives to favor the better machine that has all the new and approved ideas.

Prices More Reasonable

There is every reason to believe that any price movement that takes place in the steel market will be toward a downward revision.

That is not a guess, but the statement of one of the largest warehouse firms in this district. One bit of evidence is given in the experience of this firm in the matter of sheets from the premium mills. "A short time ago the only basis on which they would talk business to us," stated this firm, "was $8.50 base, while to-day the same people will gladly take on business at $6.50 base, and give us just as good service in the matter of delivery at the lower price as they were doing at the former price of $8. There are other lines too where we find that there is quite a marked tendency to give us better price treatment, and a greater desire to do business than there has been for some time past." A good many sheets are selling this week around the basis of $10.50 per hundred for 28 gauge.

POINTS IN WEEK'S MARKETING NOTES

Some steel merchants believe there is an easier tone to the steel market, and that if railway traffic were able to handle the material piled at the mills, we would be facing a normal steel market.

—

Bar mill material is in demand, but the supplies forthcoming are not showing any signs of improving. Canadian mills are being pressed by their customers for these shipments.

—

Although prices for scrap metal are very high in the Old Country now Canadian exporters cannot get into the market, claiming that they cannot get shipping space, although offering $20 per ton.

—

The New York machine tool market is looking to the railroads to come into the situation there as large buyers of equipment.

—

Old Country firms report that they are getting better shipments of their orders for the Canadian market. Heavy duty machinery, such as boring mills and heavy planers are on a more extended schedule.

—

One maker of machine tools advised the Canadian trade of an increase in price this week.

—

It is estimated that United States steel mills now have about three million tons of material, finished and semi-finished, piled at their plants, waiting shipment.

The matter of securing a good supply of bar mill material is becoming a question that is not easy to handle. The Canadian mills have a large tonnage on their books, much of it very urgent owing to the fact that it must be secured for certain seasons, and it is almost impossible for the mills here, owing to shortage of materials, to get the rollings through to satisfy the trade. Bars for some time were one of the best classes in the trade, but recently they have become one of the worst.

Old Country dealers are getting in shipments now that were ordered last November, and they are getting fairly good satisfaction in the matter of future deliveries, unless they go into the line of heavy duty machinery, when the time gets extended by some months. The supposition is that many of the large steel and iron plants on the continent are getting equipment ready to start operating again, and in this way there is an unusual demand for this class of equipment. Boring mills and heavy planers, for instance, are hard to secure unless the buyer is prepared to wait his turn.

The Scrap Market

Canadian dealers are experiencing a dull season in scrap metal in almost all their lines. Last week this paper published a letter from a Scottish iron and steel merchant, calling attention to the prices that were being paid by the ironmasters of that country for scrap lines, and noting the difference in price between their figures and what is offered here. Canadian Machinery took this matter up with one of the large yards here to-day, and inquired why it was that Canadian scrap could not be sold profitably in Scotland under these circumstances.

"The explanation is simply this," was the reply. "We cannot ship to the Old Country because we cannot get bottoms to take our stuff. We have offered as high as $20 per ton to carry shipments of steel and iron scrap, but we can get no takers. So you see the price may as well be anything as far as we are concerned. It is a nice market, but we have no way to reach it now."

Coppers for a day or so seemed to show some strength, but the demand locally is weak. Any of these metals may seem to be worth more than the figures quoted at times, but the real touchstone as far as this market is concerned seems to be, "Do you want it, or don't you?" If there are no buyers wanting metals then the chances are that prices will stay down.

Can Get Started. — The Hamilton Chamber of Commerce was advised that a Western Canada coal company can send 1,000 tons of coal per day East for the next eight weeks. Local manufacturers have been advised of this.

Steel Co. Starts.—The Steel Company of Canada has secured a supply of coal and oil again, and will start part of its plant next week. It has not been able to get full supplies yet.

STEEL MILLS CONTINUE TO PILE AS CAR SUPPLY IS TAKEN FROM THEM

Special to CANADIAN MACHINERY.

PITTSBURGH, July 8.—The sheet and tin mill wage matter has been settled, and there is no strike. As noted in our report of a fortnight ago, the Amalgamated Association broke with the sheet and tin plate manufacturers who had formerly recognized the union, the issue between an amendment proposed by the union which would enable it to use its hold on the hot mill labor to induce workmen in other departments to join by being able to promise such men, only ten being required to form a new lodge, that they would use their previous strength to secure signatures for new and additional scales. When the Atlantic City conference broke up, June 14, President Tighe of the Amalgamated Association stated that if an adjournment were had it would be to a date not later than the first Tuesday in September, which of course meant that the men would walk out July 1st, as the existing scale agreement expired June 30. However, probably on account of pressure of the members, the Amalgamated Association officials reconsidered the matter and called for another conference, to which the mills acceded. The conference was in session at Columbus, June 30, when the Amalgamated Association officials telegraphed the lodge that the men should continue at work, and an agreement was reached late last Thursday. At the Standard Tin Plate Company plant, Canonsburg, Pa., the men walked out as a local president refrained from acting on his telegram. A few mills closed because the management had made arrangements in accordance with the common expectation that the walkout would be attempted. Otherwise the mills are working the same as formerly.

Besides the amendment to the preamble, the men had demanded a 20 per cent. increase in basis rates, a six-hour shift instead of the eight-hour shift that has been in force for many years, and a great many other things, but the mills made only small concessions. Outside of some trivial matters the changes were as follows: In the tin mill scale a spell hand is introduced, not a regular member of the crew, who will help the catcher part of the time and help in other ways, the man to be paid about 50 per cent. as much as the catcher, while the catcher's rate is reduced 10 per cent. The increments in the sliding scale rates, when tin plate is selling above the $3.50 base, are to be 1 1-3 per cent. instead of one per cent. Thus when the realized average on tin plate shipments is $7.40, as it was at the last bi-monthly settlement, the men would receive 87¾ per cent. above the base rates instead of 78 per cent. above. In the sheet scale, an extra spell hand is also introduced, to be paid also by the company, but not to be considered a regular member of the crew. In each case, the extra man will conduce to greater output, this benefiting the men. The wage cost per ton will be increased between $1 and $2 per ton, but this may be made up to the management by increased output.

Not Much Organizing Expected

The difference between the American Federation of Labor, which contemplated by its action at the Montreal convention a fresh effort to organize the iron and steel industry, and the Amalgamated Association, which held that it should have sole charge of any organizing of the iron and steel industry, was recently settled between the two bodies on the compromise basis that if the Federation committee were formed by the various unions, the Amalgamated Association would be accorded a 51 per cent. representation on it. The manufacturers believe, however, that this arrangement is made simply to save the faces of the Federation management, and that the committee is not likely even to be formed. The present outlook, therefore, is that little, if any, attempt at organizing will be done and that the iron and steel industry will remain non-union.

Even the hold the Amalgamated Association has had, by controlling some 30 to 40 per cent. of the hot mills in the sheet and tin plate industries, and the tonnage men at most of the iron mills, may possibly disappear in time, for many of the mills that have hitherto been quite willing to sign Amalgamated Association scales year after year are now disposed to embrace the next favorable opportunity to eliminate the Amalgamated Association entirely. It is observed the non-union sheet and tin mills, which include all those of the Steel Corporation, get along very nicely, and thus the Amalgamated Association is not useful as it once was in preventing minor disturbances from day to day or week to week.

Car Shortage

In connection with the Interstate Commerce Commission order that the railroads give full preference to coal mines in furnishing coal cars, the curious situation develops that the coal operators claim they are not getting many more coal cars than formerly, while the iron and steel interests claim their car supplies have been greatly diminished, through gondola cars, particularly high side gondolas, being transferred from their service to the coal service. Any increase in coal movement would benefit the iron and steel industry, by supplying more coal to the by-product coke ovens and more coal to the steel mills, but the industry wants to ship more material rather than to make more, since right along it has been accumulating stocks.

Some estimates of the stock of steel accumulated at mills on account of car shortage now run up to 3,000,000 gross tons, while the lowest guess is about 2,000,000 tons. Thus the accumulation represents something like from three to five weeks of production at the rate recently obtaining.

Thus the accumulations of steel have become a much more serious matter, a great difficulty being that some of the steel will be shipped so much later than expected that the customers may not require it at that time. It would at best require a long time to work off the extra steel, given the best transportation conditions that can be expected, and thus far even the beginning has not been made as the mills are still shipping less steel than they produce. At a number of plants rolling schedules have been changed so that finishing operations are decreased, without the production of steel itself being decreased, and thus more steel is being accumulated in the intermediate forms of blooms, billets, slabs and sheet bars. Steel in this form can be piled conveniently and can later be finished into the forms then desired by customers.

Markets Quiet

The markets continue quiet all along the line, but the situation attracts less attention than formerly, as the traditionally dull midsummer period has been entered upon. Premiums for prompt shipment of steel products continue to sag, but the large independents have not changed their prices, which cover moderately early delivery, and the Steel Corporation of course continues its adherence to the Industrial Board schedule. Its unfilled tonnage statement for June is expected to show a further increase by bookings during the month exceeding the shipments.

LOOK TO RAILS TO KEEP TRADE UP NOW

Otherwise There Are Not Many Large Buyers in the New York Tool Market

Special to CANADIAN MACHINERY.

NEW YORK, July 3.—The machine-tool trade is centering its attention on railroad business, most of which is still in a prospective stage. It is apparent, however, that the railroads will buy a great deal of shop equipment when funds become available. The Norfolk & Western, which issued a list of about 70 machines several weeks ago, is now about to place orders. These orders will probably come through this week. The Delaware, Lackawanna & Western has bought a driving wheel lathe and a wheel press. The Seaboard Air Line is expected to be a fairly large purchaser. Some small inquiries have been issued by the New York Central Railroad, but a large list is being held up pending the approval of the necessary appropriation.

Conditions as a whole in the machine-tool trade continue pretty much as they have been during the past six or eight weeks. The credit situation and the freight congestion have pretty effectually stopped all buying except for immediate requirements. A great many manufacturers will not purchase tools

unless they can obtain immediate delivery, and as there are few lines of new tools on which prompt delivery can be promised the sale of used tools is stimulated. In the past week inquiry has been slightly better than in the two weeks preceding. The General Electric Co., Schenectady, N. Y., has issued an inquiry for about 20 machines, half metal working and half woodworking, for its Baltimore, Md., plant. The E. W. Bliss Co., Brooklyn, N. Y., has issued a list of about 15 tools, most planers, slotters and lathes, for a prospective plant at Birmingham, England. The Wasson Piston Ring Co., Plainfield, N. J., and the Edison Lamp Works, Harrison, N. J., have bought a few machines each.

COAL STRIKE IN THE EAST WAS AVERTED BY NARROW MARGIN

Sydney, N. S.—That a general strike in the Nova Scotia coal fields was only just averted by the arrival of Hon. Gideon Robertson's telegram announcing the appointment of a Royal Commission on wages, was the statement made by J. B. McLachlin, District Secretary, at the United Mine Workers' headquarters.

The strike order had been voted upon and was on the table ready for signature when the all important message came in. Had it been delayed its arrival would have found twelve thousand miners idle, and not a colliery working in the Provinces of Nova Scotia and New Brunswick.

In view of the coal shortage in Upper Canada and the recent Government proposal for an embargo on foreign shipment of Cape Breton coal, the miners say they consider the Robertson message the most important that has reached this part of the country for many years.

Senator Robertson notified the District Board that Royal Commission demanded by them has been authorized by Order-in Council, that the names of the members will be announced in a day or two, and that the first session of the Commission will take place at Sydney or Halifax on July 12. The U. M. W. Board immediately wired acceptance of the Government's offer.

The miners have been clamoring for a commission since the first of May. Continued delay left them in an exceedingly ugly mood, practically forcing the Executive to the preparation of a general strike order, which happily will not now be needed.

FARM MACHINERY WANTED IN RUSSIA

Great Shortage of Agricultural Equipment to be Supplied in Near Future

"Agricultural machinery in Russia is almost non-existent at the present time," said the London manager of "Selskosoyus," the All-Russian Purchasing Union of Agricultural Co-operation, to a London, England, reporter.

"Until the former stock, destroyed or worn out during the war, can be replaced, there is little hope of Russia resuming its place as a great grain-producing country.

"We are here as representatives of the Russian co-operative societies, to export agricultural machinery, chemicals, and seeds, for which we shall pay in goods imported from Russia or by long credit. So far we have been carrying on a very uphill undertaking, and our exports have only amounted to £300,000. The difficulties of communications have been almost insuperable, and are now beginning to be surmounted. Even to-day we are afraid that a great quantity of our goods may have been endangered by the British evacuation of Batoum.

"The 'Selskosoyus,' or 'Village Union,' is the great association of Russian co-operative societies. It is divided into three grades—the village society, the association of vilagers, and the union of districts. The whole movement is under the aegis of the Moscow Narodny Bank, and is entirely non-political."

POWER PROBLEM GROWS SERIOUS

Plants Have to Pay for Time and They Get No Production to Balance It

At a recent meeting of Canadian manufacturers the question of power was discussed, and it was found that real difficulty was being experienced by firms which were being cut off.

Mr. F. G. Perrin of the Willys-Overland Co., in stating the case for his plant, gave the experience of a number of other firms in the district. Mr. Perrin said:

"When our plant shuts down we have the choice of paying the men off, or keeping them on and paying them. When it is shut down, it is always difficult to know when it will be on. Consequently we lay men off for a certain length of time and pay them, so we are paying them for producing nothing, thus doubling our loss. It is a condition that we are all up against. It is not only our own plant that is shut down, but all the plants that supply us with materials. Along the Windsor border our representatives telephoned us that all three plants upon which we were depending for our raw material for our plant, were closed down through lack of power. In our own case we have kept a record of all shut-downs. Our graphic watt meter, which registers all current coming into the factory, shows stoppages aggregating 38¼ hours' duration from December 2 to April 27, which is a very serious matter."

PIG IRON TRADE

Another embarrassing factor in the pig iron market is the embargo placed by the Inter-State Commerce Commission on the use of open cars for the conveyance of anything but fuel. This is now hitting the industry through the limestone supply as well as regular transportation facilities for iron, and in consequence quite a large number of stacks have banked down.

The current market ranges from $44 to $45.50 delivered in the East.

The lower price of bessemer has tended towards an equalization in the price of the two grades. In fact nearly all grades of iron are now quotable at a uniform price of $45 valley furnace.

Some iron and steel works are so pressed for pig iron that a large percentage of their melt is scrap iron.

New England foundries are nearly withotu exception reported with orders booked up for eight months ahead.

The bulk of present activity is for prompt iron.

There have been some large requests for export recently, one export house inquiring for 80,000 tons basic and 20,000 tons No. 1 foundry for Italy was only able to get quotations for 10,000 tons basic and 20,000 tons of foundry. The exporter stated that the prices quoted were too high to interest the prospective buyer. There were also numerous other inquiries, some of which call for 20,000 to 30,000 each of various grades of iron.

The trade is mostly concerned with transportation facilities and fear that unless some modification in the embargo on the use of open cars is made that a high percentage of furnaces will be forced to bank down.

U.S. SCRAP METAL

In spite of the dullness of the scrap metal market generally the demand for melting steel has been strongly held by the large foreign sales during the last month, England and Scotland having purchased 150,000 to 200,000 tons, delivered seaboard at between $24 to $30.

The market is generally dull everywhere, owing to the difficulties of transportation and scrap metal. Consumers who have not covered for future requirements are beginning to fear that their indifference in this matter may cost them dearly.

There is a general feeling amongst dealers that there will be a rise in the scrap market, as steel grades have advanced about 50 cents per ton above last week's level, and they are covering to protect sales already effected.

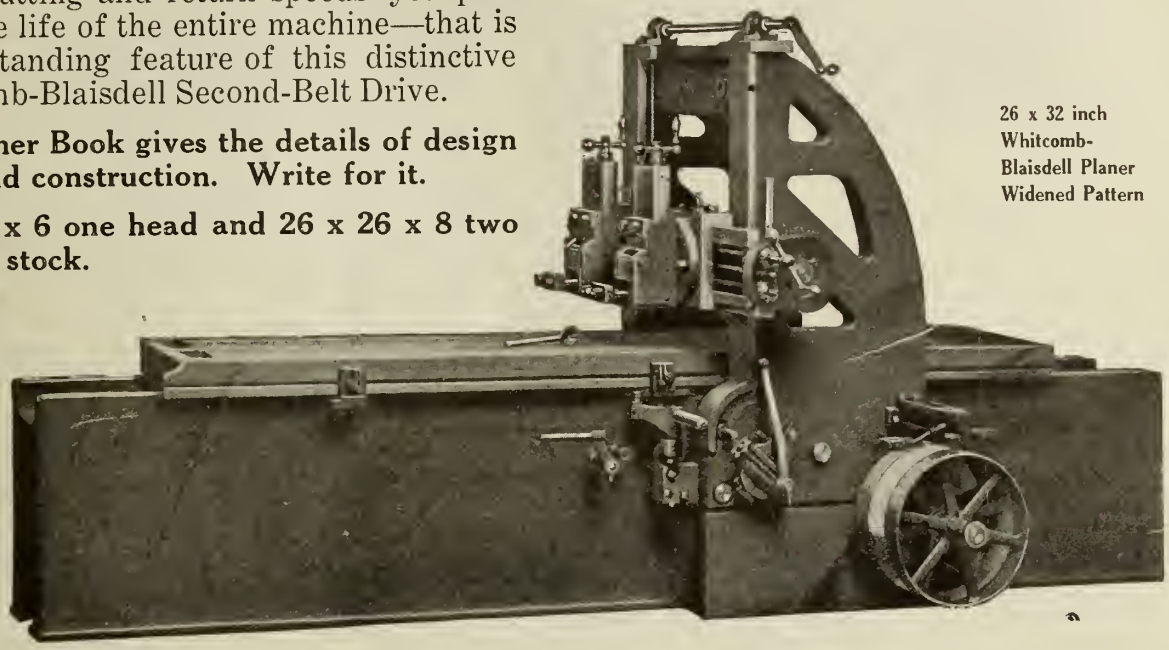
On account of the large demand for the best quality grades, for export, it is the general impression that domestic buyers will have difficulty when they enter the market.

The Planer With the Second-Belt Drive

A smooth, easy reverse—which permits higher cutting and return speeds yet prolongs the life of the entire machine—that is the outstanding feature of this distinctive Whitcomb-Blaisdell Second-Belt Drive.

Our Planer Book gives the details of design and construction. Write for it.

24 x 24 x 6 one head and 26 x 26 x 8 two heads in stock.



26 x 32 inch Whitcomb-Blaisdell Planer Widened Pattern

THE A. R. WILLIAMS MACHINERY CO., LIMITED

Halifax, St. John, Montreal, Winnipeg, Vancouver

If It's Machinery---Write "Williams"

64 Front St. TORONTO

Gray Iron and Semi Steel Castings of all Descriptions

From 5 lbs. up to 4 tons

Foundry capacity, 15 tons per day.

Difficult castings our specialty.

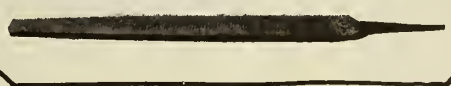
Mixtures regulated by chemical analysis and all castings sandblasted.

Estimates from blue prints submitted promptly.

If desired, we can make patterns to your drawings.

G. W. MacFarlane Engineering, Limited

Paris, Ontario



Who pays most for files?

Undoubtedly he who abuses them.

We are very desirous of co-operating with all file users in an endeavor to obtain longer life and more work from the files they are working with. To this end we enclose in each box of

P.H. or Imperial Files

a leaflet entitled

"A File is a Fine Tool,"

which makes many practical suggestions as to the care of files.

See that your employes read this leaflet.

Be File-wise.

Ingersoll File Company, Limited,

John Morrow Screw and Nut Co., Ltd., Sole Distributors,

Ingersoll, Ontario.

P X H

IMPERIAL

INGERSOLL

If interested tear out this page and place with letters to be answered

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$42 40
Lake Superior, charcoal, Chicago	57 00
Standard low phos., Philadelphia	50 00
Bessemer, Pittsburgh	43 00
Basic, Valley furnace	42 90
Toronto price:—	
Silicon, 2.25% to 2.75%	52 00
No. 2 Foundry, 1.75 to 2.25%	50 00

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	$ 5 50
Steel bars, base, Toronto	5 50
Iron bars, base, Montreal	5 50
Steel bars, base, Montreal	5 50
Reinforcing bars, base	5 00
Steel hoops	7 00
Norway iron	11 00
Tire steel	5 75
Spring steel	10 00
Band steel, No. 10 gauge and 3-16 in. base	6 00
Chequered floor plate, 3-16 in.	8 40
Chequered floor plate, ¼ in.	8 00
Bessemer rails, heavy, at mill	....
Steel bars, Pittsburgh	3 00-4 00
Tank plates, Pittsburgh	4 00
Structural shapes, Pittsburgh	3 00
Steel hoops, Pittsburgh	3 50-3 75
F.O.B., Toronto Warehouse	
Small shapes	4 25
F.O.B. Chicago Warehouse	
Steel bars	3 62
Structural shapes	3 72
Plates	3 67 to 5 50
Small shapes under 3"	3 62
	C.L. L.C.L.

FREIGHT RATES

Per 100 Pounds.

Pittsburgh to Following Points		
Montreal	33	45
St. John, N.B.	41½	55
Halifax	49	64½
Toronto	27	39
Guelph	27	39
London	27	39
Windsor	27	39
Winnipeg	89½	135

METALS

	Gross. Montreal	Toronto
Lake copper	$25 00	$24 00
Electro copper	24 50	24 00
Castings, copper	24 00	24 00
Tin	66 00	65 00
Spelter	12 00	12 00
Lead	11 50	11 00
Antimony	14 50	14 00
Aluminum	34 00	36 00

Prices per 100 lbs.

PLATES

Plates, 3-16 in.	$ 7 25	$ 7 25
Plates, ¼ up	6 50	6 50

PIPE—WROUGHT

Price List No. 44—April, 1920.

STANDARD BUTTWELD S/C

	Steel Black	Steel Galv.	Gen. Wrot. Iron Black	Gen. Wrot. Iron Galv.
⅛ in.	$6 50	$ 8 50	....	....
¼ in.	5 13	7 26	$ 5 43	$ 7 56
⅜ in.	5 13	7 26	5 43	7 56
½ in.	6 84	8 42	7 27	8 84
¾ in.	8 45	10 58	9 03	11 16
1 in.	12 50	15 64	13 35	16 49
1¼ in.	16 91	21 16	18 06	22 31
1½ in.	20 21	25 30	21 59	26 68
2 in.	27 20	34 04	29 05	35 89
2½ in.	43 00	53 82	....	....
3 in.	56 23	70 38	....	....
3½ in.	71 30	88 32	....	....
4 in.	84 48	104 64	....	....

STANDARD LAPWELD S/C

	Steel Black	Steel G lv.	Gen. Wrot. Iron Black	Gen. Wrot. Iron Galv.
2 in.	$30 90	$37 74	$34 60	$41 44
2½ in.	45 34	56 16	51 19	62 01
3 in.	59 29	73 44	66 94	81 09
3½ in.	73 14	90 16	82 34	99 36
4 in.	86 66	106 82	97 56	117 72
4½ in.	0 98	1 23	1 24	1 49
5 in.	1 15	1 44	1 44	1 73
6½ in.	1 49	1 86	1 87	2 25
7 in.	1 94	2 43	2 42	2 90
8-L in.	2 04	2 55	2 54	3 05
8 in.	2 35	2 94	2 92	3 51
9 in.	2 81	3 52	3 50	4 21
10-L in.	2 61	3 26	3 25	3 90
10 in.	3 36	4 20	4 18	5 03

Prices—Ontario, Quebec and Maritime Provinces

WROUGHT NIPPLES

4" and under, 60%.

4½" and larger, 50%.

4" and under, running thread, 30%.

Standard couplings, 4-in. and under, 30%.

Do., 4½-in. and larger, 10%.

OLD MATERIAL

Dealers' Average Buying Prices.

	Per 100 Pounds. Montreal	Toronto
Copper, light	$15 00	$14 00
Copper, crucible	18 00	18 00
Copper, heavy	18 00	18 00
Copper wire	18 00	18 00
No. 1 machine composition	16 00	17 00
New brass cuttings	11 00	11 75
Red brass cuttings	14 00	15 75
Yellow brass turnings	8 50	9 50
Light brass	7 00	7 00
Medium brass	8 00	7 75
Scrap zinc	6 50	6 00
Heavy lead	7 50	7 75
Tea lead	4 50	5 00
Aluminum	19 00	20 00
	Per Ton	Gross
Heavy melting steel	18 00	18 00
Boiler plate	15 50	15 00
Axles (wrought iron)	22 00	20 00
Rails (scrap)	18 00	18 00
Malleable scrap	25 00	25 00
No. 1 machine east iron	32 00	33 00
Pipe, wrought	12 00	12 00
Car wheel	26 00	26 00
Steel axles	22 00	20 00
Mach. shop turnings	11 00	11 00
Stove plate	26 50	25 00
Cast boring	12 00	12 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, ⅝-in. and less	10
Carriage bolts, 7-16 and up	Net
Coach and lag screws	25
Stove bolts	55
Wrought washers	45
Elevator bolts	Net
Machine bolts, 7/16 and over	Net
Machine bolts, ⅝-in. and less	15
Blank bolts	Net
Bolt ends	Net
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	net
Machine screws, o. and fil. hd., brass	net
Nuts, square, blank	add $2 00
Nuts, square, tapped	add 2 25
Nuts, hex., blank	add 2 25
Nuts, hex., tapped	add 2 50
Copper rivets and burrs, list less	15
Burrs only, list plus	25
Iron rivets and burrs	40 and 5
Boiler rivets, base ¾" and larger	$8 50
Structural rivets, as above	8 40
Wood screws, O. & R., bright	75
Wood screws, flat, bright	77½
Wood screws, flat, brass	55
Wood screws, O. & R., brass	55½
Wood screws, flat, bronze	50
Wood screws, O. & R., bronze	47½

MILLED PRODUCTS

(Prices on unbroken packages)

	Per Cent
Set screws	25 and 5
Sq. and hex. hd. cap screws	22½
Rd. and fil. hd. cap screws	plus 17½
Flat but. hd. cap screws	plus 30
Fin. and semi-fin. nuts up to 1-in.	20
Fin. and Semi-fin. nuts, over 1 in., up to 1½-in.	10
Fin. and Semi-fin. nuts over 1½ in., up to 2-in.	Net
Studs	15
Taper pins	40
Coupling bolts	Net
Planer head bolts, without fillet, list	10
Planer head bolts, with fillet, list plus 10 and	net
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	net
Collar screws	list plus 20, 30
Thumb screws	40
Thumb nuts	75
Patch bolts	add 20
Cold pressed nuts to 1½ in.	add $1 00
Cold pressed nuts over 1½ in.	add 2 00

BILLETS

	Per gross ton
Bessemer billets	$60 00
Open-hearth billets	60 00
O.H. sheet bars	76 00
Forging billets	56 00-75 00
Wire rods	52 00-70 00

Government prices.

F.O.B. Pittsburgh.

NAILS AND SPIKES

Wire nails	$5 70
Cut nails	5 85
Miscellaneous wire nails	60%
Spikes, ⅜ in. and larger	$7 50
Spikes, ¼ and 5-16 in.	8 00

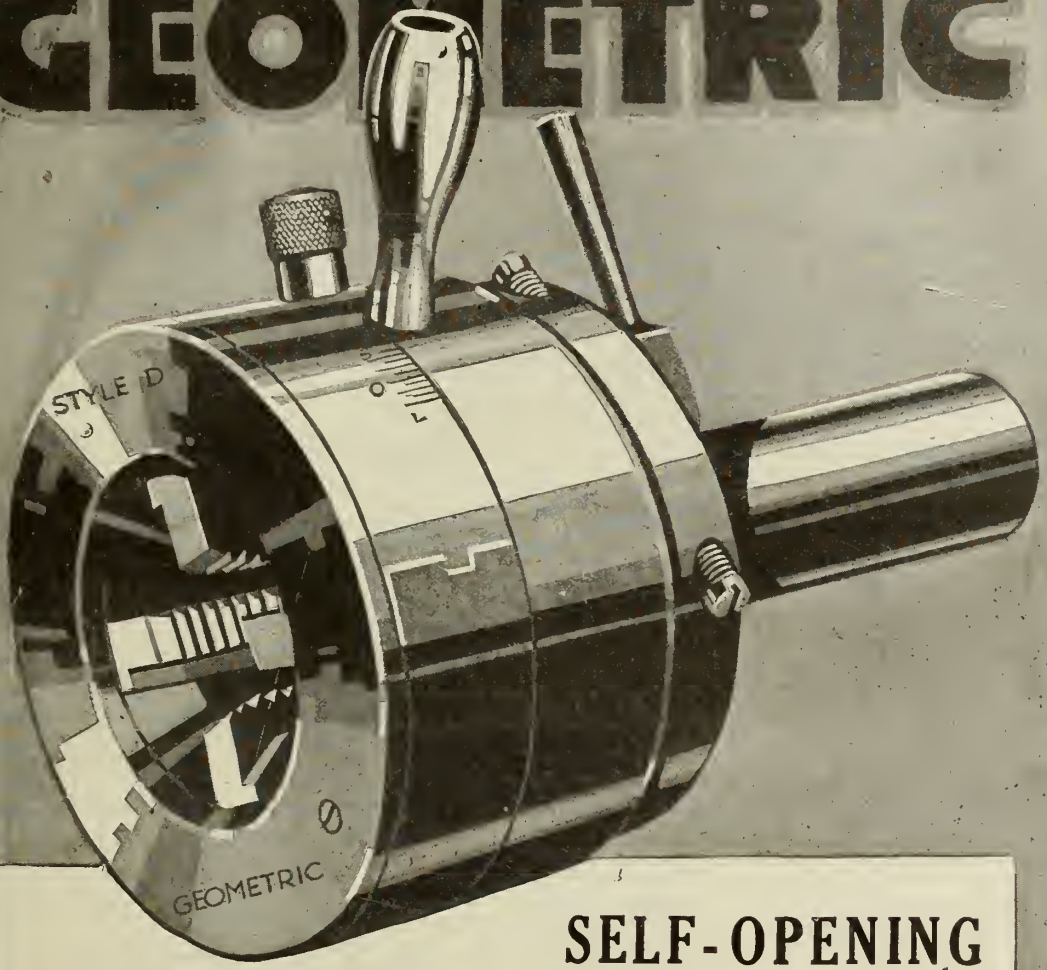
ROPE AND PACKINGS

Drilling cables, Manila	0 39
Plumbers' oakum, per lb.	0 10¼
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 35½
British Manila rope	0 28
New Zealand hemp	0 28
Transmission rope, Manila	0 47
Cotton rope, ¼-in. and up	0 88

POLISHED DRILL ROD

Discount off list, Montreal and Toronto	net

GEOMETRIC



"YOU CAN'T BEAT 'EM"

SELF-OPENING DIE HEADS

It is not the manufacturers of Geometric Self-Opening Die Heads who make this statement, but the users of the tools.

This is the reason that besides being the originators, we are known as the

LARGEST AND BEST KNOWN MANUFACTURERS OF AUTOMATIC THREADING TOOLS

The big question is: Have you applied Geometric Screw Thread Cutting Tools to your threading work?

THE GEOMETRIC TOOL COMPANY
NEW HAVEN CONNECTICUT

Canadian Agents: Williams & Wilson, Ltd., Montreal; The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg and St. John, N.B.; The Canadian Fairbanks-Morse Co., Ltd., Manitoba, Saskatchewan, Alberta

If interested, tear out this page and keep with letters to be answered.

MISCELLANEOUS

Solder, strictly	$ 0 40
Solder, guaranteed	0 43
Babbitt metals	18 to 70
Soldering coppers, lb.	0 62
Lead wool, per lb.	0 16
Putty, 100-lb. drums	8 30
White lead, pure, cwt.	20 00
Red dry lead, 100-lb. kegs, per cwt.	16 50
Glue, English	0 40
Tarred slater's paper, roll	1 30
Gasoline, per gal., bulk	0 35
Benzine, per gal., bulk	0 35
Pure turp., single bbls., gal.	3 60
Linseed oil, raw, single bbls.	3 00
Linseed oil, boiled, single bbls.	3 03
Sandpaper, B. & A.	List plus 43
Emery cloth	List plus 37½
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin, "D," per lb.	0 14
Borax crystal and granular	0 14
Wood alcohol, per gal.	2 70
Whiting, plain, per 100 lbs.	2 75

CARBON DRILLS AND REAMERS

S.S. drills, wire sizes	32½
Can. carbon cutters, plus	20
Standard drills, all sizes	32½
3-fluted drills, plus	10
Jobbers' and letter sizes	32½
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	50
Sleeves	50
Taper pin reamers	25 off
Drills and countersinks	net
Bridge reamers	50
Centre reamers	10
Chucking reamers	net
Hand reamers	10
High speed drills, list plus	20 to 40
Can. high speed cutters, net to plus	10
American	plus 40

COLD ROLLED STEEL

[At warehouse]

Rounds and squares	$7 base
Hexagons and flats	$7.75 base

IRON PIPE FITTINGS

	Black	Galv.
Class A	60	75
Class B	27	37
Class C	18	27

Cast iron fittings, 5%; malleable bushings, 22½%; cast bushings, 22½%; unions, 37½%; plugs, 20% off list.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$ 8 50	$ 9 50
Sheets, Blue ann., No. 10	8 50	9 00
Canada plates, dull, 52 sheets	8 50	10 00
Can. plates, all bright	8 60	9 00
Apollo brand, 10¾ oz. galvanized	....	....
Queen's Head, 28 B.W.G.	11 00	....
Fleur-de-Lis, 28 B.W.G.	10 50	....
Gorbal's Best, No. 28	....	....
Colborne Crown, No. 28.	....	....
Premier, No. 28, U.S.	11 50	10 50
Premier, 10¾-oz.	11 50	10 90
Zinc sheets	16 50	20 00

PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13.00; 5-16, $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.20; ¾ in., $9.30; ⅞ in., $9.50; 1 in., $9.10; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $13.00; 5-16 in., $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.50; ¾ in., $9.30.

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

BOILER TUBES.

Size.	Seamless	Lapwelded
1 in.	$27 00	$.....
1¼ in.	29 50	.....
1½ in.	31 50	29 50
1¾ in.	31 50	30 00
2 in.	35 00	30 00
2¼ in.	35 00	29 00
2½ in.	42 00	37 00
3 in.	50 00	48 00
3¼ in.	.. ..	48 50
3½ in.	63 00	51 50
4 in.	85 00	65 50

Prices per 100 ft., Montreal and Toronto

OILS AND COMPOUNDS.

Castor oil, per lb.	
Royalite, per gal., bulk	24½
Palacine	27½
Machine oil, per gal.	43½
Black oil, per gal.	18½
Cylinder oil, Capital	82
Cylinder oil, Acme	70
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	$2 60
Union thread cutting oil, antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil, bbls., net	13½

BELTING—No 1 OAK TANNED

Extra heavy, single and double	10%
Standard	10%
Cut leather lacing, No. 1	2 75
Leather in side	2 40

TAPES

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	$4 60
Polishing wheels, bull-neck	2 00
Emery in kegs, Turkish	09
Pumice, ground	06
Emery glue	30
Tripoli composition	09
Crocus composition	12
Emery composition	10
Rouge, silver	60
Rouge, powder, nickel	45

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	.08½
Grits, 80 and finer	.6

BRASS—Warehouse Price

Brass rods, base ½ in. to 1 in. rod	0 34
Brass sheets, 24 gauge and heavier, base	$0 42
Brass tubing, seamless	0 46
Copper tubing, seamless	0 43

WASTE

XXX Extra	.24	Atlas	.20
Peerless	.22½	X Empire	.19½
Grand	.22½	Ideal	.19
Superior	.22½	X Press	.17½
X L C R	.21		

Colored

Lion	.17	Popular	.13
Standard	.15	Keen	.11
No. 1	.15		

Wool Packing

Arrow	.35	Anvil	.22
Axle	.28	Anchor	.17

Washed Wipers

Select White	.20	Dark colored	.09
Mixed colored	.10		

This list subject to trade discount for quantity.

RUBBER BELTING

Standard ... 10% Best grades... 15%

ANODES

Nickel	.58 to .65
Copper	.38 to .45
Tin	.70 to .70
Zinc	.18 to .18

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	$42 50	$43 00
Copper wire, list plus 10		
Plain sheets, 14 oz., 14x60 in.	46 00	44 00
Copper sheet, tinned, 14x60, 14 oz.	48 00	48 00
Copper sheet, planished, 16 oz. base	46 00	45 00
Braziers', in sheets, 6 x 4 base	45 00	44 00

LEAD SHEETS

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$10 75	$14 50
Sheets, 3½ lbs. sq. ft.	10 50	14 00
Sheets, 4 to 6 lbs. sq. ft.	10 25	13 50

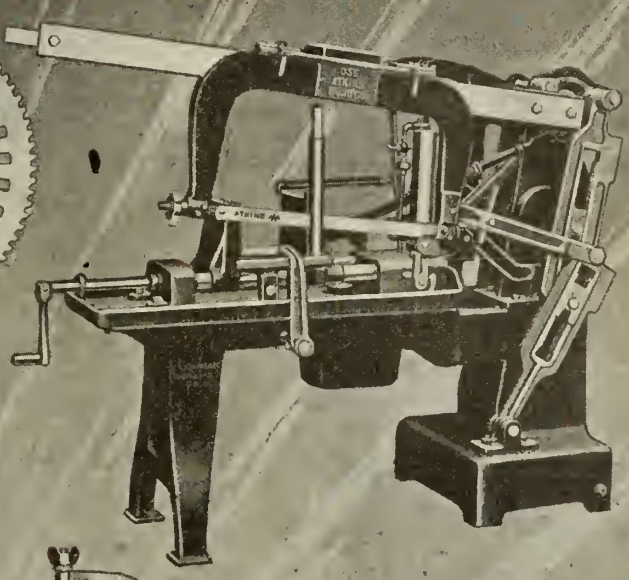
Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS

Acid, boracic	$ .23
Acid, hydrochloric	.03¼
Acid, nitric	.10
Acid, sulphuric	.03¼
Ammonia, aqua	.15
Ammonium, carbonate	.20
Ammonium, chloride	.22
Ammonium hydrosulphuret	.75
Ammonium sulphate	.30
Arsenic, white	.14
Copper, carbonate, annhy.	.41
Copper, sulphate	.16
Cobalt, sulphate	.20
Iron perchloride	.62
Lead acetate	.30
Nickel ammonium sulphate	.08
Nickel carbonate	.32
Nickel sulphate	.19
Potassium sulphide (substitute)	.42
Silver chloride (per oz.)	1.25
Silver nitrate (per oz.)	1.20
Sodium bisulphate	.11
Sodium carbonate crystals	.06
Sodium cyanide, 127-130%	.38
Sodium hyposulphite per 100 lbs	8.00
Sodium phosphate	.18
Tin chloride	1.00
Zinc chloride, C.P.	.30
Zinc sulphate	.08

Prices per lb. unless otherwise stated

ATKINS STERLING QUALITY SAWS



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North South East West

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are noted for their efficiency. Their use will increase your production.

Ask for new literature describing Atkins Kwik Kut Power Hack Saw and Metal Cutting Band Saw Machines, Circular Metal Cutting Saws, AAA Hack Saw Blades and Frames, etc.

"A Better Saw For Every Use"

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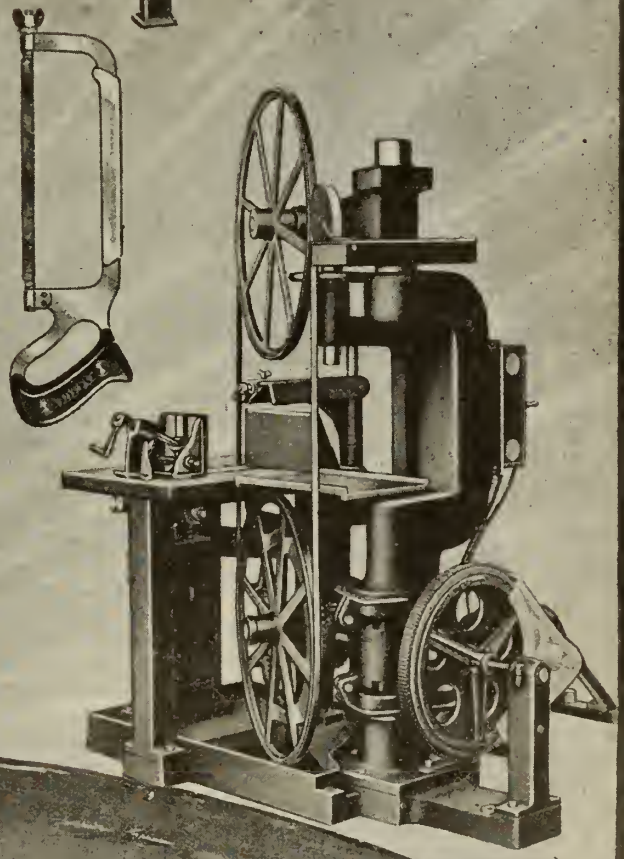
Branch: VANCOUVER, B. C.



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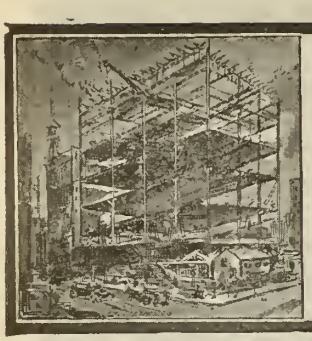


INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS PERSONAL AND TRADE NOTES

INCORPORATIONS NEW

The Instantaneous Electric Heater (Canada), Limited, has been incorporated with a capital of $250,000, divided into 2,500 shares of $10 each.

The Rose Castle Steamship Co., Ltd., has been incorporated with a capital stock of $1,500,000, to carry on the business of steamship owners. The head office will be in Montreal.

Notice is received of the changing of the corporate name of the "Stamped Metal Products Company of Canada, Ltd." to the "Sheet Metal Products Company of Canada, Ltd." with effect from June 15th.

The "Nicu Steel Corporation, Ltd.," have been granted authority to increase their capital from the sum of $200,000 to $300,000. The increase to consist of one thousand shares of one hundred dollars each. Effective from June 16th.

Under the title of Industrial Sites, Ltd., a company has been incorporated under the Ontario Act, with a capital of $100,000, divided into 1,000 shares of $100 each, to construct docks, warehouses, etc. Head offices to be in Hamilton.

Incorporation is granted to "The Canada Gas and Fuel Co., Ltd.," under date of June 14th. The company is to have a stock of three million dollars, divided into 30,000 shares of one hundred dollars each. The chief place of business is Toronto.

The Orton Motor Company has been incorporated under the Ontario Act, with a capital of $500,000 divided into 5,000 shares of $100 each, to carry on a general business as motor dealers and manufacturers. The head office is to be in the town of Petrolia, Ont.

The firm of Dunn's Auto Markers, Ltd., has been incorporated under a Dominion charter with a capital of $1,000,000 to carry on a general business in auto vehicles. The shares are divided into 10,000 of $100 each, the chief place of business being Montreal.

The Lee Valley Rural Telephone Co. Ltd., has been incorporated under the Ontario Act, to operate and control a telephone service in the townships of Hallam and May. The capital is $2,400 in thirty shares of $80 each, and the head office at Lee Valley, Sudbury.

The Canadian Paper Board Co., Ltd., has been incorporated under a Dominion charter with a capital stock of $5,000,000, divided into 50,000 shares of $100 each. The head office is to be in Toronto. The company will manufacture and deal in paper and pulp of all kinds.

Notice is received of the incorporation of "The Cornfield Wheel Company, Ltd." with a capital stock of $750,000, divided

SOVIET HAD REPRESENTATIVE IN OTTAWA LOOKING FOR SUPPLIES

New York.—Two representatives of the Russian Soviet Government Bureau here, who spent two weeks in Canada seeking to place orders with Canadian manufacturers for the Russian Soviet Government, submitted a report to Ludwig C. A. K. Martens, chief of the bureau, in which they declared they had been favorably received both by representative Canadian manufacturers and officials of the Canadian Government, and that preliminaries for trading between Canada and the Soviet Government had been arranged.

It was stated by officials of the bureau that as a starter a $5,000,000 contract for rolling stock with a Canadian firm would likely be signed "in the course of a few days." The officials refused to give the name of the firm, saying that they considered it inadvisable to announce it until after the contract was actually signed.

The Soviet trade envoys to Canada were S. Nuorteva, secretary to Martens, and Captain O. S. Beyer, a consulting engineer, who went as technical adviser, Nuorteva attending to the financial negotiations. The latter has gone to London to consult with Leonid Krassin, and the captain returned to New York, bringing the report of the commission.

"Mr. Nuorteva and Captain Beyer interviewed the officials of a number of firms in Montreal, Ottawa, and Toronto, as well as a number of bankers," Mr. Martens said, "and they report that they were well received. A number of big manufacturing firms in Canada have stated that they are prepared to accept contracts with the Soviet Government, and they will have the sanction of the Canadian Government in doing so."

Meetings in Ottawa

Martens said that the Russian representatives while in Ottawa had several conferences with "high officials" of the Canadian Government, and as a result he could state that the opening of trade relations with Soviet Russia was regarded favorably by the Ottawa authorities. He refused to state who the Ottawa officials were, or to give the names of the Canadian manufacturers who were reported by his agents to be ready to do business with the Soviets.

The material which the Soviet Government hopes to purchase in Canada includes rolling stock, agricultural machinery, machine tools, and drugs. According to the proposition which has been submitted to the Dominion firms upon the signing of the contracts the Soviet Government will send gold for deposit in Canadian banks to establish credits sufficient to cover the total amount of the contracts.

An effort is also being made by the Soviet Government to purchase 4,000 freight cars, which were manufactured in Montreal on the order of the Imperial Government, and were being delivered when the revolution broke out. These are stated to be now held at Vancouver on the order of the British Munitions Board. The purchase of these cars is one of the matters which Nuorteva will attempt to negotiate in London.

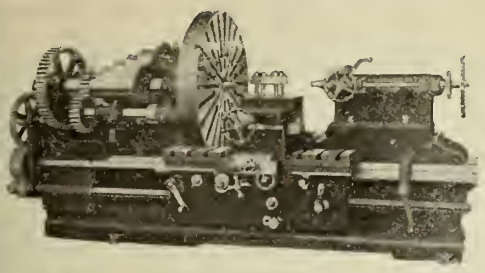
PENINSULA OUT AFTER INDUSTRIES

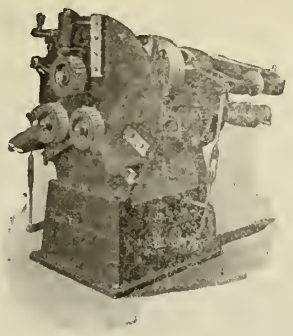
Niagara District Takes Novel Way of Bringing Attention to its Advantages

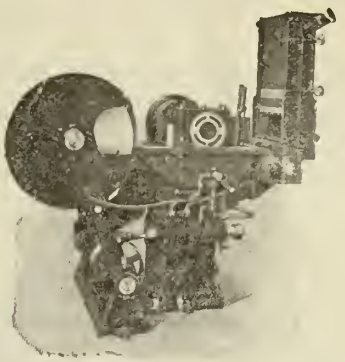
The annual Niagara District Industrial Conference date has now been set for August 2 to 4. The itinerary has all been arranged for, and will include in the three days trips to every part of the district, and the illustration of all its features, industrial, public works, hydro, etc.

At the suggestion of John T. James, of Bridgeburg, it has been decided to assess against the various cities, towns and villages in the district their share of the cost of the conference, which will be $7,000.

Visitors from the United Kingdom as well as Canada and the United States are expected at the conference, the secretary having already received a list of names of numerous delegates.

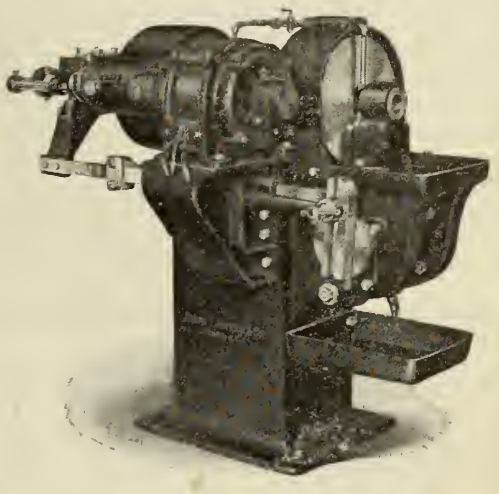






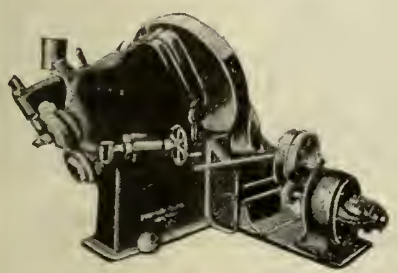
PARTIAL LIST OF MACHINERY

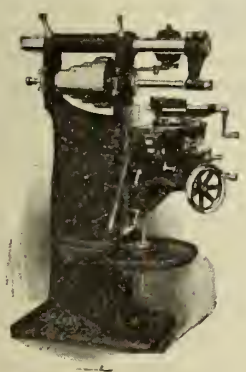
IN TORONTO STOCK

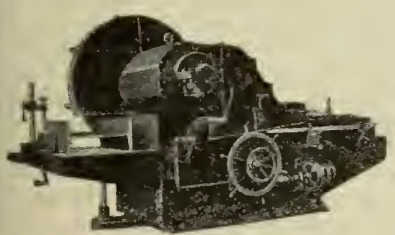


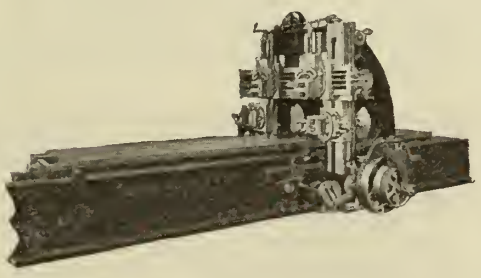
2 7 "A & B" Cataract Precision lathes.
1 18x8 Rae, D.B.G. & Q.C.G., engine lathe.
1 18x8 Milwaukee, D.B.G. & Q.C.F., engine lathe.
1 24x10 Milwaukee, D.G.B., Q.C.F., engine lathe.
1 36x18 Putnam engine lathe.
1 20x38x12 C.M.C., Gap engine lathe.
1 16" Edlund H.S. drill.
1 20" Barnes drill press.
2 20" Champion drill press.
1 No. 314 Baker, 3" capacity.
3 4-spindle Woodward H.S. drills.
1 24" McGregor and Gourlay shaper.
1 24" Steptoe single pulley drive shaper.
1 8x36 Fitchburg Plain Cylindrical grinder.
1 No. 3 Ryerson Owen Universal miller.
2 No. 3 Ford Smith plain miller.
4 Briggs Millers, 20 to 42" traverse.
1 Ryerson No. 3 Rotary Bevel Shear 1" capacity.
Cleveland, National, Acme & Brown & Sharpe Automatic and other machines for all purposes.
1 Fosdick 26" radial drill.
1 Carrol, 14x6 Q.C.G. engine lathe.

May we have your enquiries?









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LABOR DISPUTES IN CANADA IN THE METAL-WORKING FIELD

THE current issue of the "Labor Gazette" gives the following re the strikes in the metal-working field:

Under this classification there were 21 strikes, involving 4,860 employees, with an approximate time loss of 64,597 working days. One of the largest strikes in this group was that of 675 machinists and toolmakers at Peterborough, which commenced on May 6 and which was followed by a strike of 130 electrical workers in the same plant on May 18. The machinists and toolmakers demanded an 80 cents per hour minimum and a 48-hour week. The schedule prevailing prior to the strike ranged from 55 cents to 75 cents per hour for machinists, while some toolmakers were getting 80 cents per hour for a 50-hour week. An officer of the Department visited Peterborough and endeavored to effect a settlement but without success. Eventually the municipality, acting under Sec. 63a of the Industrial Dispute Investigation Act, made and Investigation, and a board was, at the close of the month, in course of establishment. As a result of refusal of their demand for increases in wages averaging about 30 per cent. and an 8-hour day, 1,000 shipyard employees went on strike at Port Arthur on May 15. Before striking, the employees signified their willingness to have the matter referred to a conciliation board. A board could be, however, established only in joint consent, the industry not being a public utility. The company declined, claiming that it would be unable to operate and to make further increases. A representative of the department visited the scene of this dispute and succeeded in postponing action. A strike finally resulted and was unterminated at the end of the month. Other strikes of machinists and metal workers occurred at Toronto, Hamilton, Montreal, Dundas, Welland and Owen Sound. The strike of shipbuilders at Three Rivers terminated on May 17.

into 75,000 share of ten dollars each; operating with Toronto, Ont., as headquarters, for the purpose of manufacturing and dealing in motor truck wheels of every description, etc.

The Glen Transportation Co., Ltd., has been incorporated with a capital stock of $500,000 in 5,000 shares of $100 each. The head office of the company will be in Midland, Ont., and the business will include transportation by land and water, towing, wrecking, salvage, etc.

The Atlantic and St. Lawrence Stevedoring and Contracting Company, Ltd., has been incorporated with a capital stock of $25,000 in 250 shares of $100 each, to carry on the business of general stevedoring, salving, towing and lighterng business. The head office will be in Montreal.

Under the Canada Companies Act, the firm of H. G. Craig & Co., Ltd., has been incorporated with a capital stock of $5,000 in 50 shares of $100 each. The company will import, export, and manufacture paper of all kinds, and also act as agents for pulp and paper mills. The head office is to be in Montreal.

With a capital of $1,500,000 divided into 150,000 shares of $10 each, the Mauson Motors, Ltd., has been incorporated under a Dominion charter. The company will carry on a general business as dealers in motor vehicles. The shares will be divided into 100,000 preference and 50,000 common. The head office will be in Toronto.

The "General Asbestos Co., Ltd.," is incorporated under date of June 19, for the purpose of developing asbestos mining rights and prospects. The company to operate from Montreal, P. Q., with a capital stock of $500,000, divided into 5,000 shares of one hundred dollars each. The company to be deemed a private company in accordance with the Companies Act.

Under the date of June 12, the "Samson Tractor Company of Canada, Ltd." is incorporated to operate with headquarters in Toronto, Ont. The Company to have a capital stock of ten thousand dollars, divided into 100 shares of one hundred dollars each, and to engage in the manufacture and deal in tractors, trucks, farm machinery and implements.

The Northwest Oil Exportation Company of Canada, Ltd., has been incorporated to carry on the business of mining, prospecting, etc. The capital stock is to consist of 300,000 shares of nominal or par value, and 1,000 shares of preferred stock of $100 each, provided that the company shall carry on business with $1,600,000 capital. The head office will be in Ottawa.

The firm of D. G. Loomis & Sons, Ltd., has been incorporated with a capital stock of $1,300,000, in thirteen thousand shares of $100 each. The company will take over the business of D. G. Loomis & Sons as a going concern, as well as the business formerly carried on by George R. Heckel. The head office of the company will be at Montreal.

At a special meeting of the board of directors of S. K. F. Industries, Inc., the resignation of Mr. B. G. Prytz, as president, was accepted; Mr. Prytz having been elected managing director of the parent company, with headquarters at Gothenburg, Sweden. At the same meeting F. B. Kirkbride, vice-president since the organization of the company, was elected president to succeed Mr. Prytz.

Notice is received of the incorporation of the "Importing Company of Montreal, Ltd.," under date of May 27, for the purpose of carrying on an export and import business. The company to be situated in Montreal, with a capital stock of $100,000, divided into 1,000 shares of one hundred dollars each. The company to be deemed a private company in accordance with the Companies Act.

The Williams Tool Corporation of Canada, Ltd., Brantford, Ont., has been incorporated with a capital stock of $150,000 by James Harley Ed. Sweet, Archibald M. Harley and others, to acquire and take over the plant and business now carried on by John H. Hall & Sons, Ltd., manufacturer of tools, machinery, etc. It is the intention of the new owners to increase production and to install considerable new machinery and equipment.

Notice has been received of the incorporation of "Coates Supplies & Agencies, Ltd." of Chatham, Ont., with effect from June 22, for the following purposes:—

WHITMAN & BARNES ANNOUNCE PLANS

What They Intend Doing Following the Merger With J. H. Williams & Co.

The Whitman & Barnes Manufacturing Company, Akron, Ohio, are now manufacturers of twist drills and reamers exclusively. The merger of their two drop forge and wrench factories at Chicago, Ill., and St. Catharines, Ontario, with J. H. Williams & Co., of Brooklyn, N. Y., was officially consummated June 23rd.

A D. Armitage, president of Whitman & Barnes, will be vice-president of J. H. Williams & Co., and W. E. Rowell, Whitman & Barnes' secretary, becomes Western manager of J. H. Williams & Co. at the Chicago factory.

The Whitman & Barnes Manufacturing Company will remain in the twist drill and reamer business, retaining for this purpose its Akron, Ohio, factory where twist drills and reamers have been made in the past. The entire time and energies of its organization in the future will be directed exclusively to the manufacture and sale of twist drills and reamers. A new and enlarged plant will be constructed, the plans for which are rapidly developing. When completed, the new factory will be the last word in equipment and facilities for producing twist drills and reamers, and will rank among the largest of its class in the country. The present plant faciities are unable to supply the demand for W. & B. twist drills and reamers, and the company reports constantly increasing sales over production.

Keep your resources well in hand! If you are owing money to the bank, have your plans arranged so that you can realize on your assets quickly.

MORROW FORGED DRILLS ARE GOOD DRILLS

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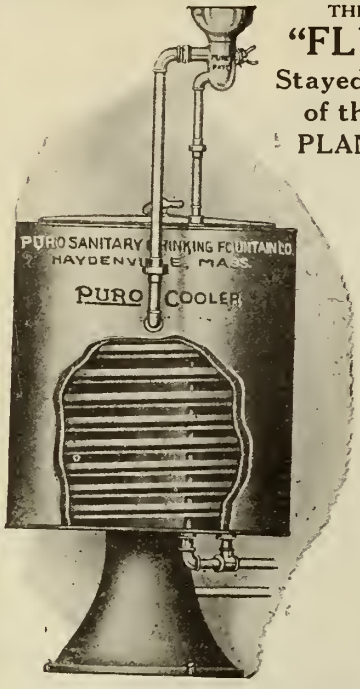

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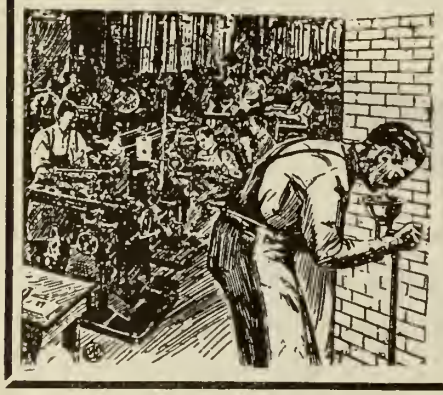

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The company to carry on business as importers and exporters and to deal in all kinds of goods, viz., machinery, vehicles and motor vehicles; rubber and a combination of other materials, or ingredients, etc. The capital stock to consist of five hundred shares of no nominal or par value; provided the company shall carry a business with a capital of $2,500.

TRADE GOSSIP

Have Contract.—E. A. James & Co., engineers, of Toronto, have been awarded the contract for the proposed extensions to the Chatham waterworks plant.

Cannot Picket.—In consequence of disturbances following a strike at the Halifax shipyards, an injunction was granted by Justice Chisholm, restraining the em-

CANADIAN FIRM HAS AMERICAN PLANT

Gray Ball Bearing Co. Have Moved to New Premises at Batavia From Buffalo

The Gray Ball Bearing Co., Ltd., of Toronto, have moved their plant, which was operating in Buffalo, N.Y., under the name of the Gray Machine Tool Co., Inc., to Batavia, N.Y. Coinciding with the move to Batavia, a new corporation has been formed called The Gray Machine and Parts Corporation, with an authorized capital of $225,000, which will take over the Gray Machine Tool Co., Inc., the additional capital being utilized for proposed expansion. The new corporation and the Gray Ball Bearing Co., Ltd., of Toronto, are allied companies under the following control:

Mr. Alexander Gray, president.
Mr. James Gray, vice-president.
Mr. A. M. D. Martin, general manager of the Batavia plant.

The factory now occupied by The Gray Machine and Parts Corporation was bought from the Batavia Steel Products Co., in which Mr. J. J. Carrick was largely interested. The site covers three acres of ground and has its own siding; the factory having a floor space of 60,000 feet, with a two-storey office building.

The move from Buffalo was carried out last week and the factory is now working under normal conditions. It is proposed to continue the manufacture of piston blasting machines and thread millers, and expansion will take place along the line of the manufacture of standard automobile parts, specializing on drag links.

The Toronto and Batavia companies are already doing business with some of the largest automobile manufacturers in the United States and Canada.

The flow of business at the Toronto plant is so heavy that they are booked up eight months ahead, and are already considering the possibility of moving to more extensive quarters when certain organization developments have been carried out.

ployees on strike from picketing the company's grounds.

Motor Is There.—The motor for driving the new 12-million gallon centrifugal pump now installed at the Montreal Low Water Pumping Station has just been delivered, and it is expected that the final work of placing this unit will be completed in time for putting it into operation by the end of the present month. In addition to this additional supply of water, it is anticipated that before the winter the two new 30-million gallon pumps will be ready for service.

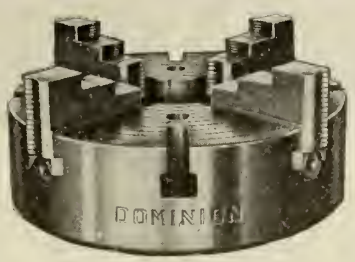
Have New Quarters.—Alfred Herbert. Ltd., who have been conducting their Canadian business from an office at 31 Yonge Street, have moved to 1 and 3 Jarvis Street. In the new premises they will have some three or four thousand feet of floor space which they will use for offices, show and ware rooms. A large shipment of lathes, grinders and other lines has been received in Toronto and some of these will be put under power in the showroom. Mr. Blair, the Canadian representative, changed his headquarters to the Jarvis Street address during the week.

Visiting Canada.—Dominion Day witnessed 115 members of the American Institute of Mining Engineers from New York, accompanied by thirty women, as guests of the city of Belleville and county of Hastings. The visitors were taken by motor about the city, and at 10 o'clock left for Deloro, going by way of Stirling and Marmora and the Trent Valley. The extensive work of the Deloro Smelting & Refining Company was inspected. The processes of smelting and refining ores from the Cobalt region to recover cobalt, arsenic and nickel, and, by the electric furnace, stellite metal were watched. Madoc was visited and a stop was made at the plant of G. H. Gillespie & Company, miners and manufacturers of talc. At Corbyville the party inspected the plant of the Industrial Alcohol Company, Ltd.

PERSONAL

Thomas A. Kennedy, foundry superintendent, and for many years identified with the field force of the National Founders' Association, has been appointed assistant commissioner of the Canadian Founders' Association, Toronto, Ont., in charge of the Bureau on Foundry Methods and Equipment.

Alfred Herbert, Ltd., machine tools, 54 Day Street, New York, announce the appointment of E. D. Mitchell as manager of the New York branch in place of W. J. Fuller, who recently resigned. Mr. Mitchell joined the company in January, 1906. He has had a great deal of experience in connection with the export business of the company, having visited the Far East, India, and Continental Europe. He is also a director in the Societe Anonyme Alfred Herbert. Paris.



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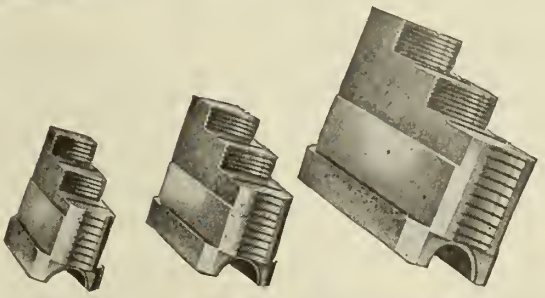

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300	2200		150	15 x 32 x 30	McIntosh & Seymour.
400	2300	Westinghouse	107	18 x 32 x 42	Rice & Sergeant.
400	370	Westinghouse	370	20 x 28 x 36	Hamilton Corliss.
450	550	Westinghouse	125		McIntosh & Seymour.
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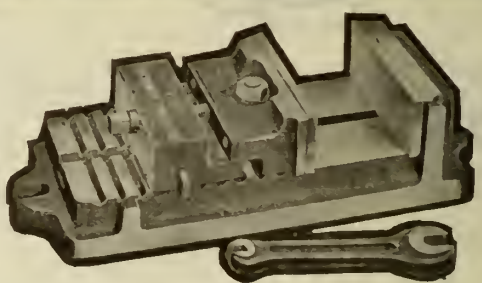

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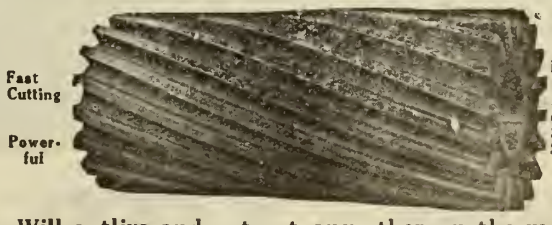

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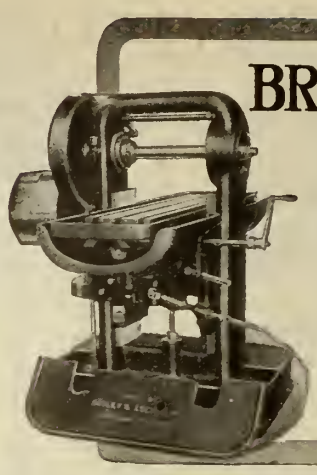

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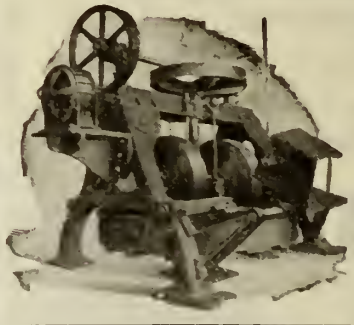

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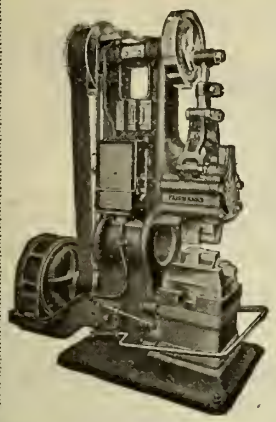

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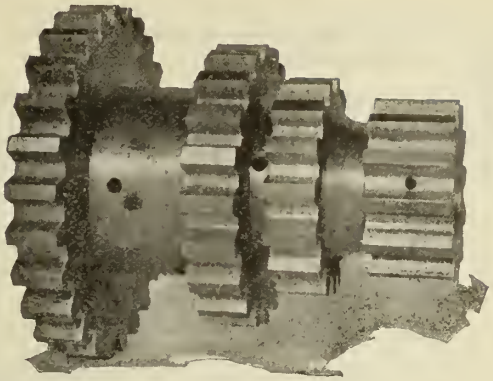

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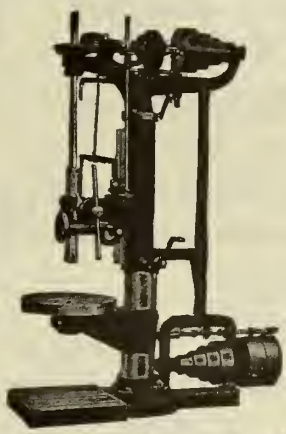

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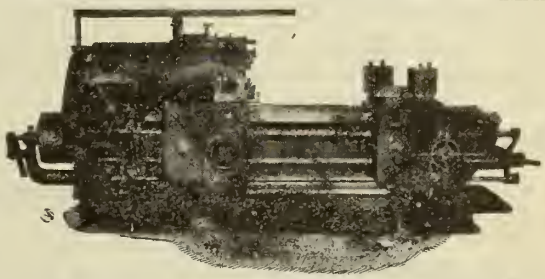

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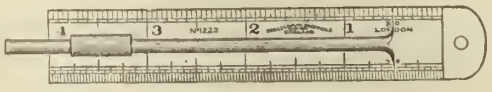
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Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto
Gisholt Machine Co., Madison, Wis.
Holden Co., Ltd., Montreal, Que.
Hoefer Mfg. Co., Freeport, Ill.
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Oliver Mach'y Co., Grand Rapids, Mich.
Rockefson Machine & Tool Co., Toronto.
Rockford Drilling Mche. Co, Rockford, Ill

BORING AND TURNING MILLS
Barber Mchy. Co., Ltd., Toronto, Ont.
Bertram & Sons Co., John, Dundas.
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Foss Mch. & S'ply Co., Geo. F., Montreal
Knight Metal Products, Toronto.
Oliver Mach. Co., Grand Rapids, Mich.
Niles-Bement-Pond Co., New York.
Strelinger Co., C. A., Windsor, Ont.

BOXES, CAST IRON
Brown & Sharpe Mfg. Co., Providence, R.I.

BOXES, STEEL SHOP AND TOTE
Cleveland Wire Spring Co., Cleveland.

BRAKES
Brown, Boggs & Co., Hamilton, Can.
Electric Steel & Metals, Ltd., Welland.

BRASS—SHEETS, ROLLS, PLATES, and RODS
Brown's Copper and Brass Rolling Mills, New Toronto.

BRASS ALLOYS
British Smelting & Refining Co., Ltd., Montreal, Que.

BRASS AND COPPER TUBING
Lyman Tube & Supply Co., Montreal, Que.

BRASS FOUNDERS
Canada Metal Co., Toronto.
St. Lawrence Welding Co., Montreal.
Tallman Brass & Metal Co., Hamilton.

BRASS GOODS
Crane, Ltd., Montreal, Que.

BRASS PIPE AND TUBE
Crane, Ltd., Montreal, Que.

BRASS WORKING MACHINERY
Barber Mchy. Co., Ltd., Toronto, Ont.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machinery Co., Toronto.
Warner & Swasey Co., Cleveland, O.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Pratt-O-Lite Co., Inc., Toronto, Ont.
Wood Turret Machine Co., Brazil, Ind.
Williams Machy. Co., A. R., Toronto.
Brown's Copper and Brass Rolling Mills, New Toronto.

BRAZING EQUIPMENT
Chicago Flexible Shaft Co., Chicago, Ill.

BRICKS, FIRE
Elk Fire Brick Co., Can., Ltd., Hamilton, Ont.

BRIDGES, RLY. AND HIGHWAY
Canadian Mead-Morrison Co., Limited, Montreal, Que.
Dominion Bridge Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.

BROACHING MACHINES
Strelinger Co., C. A., Windsor, Ont.

BRONZE—SHEETS, ROLLS, PLATES, and RODS
Brown's Copper and Brass Rolling Mills, New Toronto.

BRONZE, NAVAL
Canada Metal Co., Toronto.
Tallman Brass and Metal Co., Hamilton.

BRONZE COPPER
Canada Metal Co., Toronto.

BRUSHES, CARBON
Lyman Tube & Supply Co., Montreal, Que.

BUFFING AND POLISHING MACHINERY
Ford-Smith Mach. Co., Hamilton.
Foss Mchy. & S'ply Co., Geo. F. Montreal
Garlock-Walker Machinery Co., Toronto.
Petrie, Ltd., H. W., Toronto.

BUCKETS, DUMP
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
St Lawrence Welding Co, Ltd , Montreal

BUCKETS, ELEVATOR
Can. Link-Belt Co., Toronto, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
nce Welding Co, Ltd., Montreal

BUCKETS, CLAM SHELL, CRAB, DUMP
Brown Hoisting Machinery Co., Cleveland, Ohio.
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Ltd, Walkerville.

BULLDOZERS
Bertram & Sons Co., John, Dundas.
Canada Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machinery Co., Toronto.
Lourie Manufacturing Co., Springfield, Ill
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

BURNERS, OIL AND NATURAL GAS
Northern Crane Works, Ltd., Walkerville.
W. S. Rockwell Co., New York, N.Y.

BURRS, IRON AND COPPER
Parmenter & Bulloch Co., Gananoque,.

BUSHINGS, BRONZE
Morrow Screw & Nut Co., John, Ingersoll.
St Lawrence Welding Co, Ltd., Montreal

CALIPERS
Brown & Sharpe Mfg. Co., Providence, R.I.
Pangborn Corporation, Hagerstown, Md.

CABINETS, SAND BLAST
Pangborn Corporation, Hagerstown, Md.

CABLE, ELECTRIC
International Machinery & Supply Co., Ltd., Montreal, Que.

CABLES, TRANSMISSION AND TELEPHONES
Northern Electric Co., Ltd., Montreal.

CALKS, BOOT
Lufkin Rule Co., of Can., Windsor, Ont.

CANNERS' MACHINERY
Bliss, E. W. Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Can.

CANNERS' CONVEYORS
Can. Link-Belt Co., Toronto, Ont.

CARBIDE
Carter Welding Co., Ltd., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.
Union Carbide Co., of Canada, Limited, Weland, nt.

CARBONIZING BOXES
Can. Driver-Harris Co., Ltd., Walkerville
Katie Foundry, Galt, Ont.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.
Swedish Crucible Steel Co., Windsor.

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Jones & Glassco, Montreal.

CARS, INDUSTRIAL
Can. Blower & Forge Co., Kitchener, Ont
Can. Fairbanks-Morse Co., Ltd, Montreal
Elec. Steel & Metals, Welland, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

CAR MOVERS
Holden Co., Ltd., Montreal, Que.

CASES, FILING
Economy Drawing Table Co., Adrian, Mich.

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Algoma Steel Corp., Sault Ste. Marie.
Franklin Mfg. Co., Syracuse, N.Y.
Canada Metal Co., Ltd., Toronto, Ont.

CASTINGS, DIE CAST
Canada Metal Co., Ltd., Toronto, Ont.
Franklin Mfg. Co., Syracuse, N.Y.
Fisher Motor Co., Ltd., Orillia, Ont.
Tallman Brass & Metals Ltd., Hamilton, Ont.

CASTINGS, STEEL—ALL KINDS
Canada Electric Castings, Ltd., Orillia, Ont.
Dominion Foundries & Steel Ltd., Hamilton, Ont.
Electric Steel & Metals Co., Welland.
Mesta Machine Co., Pittsburgh, Pa.

CASTINGS, ELECTRIC AND ALLOY STEEL
Can. Elec. Castings Co. Ltd., Orillia, Ont
Dominion Foundries & Steel Ltd., Hamilton, Ont.

CARRIERS COUPLING BOLTS
John Morrow Screw & Nut Co., Ingersoll
Alexander Fleck Ltd., Ottawa.
Tallman Brass & Metal Co., Hamilton.

CASTINGS, BENCH LEG.
Brown & Sharpe Mfg. Co., Providence, R.I.

CASTINGS, BRASS AND IRON
Algoma Steel Corp., Sault Ste. Marie.
International Machinery and Supply Co., Ltd., Montreal, Que.

CASTINGS, BUILDING
Katie Foundry, Galt, Ont.

CASTINGS, GRAY IRON
Bernard Industrial Co., A., Fortierville, Q.
Brown & Sharpe Mfg. Co., Providence, R.I.
Brown, Boggs Co., Ltd., Hamilton.
Can. Elec. Castings Co, Ltd., Orillia, Ont
Alexander Fleck, Ltd., Ottawa.
Gardner & Son, Robt., Montreal.
Hull Iron & Steel Foundries, Ltd., Hull
International Malleable Iron Co., Guelph
Kennedy & Sons, Ltd., Wm., Owen Sound.
Katie Foundry, Ltd., Galt, Ont.
Hamilton Co., Wm., Peterboro.
McFarlane Engineering Ltd., G. W., Paris, Ont.

CASTINGS, PLUMBERS'
Katie Foundry, Galt, Ont.

CASTINGS, NICHROME
Can. Driver-Harris Co., Ltd., Walkerville

CASTINGS, HARDWARE
Katie Foundry, Galt, Ont.

CASTINGS, STEEL CHROME AND MANGANESE STEEL
Thos. Davidson Mfg. Co., Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Hull Iron & Steel Foundries, Ltd., Hull.
Kennedy & Sons, Ltd, Owen Sound.

CASTINGS, MALLEABLE
International Malleable Iron Co., Guelph

CASTINGS, NICKEL STEEL
Hull Iron & Steel Foundries, Ltd., Hull.

CEMENT MACHINERY
Can. Fairbanks-Morse Co., Ltd., Montreal.
Gardner, Robt., & Son, Montreal.

CEMENT HANDLING MACHINERY
Can. Link-Belt Co., Toronto, Ont.

CEMENT TOOLS
Atkins & Co., E. C., Hamilton, Ont.

CENTERING MACHINES
Victoria Foundry Co., Ottawa, Ont.

CENTRE REAMERS
Bertram & Sons Co., John, Dundas.
Butterfield & Co., Inc., Rock Island, Que.
Gardner, Robt. & Son, Montreal.
Hurlburt, Rogers Mch. Co., South Sudbury, Mass.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co., of Canada, Galt, Ont.

CHAIN, WELDED COIL
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

CHAIN BLOCKS
Aikenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Ford Chain Block & Mfg. Co., Phila., Pa.
Garlock-Walker Machy. Co., Toronto.
Lyman Tube & Supply Co., Montreal, Que.
Morris Crane & HoistCo., Herbert, Niagara Falls, Ont.
Oliver Engineering Co., Montreal.
Rice Lewis & Son, Toronto, Ont.
Jones & Glassco, Montreal, Que.

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Canadian Link-Belt Co., Ltd., Toronto, Ont.
Morse Chain Co., Ithaca, New York.

CHAINS, AUTOMOBILE ENGINE
Can. Link-Belt Co., Ltd., Toronto, Ont.
Morse Chain Co., Ithaca, New York.

CHAINS, BICYCLE, DRIVE AND BLOCK
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.

CHAINS, FOR ELEVATORS AND CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

CHAIN, MALLEABLE, DETACHABLE AND RIVETED
Can. Link-Belt Co., Toronto, Ont.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

CHAINS, POWER TRANSMISSION
Canadian Link-Belt Co., Ltd., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, New York.
Glasgow, N.S.

CHAINS, SPROCKET WHEEL
Can. Link-Belt Co., Ltd., Toronto, Ont.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.

CHAIN DRIVES
Can. Link-Belt Co., Toronto, Ont.
Coventry Chain Co., Coventry, England.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.

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National Acme Co., Cleveland, Ohio.
Taylor, J. A. M., 315 Stair Bldg., Toronto, Ont.

CHEMISTS
Toronto Testing Lab'tory, Ltd., Toronto

CHUCKS, AERO, AUTOMATIC
Garvin Machine Co., New York.

CHUCKS, CENTERING
Hoggson & Pettis Mfg. Co., New Haven, Conn.

CHUCKS, COLLET, AIR
Elliott & Whitehall Mach. & Tool Co. Galt, Ont.
Smalley-General Co., Inc., Bay City, Mich.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

CHUCKS, DRILL, LATHE AND UNIVERSAL
Aikenhead Hardware Co., Toronto, Ont.
Bertram & Sons Co., John, Dundas.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Ltd., Brantford.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Mach'y Co., Toronto.
Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Chicago, Ill.
Jacobs Mfg. Co., Hartford, Conn.
Ker & Goodwin Machine Co., Ltd., Knight Metal Products, Toronto.
Modern Tool Co., Erie, Pa.
Rice Lewis & Son, Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

CHUCKS, DRILL, AUTOMATIC AND KEYLESS
Aikenhead Hardware Co., Toronto, Ont
Can. Blower & Forge Co., Kitchener.
McCrosky Tool Corp., Meadville, Pa., U. S. A.

CHUCKS, FRICTION AND TAP
Victor Tool Co., Waynesboro, Pa.

CHUCKS, MAGNETIC
Heald Machine Co., Worcester, Mass.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co, Ltd., A. R., Montreal

CHUCKS, RING WHEEL
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.

CHUCKS, WHEEL, CAR
Hoggson & Pettis Mfg. Co., New Haven, Conn.

CHUCKING MACHINES
Barber Mchy. Co., Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Garvin Machine Co., New York.
Gisholt Machine Co., Madison, Wis.
National Acme Co., Windsor, Vt.
Niles-Bement-Pond Co., New York.
Rockefson Machine & Tool Co., Toronto.
Warner & Swasey Co., Cleveland, O.
Wood Turret Mach. Co., Brazil, Ind.
Williams Mchy Co., A. R., Toronto, Ont.

CIRCULATING SYSTEMS FOR LUBRICATING OIL
Bowser Co., Ltd., S. F., Toronto, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

CLAY FIRE
Elk Fire Brick Co., Can., Ltd., Hamilton, Ont.

CLEANERS, METER, WASTE, GENERAL
Oakley Chemical Co., New York, N.Y.

CLEANING COMPOUND
Oakley Chemical Co., New York.

CLOCK SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

CLOCKS, WATCHMAN, PORTABLE
Gisholt Machine Co., Madison, Wis.

CLOSETS
Crane, Ltd., Montreal, Que.

CLUTCHES, CHAIN
Wright Mfg. Co., Lisbon, Ohio.

CLUTCHES, FRICTION AND PULLEY
Bernard Industrial Co., A., Fortierville, Q.
Can. Link-Belt Co., Toronto, Ont.
Carlyle Johnson Mach. Co., Manchester, Conn.
Positive Clutch & Pulley Wks., Aurora, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.

COAL CRUSHERS
Canadian Link-Belt Co., Ltd., Toronto, Ont.
Canadian Mead-Morrison Co., Limited, Montreal, Que.

COAL HANDLING MACHINERY
Brown Hoisting Machinery Co., Cleveland, Ohio.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Canadian Mead-Morrison Co., Limited, Montreal, Que.
Dominion Bridge Co., Montreal, Que.
MacGovern & Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont
Nova Scotia Steel & Coal Co., New

COLD ROLLED STRIP, ALL METAL

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Can. Driver-Harris Co., Ltd., Walkerville
Williams & Co., J. H., Brooklyn, N.Y.

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Can. Blower & Forge Co., Kitchener.
Sturtevant Co., B. F., Galt, Ont.

COLLETS
Becker Milling Machine Co., Boston.

COMPOSITION INGOT
Canada Metal Co., Toronto, Ont.

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Oakley Chemical Co., New York, N.Y.

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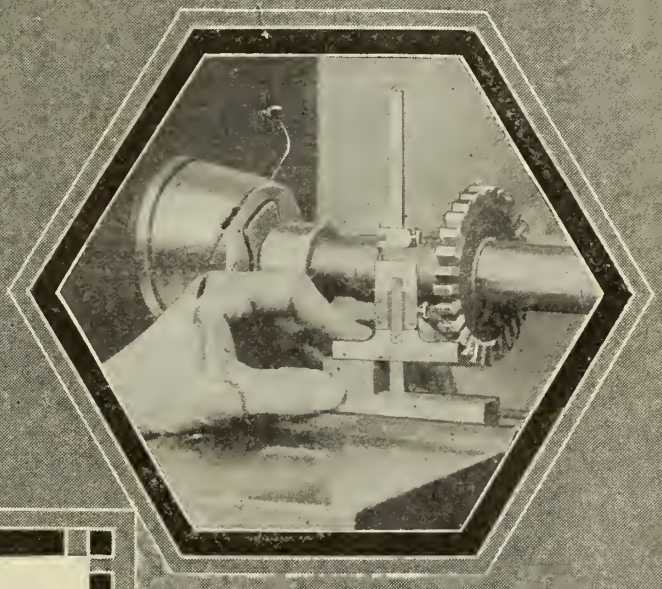
Atkins & Co., E. C., Hamilton, Ont.
Can. Ingersoll-Rand Co., Sherbrooke.
Cleveland Pneumatic Tool Co., Toronto.
Curtis Pneumatic Machy. Co., St. Louis
Elliott & Whitehall, Galt, Ont.
Garlock-Walker Machy. Co., Toronto.
Holden Co., Ltd., Montreal, Que.
MacGovern & Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto.

Is The Tool Room Complete?



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MacGovern & Co., Montreal, Que.
Smalley-General Co., Inc., Bay City, Mich.

CONDUITS

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CONNECTING RODS

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CONNECTING ROD CUTTERS INTERCHANGEABLE

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CONTRACT WORK

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Globe Engineering Co., Hamilton, Ont.
Homer & Wilson, Hamilton, Ont.
Katie Foundry, Ltd., Galt, Ont.
Victoria Foundry Co., Ottawa.

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Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal.

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Canadian Mead-Morrison Co., Limited, Montreal, Que.

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Can. Blower & Forge Co., Kitchener.

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Brown's Copper and Brass Rolling Mills, New Toronto.

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Aikenhead Hardware Co., Toronto, Ont.
Cleveland Twist Drill Co., Cleveland.
Eclipse Counterbore Co., Ltd., Walkerville.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
McCrosky Tool Corp., Meadville, Pa., U. S. A.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.

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Eclipse Counterbore Co., Ltd., Walkerville, Ont.

COUNTERBORES, INVERTED, INTERCHANGEABLE

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Brown & Sharpe Mfg. Co., Providence, R.I.
Gray Ball Bearing Co., Ltd., Toronto.
Baird Machine Co., Bridgeport, Conn.
Ford-Smith Machine Co., Hamilton, Ont.
Foster Machine Co., Elkhart, Ind.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co, Ltd., A. R., Montreal
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Petrie, Ltd., H. W., Toronto.
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Garlock-Walker Machinery Co., Toronto.

COKE AND COAL

Hanna & Co., M. A., Cleveland O

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Cleveland Pneumatic Tool Co., of Canada, Toronto.

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Independent Pneumatic Tool Co., Chicago

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Northern Crane Works, Walkerville.

ELECTRIC

Volta Manufacturing Co., Welland, Ont.

CUPS, OIL

Can. Winkley Co., Ltd., Windsor, Ont.

COVERS, OIL HOLE

Can. Winkley Co., Ltd., Windsor, Ont.

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Canadian Mead-Morrison Co., Limited, Montreal, Que.
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Northern Crane Works, Walkerville.

CRANE RUNWAYS

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CRANES, JIB

Brown Hoisting Machinery Co., Cleveland, Ohio.

CRANES, LOCOMOTIVE

Brown Hoisting Machinery Co., Cleveland, Ohio.
Holden Co., Ltd., Montreal, Que.

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Northern Crane Works, Walkerville.
Petrie, Ltd., H. W., Toronto.

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Brown Hoisting Machinery Co., Cleveland, Ohio.

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Dominion Bridge Co., Montreal.
Hepburn, John T., Ltd., Toronto.
Lyman Tube & Supply Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Niles-Bement-Pond Co., New York.
Northern Crane Works, Walkerville.
Oliver Engineering Co., Montreal.

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Canada Found's & Forgings Ltd., Welland
Williams & Co., J. H., Brooklyn, N.Y.

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Brown Hoisting Machinery Co., Cleveland, Ohio.
Can. Link-Belt Co., Toronto.
Lyman Tube & Supply Co., Montreal, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Rice Lewis & Son, Toronto, Ont.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

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Graton & Knight Mfg. Co., Worcester, Mass.

CRUSHERS

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Elec. Steel & Metals, Welland, Ont.

CUPOLAS

Can. Blower & Forge Co., Kitchener.
Northern Crane Works, Walkerville.

CURB PUMPS FOR OIL, GASOLINE

Bowser Co., Ltd., S. F., Toronto, Ont.

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See Bolt Cutters.

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Butterfield & Co., Inc., Rock Island, Que.
Fellows Gear Shaper Co., Springfield, Vt.

CUTTERS, FLUE

Cleveland Pneumatic Tool Co., Toronto.

CUTTER HEADS

Oliver Machinery Co. Grand Rapids, Mich

CUTTERS, PIPE (See Pipe Cutters)

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Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Cleveland Twist Drill Co., Cleveland.
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garvin Machine Co., New York.
Illinois Tool Works, Chicago, Ill.
Ingersoll Mache. Co., Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son Toronto, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Whitney Mfg. Co., Hartford, Conn.
Wilt Twist Drill Co., Walkerville, Ont.

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Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Foss Mchy & S'ply Co., Geo. F. Montreal
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield, Mass
Hurlburt, Rogers Machy. Co., South Sudbury, Mass.
Hall & Sons, John H., Brantford, Ont.
Kennedy & Sons, Wm., Owen Sound.
Lyman Tube & Supply Co., Montreal, Que.
Niles-Bement-Pond Co., New York, N.Y.
Prest-O-Lite Co., Inc., Toronto, Ont.
Petrie, Ltd., H. W., Toronto.
Tabor Mfg. Co., Philadelphia, Pa.
Wells Bros. of Can., Galt, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

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Cataract Refining Co., Ltd., Toronto.
Swan & Finch, Inc., New York.

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Bowser Co., Ltd., S. F., Toronto, Ont.

CUTTING AND WELDING PLANTS

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Prest-O-Lite Co., Inc., Toronto, Ont.
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Swedish Crucible Steel Co., Windsor.

CYLINDERS, AIR

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Ford-Smith Machine Co., Hamilton, Ont.
Smalley General Co., Inc., Bay City, Mich

CYLINDERS, AUTOMATIC REBORING JIGS AND REAMERS

Kelley Reamer Co., Cleveland, O.

DEHUMIDIFYING

B. F. Sturtevant Co, Galt, Ont.

DERRICKS

Aikenhead Hardware Co., Toronto, Ont.
Dominion Bridge Co., Montreal.
Hepburn Co., Ltd., J. T., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

DERRICK HOISTS

Canadian Mead-Morrison Co., Limited, Montreal, Que.

DIAMOND (BORTZ)

Furniss, Clarke & Co., Montreal, Que.

DIAMOND TOOLS

Can. Desmond-Stephan Mfg. Co., Hamilton
Ford-Smith Machine Co., Hamilton, Ont.
Furniss, Clarke & Co., Montreal, Que.
Joyce-Koebel Co., Inc., New York City.
Wheel Trueing Tool Co., Detroit.
Petrie, Ltd., H. W., Toronto.

DIAMONDS, CARBON AND BORTZ

Joyce Koebel Co., Inc., New York, N.Y.
Wheel Trueing Tool Co., Detroit.

DIAMONDS, BLACK AND ROUGH

Joyce, Koebel & Co., Inc., New York.
Wheel Trueing Tool Co., Windsor, Ont.

DIE CASTINGS

Fisher Motor Co., Ltd., Orillia, Ont.
Tallman Brass & Metals Ltd., Hamilton, Ont.

DIE HEADS, AUTOMATIC

Greenfield Tap & Die Corp., Greenfield Mass.
Wells Bros. of Can., Galt, Ont.
Petrie, Ltd., H. W., Toronto.

DIES, BRASS PRINTING, EMBOSSING AND LETTERING

Matthews, Jas. H., & Co., Pittsburgh, Pa

DIES FOR BIT BRACE USE

Butterfield & Co., Rock Island, Que.
Crescent Mche. Co., Ltd., Montreal, P.Q.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Wells Brothers Co., of Canada, Galt.

DIES AND DIE STOCKS

Ackworthie Ltd., J., Birmingham, Eng.
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Rock Island, Que.
Brown, Boggs Co., Hamilton, Ont.
Crescent Mche. Co., Ltd., Montreal, P.Q.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardiner, Robt. & Son, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Jones & Lamson, Springfield, Vt.
Landis Machine Co., Waynesboro, Pa.
Marshall, Son & Bunney, Toronto.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Acme Co., Cleveland, Ohio.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Rickert-Shafer Co., Erie, Pa.
Stoll Co., Inc., D. H., Buffalo, N.Y.
Wells Brothers of Canada, Galt, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

DIES, HAMMERED

Kimber & Hillier Mfg., Co., St. Catharines, Ont.

DIES, DROP FORGE.

Kimber & Hillier Mfg., Co., St. Catharines, Ont.

DIES, METAL STAMPING

Ackworthie Ltd., J., Birmingham, Eng.
Crescent Mche. Co., Ltd., Montreal, P.Q.
Elliott & Whitehall, Galt, Ont.

DIES, PIPE THREADING

Ackworthie Ltd., J., Birmingham, Eng.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Crescent Mche. Co., Ltd., Montreal, P.Q.
Landis Machine Co., Waynesboro, Pa.

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Ackworthie Ltd., J., Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Crescent Mche. Co., Ltd., Montreal.
Greenfield Tap & Die Corp., Greenfield, Mass.
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Ackworthie Ltd., J., Birmingham, Eng.
Becker Milling Machine Co., Boston
Garvin Machine Co., New York.
Kimber & Hillier Mfg., Co., St. Catharines, Ont.
Pratt & Whitney Co., Dundas, Ont.
Walcott Lathe Co., Jackson, Mich

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Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Rock Island, Que.
Firth & Sons, Thos., Montreal, Que.
Landis Machine Co., Waynesboro, Pa.
Wells Brothers Co. of Canada, Galt.

DIE HEADS

Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Canada, Galt, Ont.

DIES, SELF-OPENING

Geometric Tool Co., New Haven.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Wells Brothers Co. of Can., Galt, Ont.
Petrie, Ltd., H. W., Toronto.

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Oliver Mach. Co., Grand Rapids, Mich.

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Armstrong-Whitworth of Can., Montreal
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall, Son & Bunney, Toronto.
Firth & Sons, Thos., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.

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Wells Bros. Co. of Can., Galt, Ont.

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Brown, Boggs & Co., Hamilton, Canada
Globe Engineering Co., Hamilton, Ont.
Stoll Co., D. E., Buffalo, N.Y.

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Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
National-Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros., Co., of Can., Galt, Ont

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Can. Blower & Forge Co., Kitchener.
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Pratt & Whitney Co., Dundas, Ont.
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Can. Blower & Forge Co., Kitchener.
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Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machinery Co., Toronto
Garvin Machine Co., New York.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
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Can. Blower & Forge Co., Kitchener, Ont
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Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Mach. Co., Toronto.
Garvin Machine Co., New York.
Hoefer Mfg., Co., Freeport, Ill.
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Rockford Drilling Mach Co., Rockford, Ill

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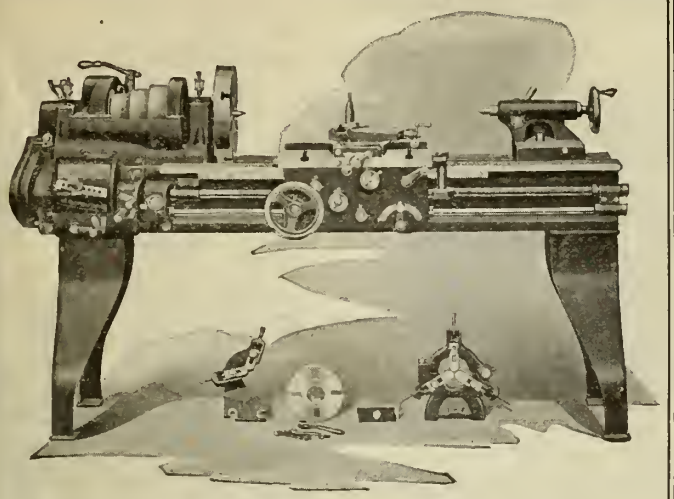
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Williams Mchy Co., A. R., Toronto, Ont.



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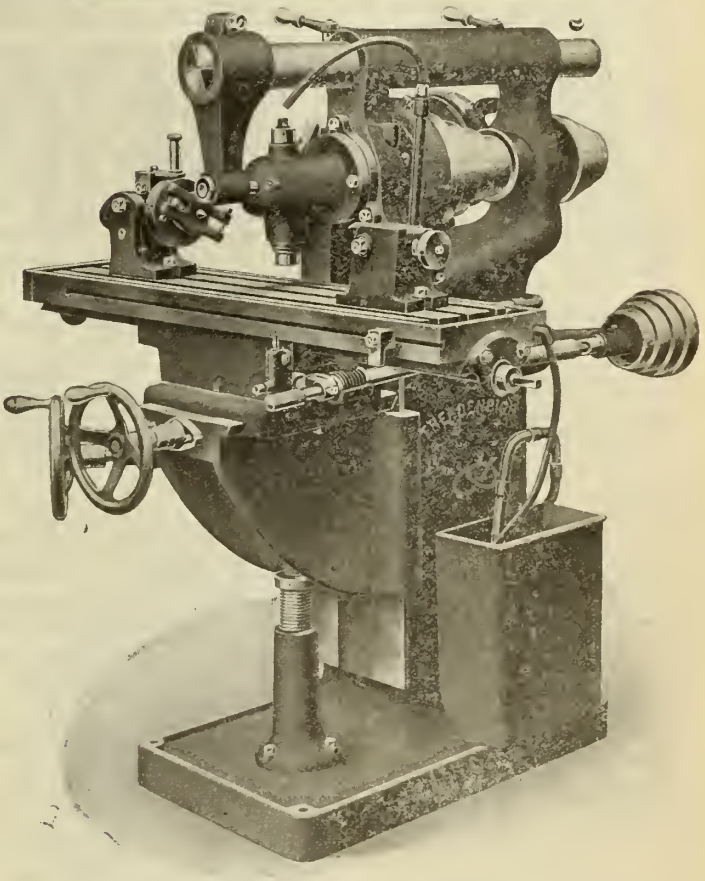

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Gisvin Machine Co., New York.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mach. Co., Toronto, Ont
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Can. Fairbanks-Morse Co., Montreal.
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Garlock-Walker Machinery Co., Toronto.
Pratt & Whitney Co., Dundas, Ont.
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A. B. Jardine & Co., Hespeler, Ont.
Morrow Screw & Nut Co., John, Ingersoll
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.
Wilkinson & Kompass, Hamilton, Ont.
Wilt Twist Drill Co. of Can., Walkerville

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Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
Morrow Screw & Nut Co., John, Ingersoll
Morse Twist Drill & Machine Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto.
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Eclipse Counterbore Co., Ltd., Walkerville, Ont.

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Niles-Bement-Pond Co., New York.
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Prest-O-Lite Co., Inc., Toronto, Ont.
Strelinger Co., C. A., Windsor, Ont.
U. S. Electrical Tool Co., Cincinnati, O.
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Williams Mchy Co., A. R., Toronto, Ont.

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DRILLS, EMERY
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Atkins & Co., Ltd., Wm., Sheffield, Eng.
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Canadian Fairbanks-Morse Co., Montreal
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Lyman Tube & Supply Co., Montreal, Que.
Marshall, Son & Bunney, Toronto.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
W. F. & John Barnes Co., Rockford, Ill
Osborne, Samuel, Montreal, P.Q.
Pratt & Whitney Co., Dundas, Ont.
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Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.
Taylor J. A. M., Stair Bldg., Toronto.
Wilt Twist Drill Co. of Can., Walkerville
Wilkinson & Kompass, Hamilton, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

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Morse Twist Drill & Mach. Co., New Bedford, Mass.
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Petrie, Ltd., H. W., Toronto.
Sturtevant Co., B. F., Galt, Ont.

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Page Steel & Wire Co., New York, N.Y.

FENCE, IRON AND FACTORY
Can. Wire & Iron Goods, Hamilton, Ont.
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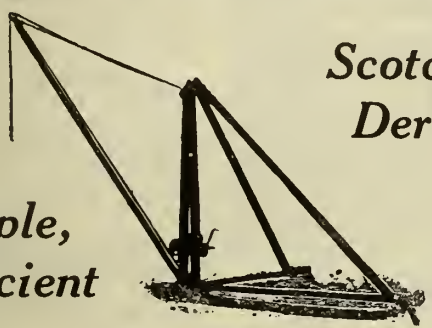

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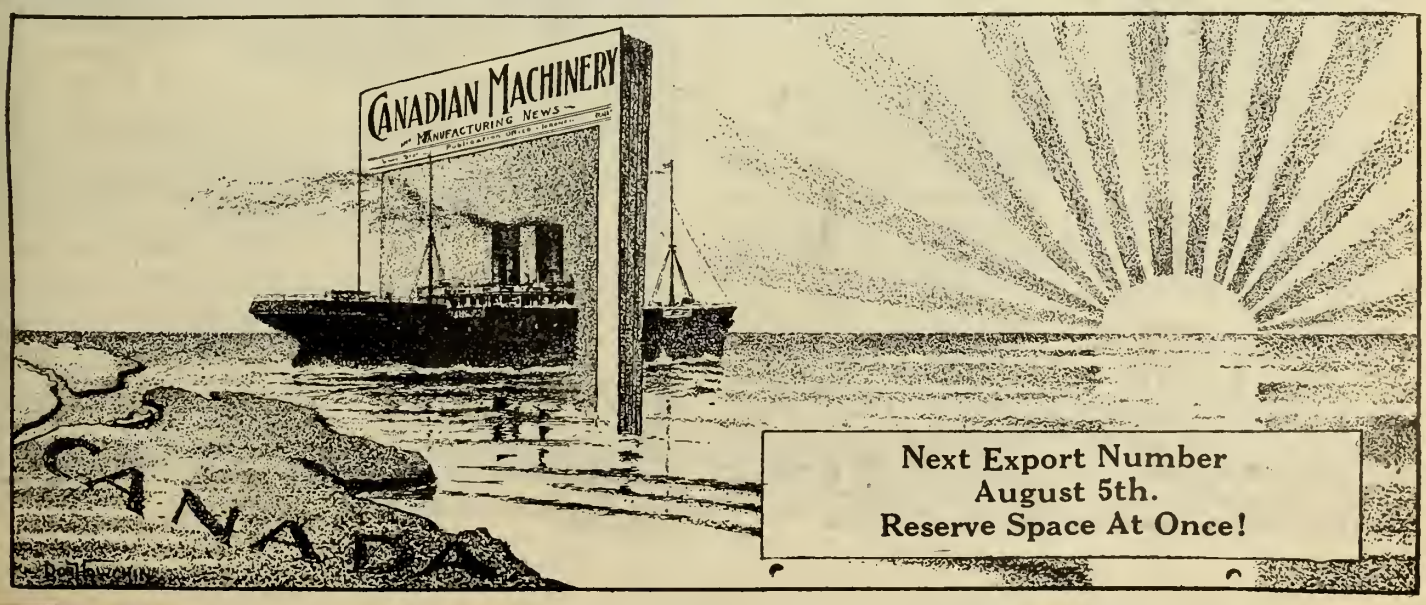

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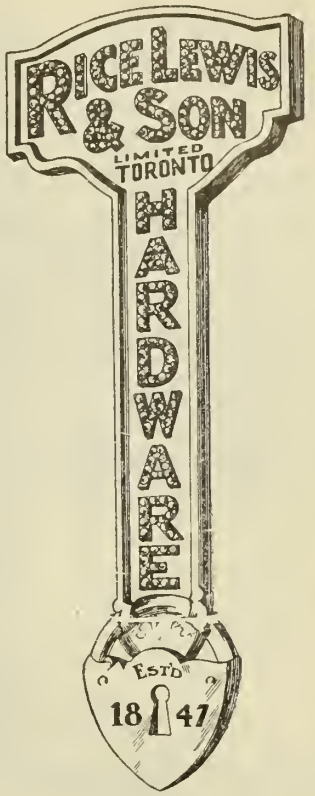

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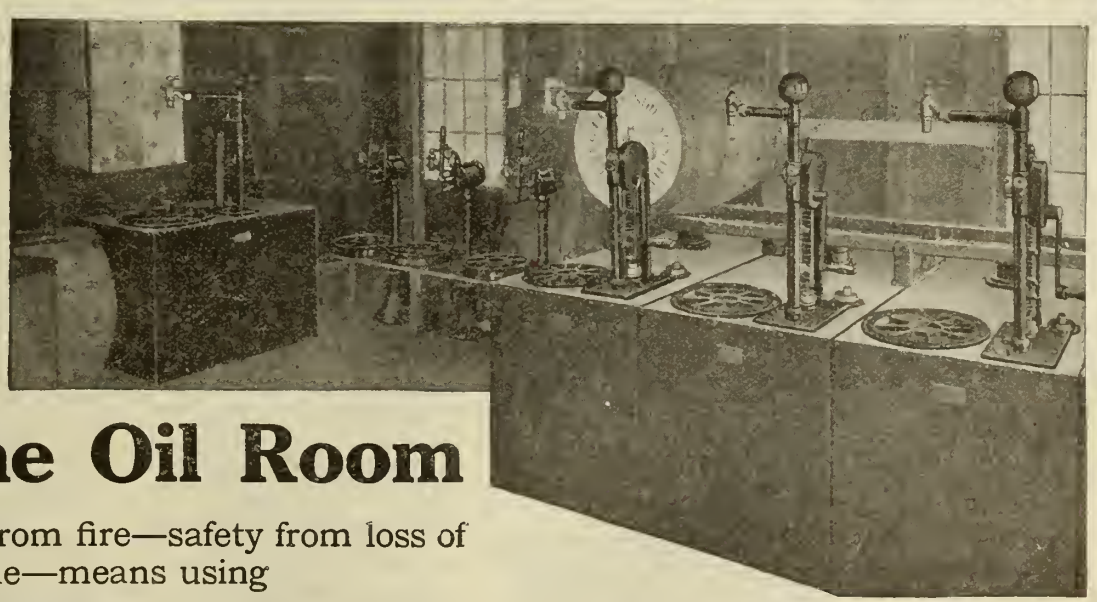

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Williams Mchy Co., A. R., Toronto, Ont.

MIXERS, SAND
Frost Mfg. Co., Chicago, Ill.

MORTISING MACHINES
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.
Gray Ball Bearing Co., Ltd., Toronto.

MOTORS, ELECTRIC
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
Lincoln Electric Co. of Canada, Ltd., Toronto, Ont.
MacGovern & Co., Montreal, Que.
Northern Elec. Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto.
Sturtevant Co., B. F., Galt, Ont.
U. S. Ordnance, Toronto, Ont.
Volta Mfg. Co., Welland, Ont.
Williams Mach'y Co., A. R., Toronto.

MOTOR SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

MOTORCYCLE FRAME AND FORK
The Dunbar Brothers Co., Bristol, Conn.

MOTORS, PNEUMATIC
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto.
Holden Co., Ltd., Montreal, Que.

MOULDS, RUBBER
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

MULTIPLE INDEX CENTRES
Garvin Machine Co., New York.
Graton & Knight Mfg. Co., Worcester, M.

MULTI-DRILLING, MULTI-BORING, MULTI-TAPPING MACHINERY,
Nat. Automatic Tool Co., Richmond, Ind.

MUNICIPALITIES
City of St. John, Quebec.

NAIL SETS
Morrow Screw & Nut Co., J., Ingersoll, Ont.

NAME PLATES, BRONZE, ETCHED AND STAMPED
Matthews & Co., Jas. H., Pittsburgh, Pa.
Turner Brass Works, Sycamore, Ill.

NICHROME CASTINGS
Can. Driver-Harris Co., Ltd., Walkerville.

NICKEL
Pilot Steel & Tool Co., Montreal, Que.

NICKEL STEEL
See Steel.

NICKEL SILVER—SHEETS, ROLLS, PLATES and RODS
Brown's Copper and Brass Rolling Mills, New Toronto.

NIPPLE THREADING MACHINES
Hall & Sons, Ltd., John H., Brantford
Landis Machine Co., Waynesboro, Pa.

NITROGEN
Carter Welding Co., Toronto, Ont.

NUTS, STEEL, CASTELLATED AND COLD PRESSED
Galt Machine Screw Co., Ltd., Galt, Ont.
Morrow Screw & Nut Co., J., Ingersoll, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

NUTS, SEMI-FINISH AND FINISHED
Galt Machine Screw Co., Galt, Ont.
National-Acme Co., Cleveland, Ohio.
Wilkinson & Kompass, Hamilton.

NUT LOCKS
Edw. W. Robinson Co., Ltd., Montreal.

NUT BURRING AND NUT MACHINES (HOT)
National Machy. Co., Tiffin, Ohio.

NUT FACING AND BOLT SHAVING MACHINES
Garvin Machine Co., New York.
National Machinery Co., Tiffin, Ohio.
Petrie, Ltd., H. W., Toronto.
Victor Tool Co., Waynesboro, Pa.

NUT TAPPERS
Bertram & Sons Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
Hall & Son, J. H., Brantford, Ont.
Jardine & Co., A. B., Hespeler.
Landis Machine Co., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
Petrie, Ltd., H. W., Toronto.

OILERS
All-Way Oiler Mfg. Co., Toronto, Ont.

OIL SEPARATORS
Can. Fairbanks-Morse Co., Montreal.

OIL STONES
Aikenhead Hardware Co., Toronto, Ont.
Carborundum Co., Niagara Falls, N.Y.
Norton Co., Worcester, Mass.
Rice Lewis & Son, Toronto, Ont.

OIL STONE GRINDERS
Oliver Machy. Co., Grand Rapids, Mich.

OIL STORAGE SYSTEMS
Bowser Co., Ltd., S. F., Toronto, Ont.
St. Lawrence Welding Co., Ltd., Montreal.

OPENING DIE HEADS
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

OPTICAL SUPPLIES
Consolidated Optical Co., Toronto, Ont.

ORE HANDLING EQUIPMENT
Brown Hoisting Machinery Co., Cleveland, Ohio.
Canadian Link-Belt Co., Ltd., Toronto, Ont.
Canadian Mead-Morrison Co., Limited, Montreal, Que.

OSCILLATING VALVE GRINDERS (PNEUMATIC)
Cleveland Pneumatic Tool Co. of Canada, Toronto.

OVENS FOR BAKING, BLUING, DRYING, ENAMELING, JAPANNING AND LACQUERING
Brantford Oven & Rack Co., Brantford.

OVEN TRUCKS, STEEL
Brantford Oven & Rack Co., Brantford.
MacKinnon Steel Co., Sherbrooke, Que.

OVENS FOR DRYING, TEMPER AND OXYGEN, ELECTROLYTIC CELLS UNDER TRUCKS
Welding & Supplies Co., Montreal, Que.
Brantford Oven & Rack Co., Brantford.

OXY-ACETYLENE WELDING AND CUTTING AND OUTFITS
Carter Welding Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
L'Air Liquide Society, Toronto, Ont.
Prest-o-Lite Co., Inc., Toronto, Ont.
Davis-Bournonville Co., Toronto, Ont.

OXYGEN
Carter Welding Co., Ltd., Toronto, Ont.
Dominion Oxygen Co., Ltd., Toronto, Ont.
Nat. Electro Products Ltd., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.

OXYGEN PLANTS (ELECTROLYTIC)
Davis-Bournonville Co., Toronto, Ont.

PACKINGS, ASBESTOS
Cleveland Wire Spring Co., Cleveland.

PACKING, ROD AND SHEET
Dunlop Tire & Rubber Goods Co., Ltd. Toronto.
Goodyear Tire & Rubber Co., Can., Ltd. Toronto
Gutta Percha & Rubber, Ltd., Toronto.
International Mach. Sp'ls, Ltd., Montreal
Petrie, Ltd., H. W., Toronto.
Quaker City Rubber Co., Philadelphia, Pa.

PANS, WET AND DRY
Frost Mfg. Co., Chicago, Ill.

PAPER MILL CONVEYORS AND DRIVES
Bertrams, Ltd., Edinburgh, Scotland.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Gutta Percha & Rubber, Ltd., Toronto.
MacKinnon Steel Co., Sherbrooke, Que.

PARTITIONS, WIRE
See Guards

PAPER MILL MACHINERY
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Machinery Co., Toronto.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

PATTERN SHOP EQUIPMENT
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Oliver Machy. Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto.

PATTERN MAKERS' LATHES
See Lathes.

PATENT SOLICITORS
Budden, Hanbury A., Montreal.
Fetherstonhaugh & Co., Ottawa.
Marion & Marion, Montreal.
Ridout & Maybee, Toronto.

PECK CARRIERS FOR POWER PLANTS
Can. Link-Belt Co., Toronto, Ont.

PENSTOCKS
William Hamilton Co., Peterboro, Ont.

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British Smelting & Refining Co., Ltd., Montreal, Que.

PHOTOSTATS
Commercial Camera Co., Providence, R.I.

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Hanna & Co., M. A., Cleveland, O.
Steel Co. of Canada, Ltd., Hamilton, Ont.

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Morrow Screw & Nut Co., J., Ingersoll, Ont.

PINS, BELT-LACING
Clipper Belt Lacer Co., Grand Rapids.

PIPE, BLACK & GALVANIZED
Crane, Ltd., Montreal, Que.

PIPE FITTINGS, MALLEABLE AND CAST IRON
International Malleable Iron Co., Guelph

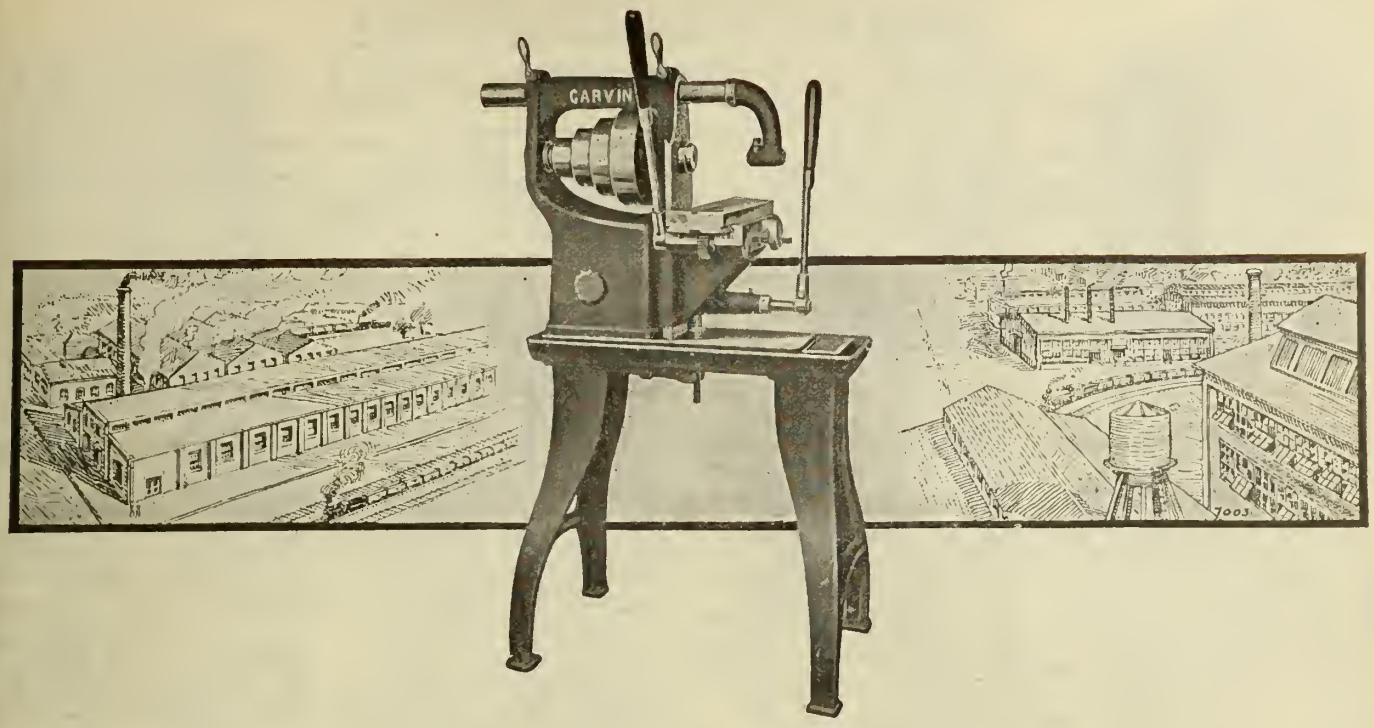
PIPE CUTTING AND THREADING MACHINES
Barber Mchy. Co., Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Curtis & Curtis Co., Bridgeport, Conn.
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield.
Hall & Sons, John H., Brantford.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
McDougall Co., R., Galt.
Petrie, Ltd., H. W., Toronto.
Wells Bros. Co. of Canada, Galt, Ont.
Williams Tool Co., Erie, Pa.
Williams Machy. Co., A. R., Toronto.

PIPE, JOINT COMPOUNDS
Crane, Ltd., Montreal, Que.

PIPE RIVETED STEEL
Toronto Iron Works, Ltd., Toronto.
William Hamilton Co., Peterboro, Ont.

PIERCING
Oliver Machy. Co., Grand Rapids, Mich.

PIPE CUTTERS, ROLLING
Curtis & Curtis Co., Bridgeport, Conn.
Greenfield Tap & Die Corp., Greenfield.
Hall & Sons, Ltd., John H., Brantford.
Wells Bros. Co. of Canada, Galt, Ont.



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GARVIN

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Ackworthie Ltd., J., Birmingham, Eng.
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PIPE CUTTERS AND REAMERS
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PIPE STOCKS AND THREADERS
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PIPE TAPS AND VISES
Ackworthie Ltd., J., Birmingham, Eng.
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PIPE WRENCHES
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

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National Acme Co., Windsor, Vt.

PLANER BOLTS
Atkins & Co., E. C., Hamilton, Ont.
Morrow Screw & Nut Co., J., Ingersoll, Ont

PLANER JACKS
Armstrong Bros. Tool Co., Chicago.

PLANERS, STANDARD AND ROTARY
Betts Machine Co., Rochester, N.Y.
Barber Mchy. Co., Ltd., Toronto, Ont.
Bertram & Sons Co., John, Dundas.
Oliver Machy. Co., Grand Rapids, Mich.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal
Gardner & Son, Robt., Montreal.
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Morton Mfg. Co., Muskegon Heights, Mich
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
Standard Equipment & Tool Wks., Montreal.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.

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Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Niles-Bement-Pond Co., New York.
Ohio Mach. Tool Co., Kenton, Ohio.
Perrin, Ltd., William, Toronto.
Williams Mchy Co. Ltd., A. R., Montreal

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Lyndhurst Co., Boston.
Petrie, Ltd., H. W., Toronto.

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Quickwork Co., St. Marys, Ohio.

PLANING MILL EXHAUSTERS
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MacGovern & Co., Montreal, Que.
Niles-Bement-Pond Co., New York.
Sturtevant Co., B. F., Galt, Ont.

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Pedlovers, Ltd., Toronto, Ont.

PLATING, PLANTS & SUPPLIES
Can. Hanson Van Winkle Co., Ltd., Toronto, Ont.

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Can. Billings & Spencer, Ltd., Welland.
Bice Lewis & Son, Toronto, Ont.

PNEUMATIC CYLINDERS
Holden Co., Ltd., Montreal, Que.

PNEUMATIC EQUIPMENT
Strelinger Co., C. A., Windsor, Ont.

PNEUMATIC TOOLS
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland P'matic Tool Co., Can., Toronto.
Curtis Pneumatic Machy. Co., St. Louis.
Garlock-Walker Machy. Co., Toronto.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool Co., Chicago.
Int. Mach. & Supply Co., Ltd., Montreal.

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MacKinnon Steel Co., Sherbrooke, Que.

POLISHING MACHINES
Ackworthie Ltd., J., Birmingham, Eng.
Brown & Sharpe Mfg. Co., Providence, R.I.
Ford-Smith Machine Co., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto.

POLISHING PLATES
Greenfield Tap & Die Corp., Greenfield.
Petrie, Ltd., H. W., Toronto.
Wells Bros. of Canada, Galt, Ont.

POLISHING PAPER
H. H. Barton & Son Co., Philadelphia.

POTS AND KETTLES, CAST STEEL
Elec. Steel & Metals, Welland, Ont.

POWER HOUSE CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

PORTABLE MACHINERY
Hoskins & Co., R. C., Chicago, Ill.

POWER TRANSMISSION MCHY.
Canadian Link-Belt Co., Ltd., Toronto, Hamilton Co., Ltd., Wm., Peterborough, Ont.
Petrie, Ltd., H. W., Toronto.

PRESSED STEEL PARTS
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Gray Ball Bearing Co., Ltd., Toronto.

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Atlas Press Co., Kalamazoo, Mich.
Metalwood Mfg. Co., Detroit, Mich.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
Lourie Manufacturing Co., Springfield, Ill.

PRESSES, BROACHING, FORGING AND FLANGING
Atlas Press Co., Kalamazoo, Mich.
Bliss Co., E. W., Brooklyn, N.Y.
Dom. Steel Products Co., Ltd., Brantford
Eastern Production Co., Detroit, Mich.
Metalwood Mfg. Co., Detroit, Mich
Petrie, Ltd., H. W., Toronto.
Toledo Machine & Tool Co., Toledo.
Stoll Co., D. H., Buffalo, N.Y.
Williams Mchy Co., Ltd., A. R., Montreal

PRESSES, CAM, TOGGLE, EYELET
Baird Machine Co., Bridgeport, Conn.
Bliss Co., E. W., Brooklyn, N.Y.
Toledo Machine & Tool Co., Toledo.
Stoll Co., D. H., Buffalo, N.Y.

PRESSES, FILTER
Perrin, Ltd., William R., Toronto.
Smalley-General Co., Inc., Bay City, Mich.

PRESSES, PNEUMATIC
Dom. Steel Products Co., Ltd., Brantford
Eastern Production Co., Detroit, Mich.
Metalwood Mfg. Co., Detroit, Mich.
Toledo Machine & Tool Co., Toledo.

PRESSES, DROP AND FORGING
Barber Mchy. Co., Ltd., Toronto, Ont.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs Co, Ltd., Hamilton.
Can. Fairbanks-Morse Co., Montreal.
Niles-Bement-Pond Co., New York.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co, Toledo.

PRESSES, HYDRAULIC
Barber Mchy. Co., Ltd., Toronto, Ont.
Bertram & Sons Co., John, Dundas.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Dom. Steel Products Co., Ltd., Brantford.
Eastern Production Co., Detroit, Mich.
Lourie Manufacturing Co., Springfield, Ill.
Metalwood Mfg. Co., Detroit, Mich.
Niles-Bement-Pond Co., New York.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.
Toledo Machine & Tool Co., Toledo.
Stoll Co., Inc., D. H., Buffalo, N.Y.
Williams Machy. Co., A. R., Toronto.

PRESSES, HYDRAULIC, HORIZONTAL
Eastern Production Co., Detroit, Mich.

PRESSES, HYDRAULIC, VERTICAL
Eastern Production Co., Detroit, Mich.

PRESSES, HYDRO-PNEUMATIC
Eastern Production Co., Detroit, Mich.

PRESSES, BALING
Perrin, Ltd., William R., Toronto.

PRESSES, POWER
Baird Machine Co., Bridgeport, Conn.
Barber Mchy. Co., Ltd., Toronto, Ont.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machinery Co., Toronto.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo.
Williams Machy. Co., A. R., Toronto.

PRESSES, SPRING FOOT
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Ont.
Toledo Machine & Tool Co., Toledo.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., Ltd., A. R., Montreal

PRESSES, SCREW
Barnes & Co., W. F. & Jno., Rockford, Ill
Bliss Co., E. W., Brooklyn, N.Y.
Manhattan Machine & Tool Co., Grand Rapids, Mich.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.

PRESSES, TIRE
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,

PRESSES, TRIMMING
Bliss Co., E. W., Brooklyn, N.Y.
Canada Machinery Corp., Galt, Ont.
Petrie, Ltd., H. W., Toronto.
Stoll Co., D. H., Buffalo, N.Y.

PROJECTORS, FLOOD LIGHTING
Holden Co., Ltd., Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que

PROPELLERS
Kennedy & Sons, Wm., Owen Sound.

PROTECTIVE COATINGS
H. H. Robertson, Ltd., Sarnia, Ont.

PSYCROMETERS, SLING
Taylor Instrument Co., Rochester, N.Y.

PULLEYS
Algoma Steel Corp., Sault Ste. Marie, Ont
American Pulley Co., Philadelphia.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., Fortierville, Que.
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Diamond State Fibre Co., Bridgeport, Pa.
Ford-Smith Machine Co., Hamilton, Ont.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Kennedy & Sons, Ltd., W., Owen Sound.
Positive Clutch & Pulley Works Ltd., Toronto.
Petrie, Ltd., H. W., Toronto.

PULLEYS, STEEL SASH, STEEL BELT
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PULLEYS, FRICTION, CLUTCH
American Pulley Co., Philadelphia, Pa.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., L., Fortierville, Q.
Can. Link-Belt Co., Toronto, Ont.
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Hamilton Co., Ltd., Wm., Peterborough, Ont.
Jones & Glassco, Montreal.
Positive Clutch & Pulley Works, Toronto.
Petrie, Ltd., H. W., Toronto.

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Hamilton Co., Ltd., Wm., Peterborough, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

PUMPS, AIR LIFT
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Holden Co., Ltd., Montreal, Que.

PUMPS, BOILER FEED
Can. Ingersoll-Rand Co., Ltd. Sherbrooke,

PUMPS, CENTRIFUGAL
Bowser Co., Ltd., S. F., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Ingersoll-Rand Co., Montreal, Que.
Darling Bros., Ltd., Montreal, Que.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

PUMPS, FUEL OIL
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Brown & Sharpe Mfg. Co., Providence, R.I.
Darling Bros., Ltd., Montreal, Que.
Trahern Pump Co., Rockford, Ill.

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Darling Bros., Ltd., Montreal, Que.
Globe Engineering Co., Hamilton, Ont.

PUMPS, HIGH PRESSURE
Perrin, Ltd., William R., Toronto.

PUMPS, HYDRAULIC
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Clarke & Co., Furniss, Montreal, Que.
Garlock-Walker Machinery Co., Toronto.
Darling Bros., Ltd., Montreal, Que.
Elec. Steel & Metals, Welland, Ont.
Metalwood Mfg. Co., Detroit, Mich.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

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PUMPS, RETURN AIR
Can. Ingersoll-Rand Co. Ltd., Sherbrooke,

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Elec. Steel & Metals, Welland, Ont.

PUMPS, RUBBER CEMENT
Bowser Co., Ltd., S. F., Toronto, Ont.

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Darling Bros., Ltd., Montreal, Que.
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Brown, Boggs Co., Ltd., Hamilton, Can.
Can. Blower & Forge Co., Kitchener, Ont.
Crescent Mach. Co., Ltd., Montreal, P.Q.
Can. Fairbanks-Morse Co., Montreal.
Elliott & Whitehall Machine and Tool Co., Galt, Ont.
Gardner & Son, Robert, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Marshall, Son & Blunney, Toronto.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, O
Williams Mchy Co., A. R., Toronto, Ont.

PUNCHES, POWER
John Bertram & Sons Co., Dundas, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd, Hamilton, Ont.
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Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machinery Co., Toronto.
A. B. Jardine & Co., Hespeler, Ont.
Long & Allstatter, Hamilton, Ohio.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
D. H. Stoll Co., Buffalo, N.Y.
Williams Mchy Co., A. R., Toronto, Ont.

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Bertrams & Sons, John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
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Brown, Boggs Co, Ltd., Hamilton, Ont.
Garlock-Walker Mach'y. Co., Toronto.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

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Niles-Bement-Pond Co., New York.

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Shore Instrument & Mfg. Co., New York
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Niles-Bement-Pond Co., New York.
Petrie Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

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Cleveland Twist Drill Co., Cleveland.
Elliott & Whitehall Machine and Tool Co., Galt, Ont.
Greenfield Tap & Die Corp., Greenfield.
Ingersoll Machy. Co., Ingersoll, Ont.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
McCrosky Tool Corp., Meadville, Pa., U. S. A.
Pieces, Ltd., Winnipeg, Man.
Pratt & Whitney Co., Dundas, Ont.
The Kelly Reamer Co., Cleveland, O.
J. A. M. Taylor, 315 Stair Bldg., Toronto
Wells Bros. of Can., Galt, Ont

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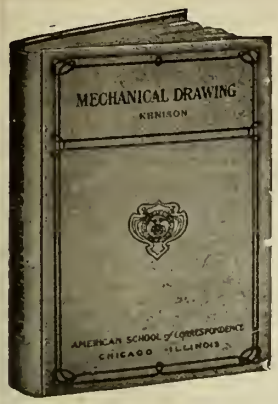

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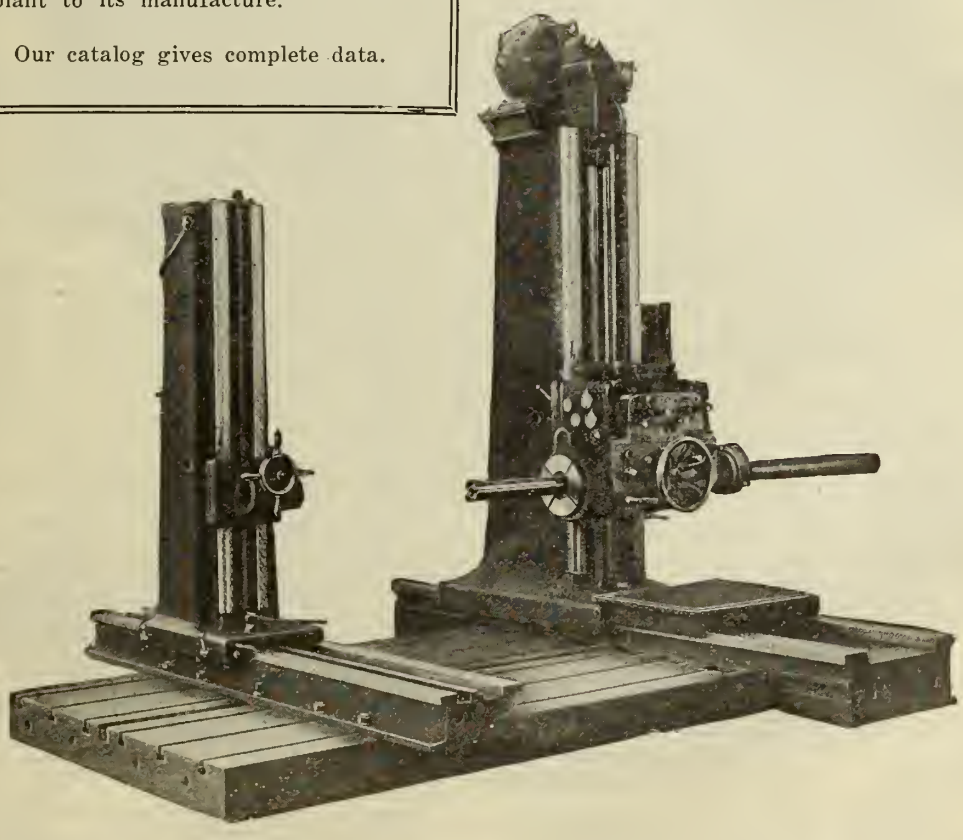

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SAW BENCHES
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Marshall, Son & Bunney, Toronto
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Electric Steel & Metals Co., Welland.
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Swedish Steel & Importing Co. Ltd., Montreal.
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Marshall, Son & Bunney, Toronto, Ont
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Ralph B. Norton, Montreal, Que.
Rice Lewis & Son, Toronto, Ont.
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Vanadium-Alloys Steel Co., Pittsburgh.

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Lincoln Electric Co. of Canada, Ltd Toronto, Ont.

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Wells Bros. of Can., Galt, Ont.

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Rice Lewis & Son, Toronto, Ont.
Wells Bros., Co., of Canada, Galt, Ont.

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MacKinnon Steel Co., Sherbrooke, Que.
Marshall, Son & Bunney, Toronto.

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Can. John Wood Mfg. Co., Ltd., Toronto

TANKS, PNEUMATIC AND CLOSET
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Hamilton Co., Ltd., Wm., Peterborough, Ont.
MacGovern & Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Toronto Iron Works, Ltd, Toronto.

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Can. Hanson Van Winkle Co., Ltd., Lincoln Electric Co. of Canada, Ltd., Toronto, Ont.

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MacKinnon Steel Co., Sherbrooke, Que.
William Hamilton Co., Peterboro, Ont.

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Ingersoll Mach. Co., Ingersoll, Ont.
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Murchey Machine & Tool Co., Detroit.
Pilot Steel & Tool Co., Montreal, Que.
Victor Tool Co., Waynesboro, Pa.

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Wells Bros. of Can., Galt, Ont.

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Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

TAPS, MACHINE SCREW
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Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

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Greenfield Tap & Die Corp., Greenfield.
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Geometric Tool Co., New Haven.
Greenfield Tap & Die Corp., Greenfield.
Ingersoll Mach. Co., Ingersoll, Ont.
Jardine & Co., A. B., Hespeler, Ont.
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Morse Twist Drill & Mchy. Co., New Bedford, Mass.
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Pratt & Whitney Co., Dundas, Ont.
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Rice Lewis & Son, Toronto, Ont.
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National Machy. Co., Tiffin, Ohio.
Pratt & Whitney Co., Dundas, Ont.
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Pratt & Whitney Co., Dundas, Ont.
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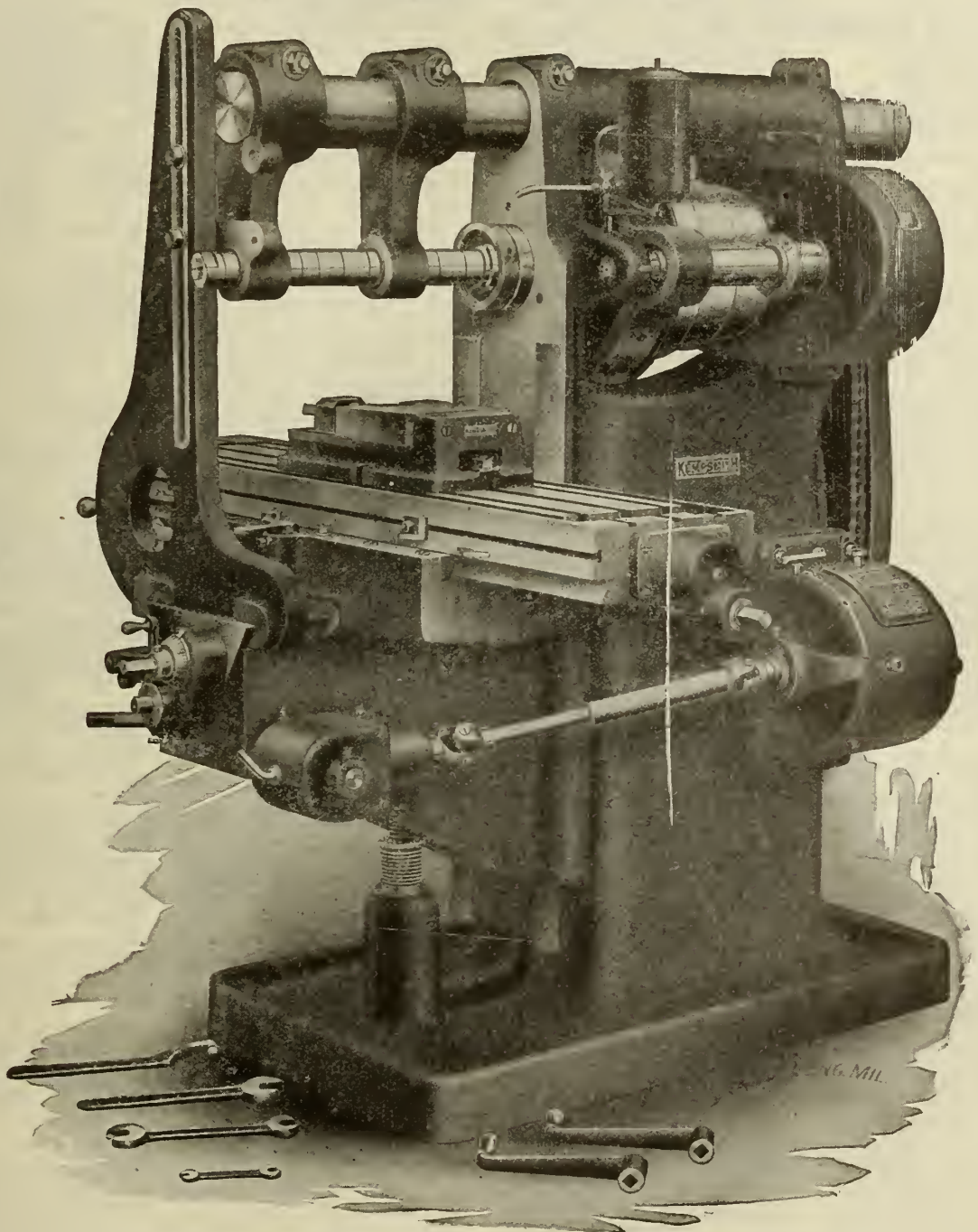

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Good Engineering Co., Toronto, Ont.

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Holyoke Truck Co., Holyoke, Mass.

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Lyman Tube & Supply Co., Montreal, Que.

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Warner & Swasey Co., The, Cleveland, O

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Holden Co., Ltd., Montreal, Que.
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Garlock-Walker Machinery Co., Toronto.
Jardine & Co., A. B., Hespeler, Ont.
National Machy. Co., Tiffin, O.
Canada Machinery Corp., Galt, Ont.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Williams Machy. Co., A. R., Toronto.

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Petrie, Ltd., H. W., Toronto.
Sturtevant Co., B. F., Galt, Ont.
Williams Machy. Co., A. R., Toronto.

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Becker Milling Machine Co., Boston, Mass.
Foss Machy. & Sply. Co., G. F., Montreal.
Petrie, Ltd., H. W., Toronto.
Chicago Flexible Shaft Co., Chicago, Ill.
Superior Machinery Co., London, Ont.

VISES, DRILL
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CANADIAN MACHINERY AND MANUFACTURING NEWS
143 UNIVERSITY AVE., TORONTO, CANADA

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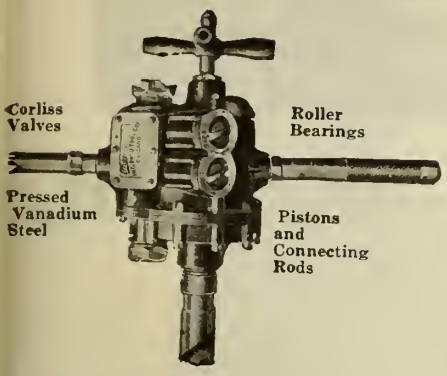
UNITED STATES—New York, K. Couillard, 1606 St. James Bldg., 1133 Broadway, Phone Watkins 5869. Boston, C. L. Morton, Room 734, Old South Bldg., Phone Main 1024; Chicago, A. H. Byrne, 405-6 Transportation Bldg., 608 S. Dearborn St., Phone Wabash 9430.

Thor Air Drills



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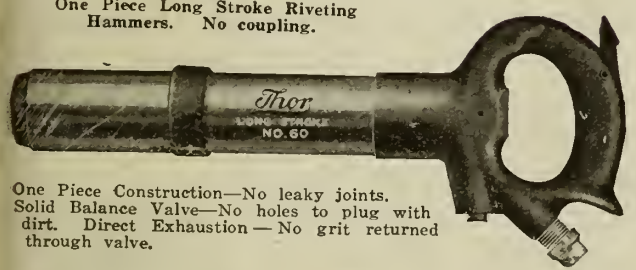

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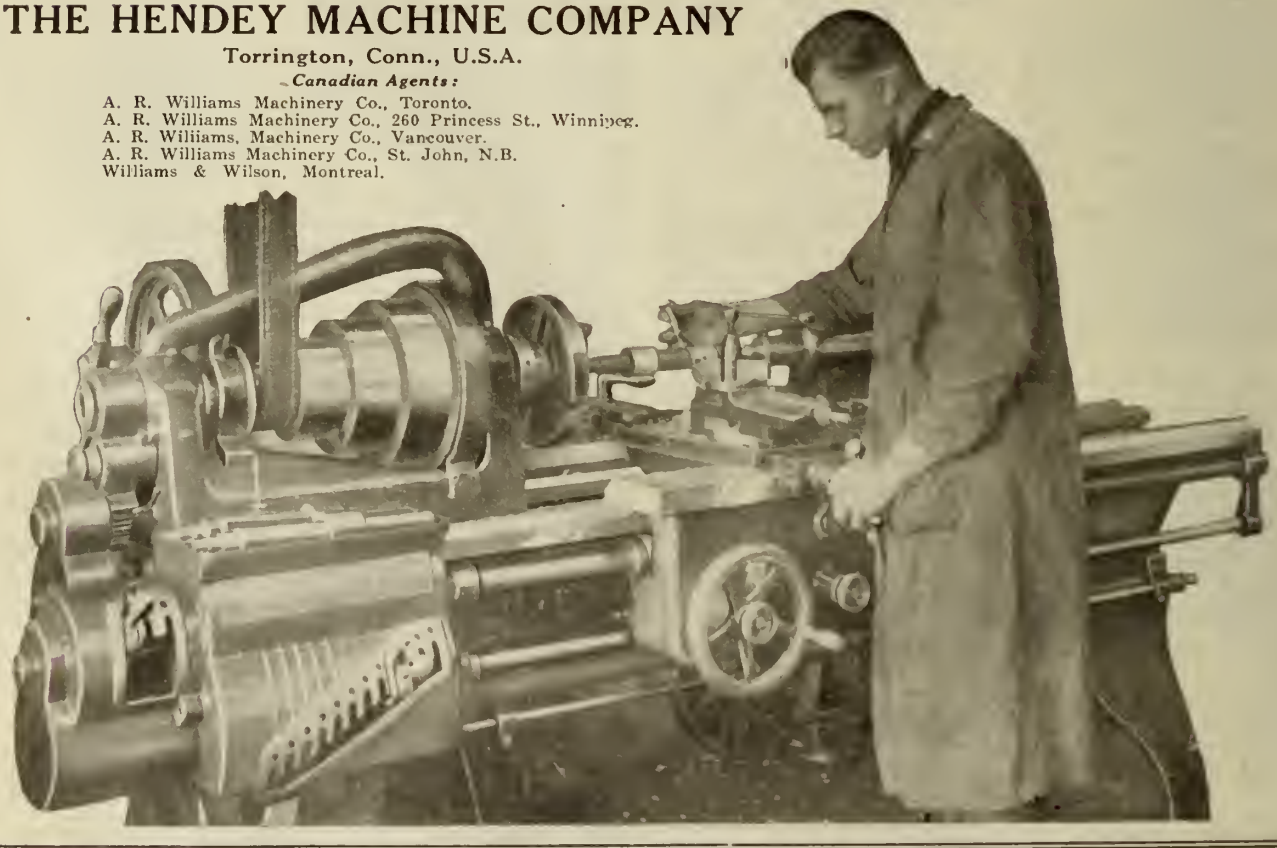

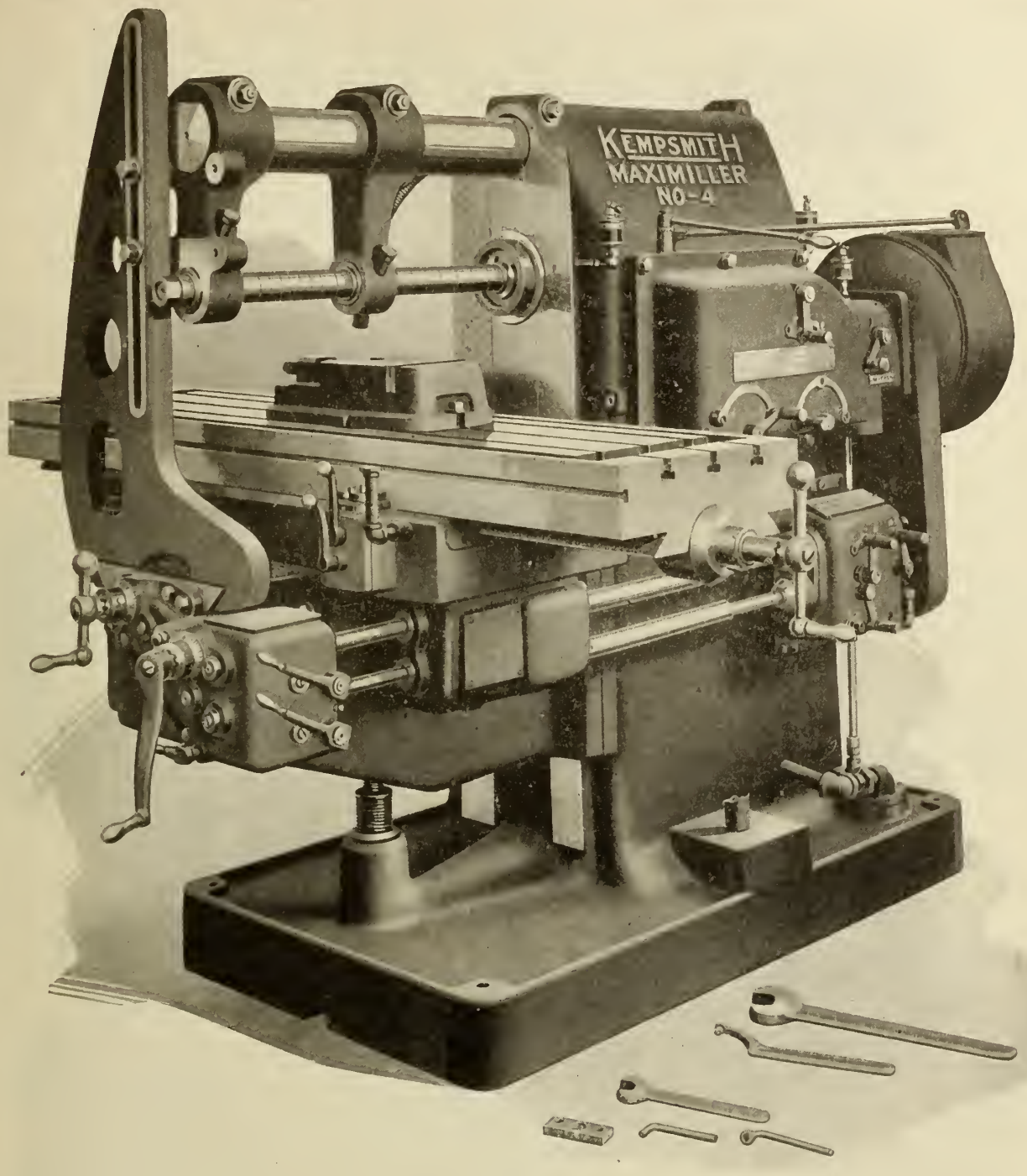

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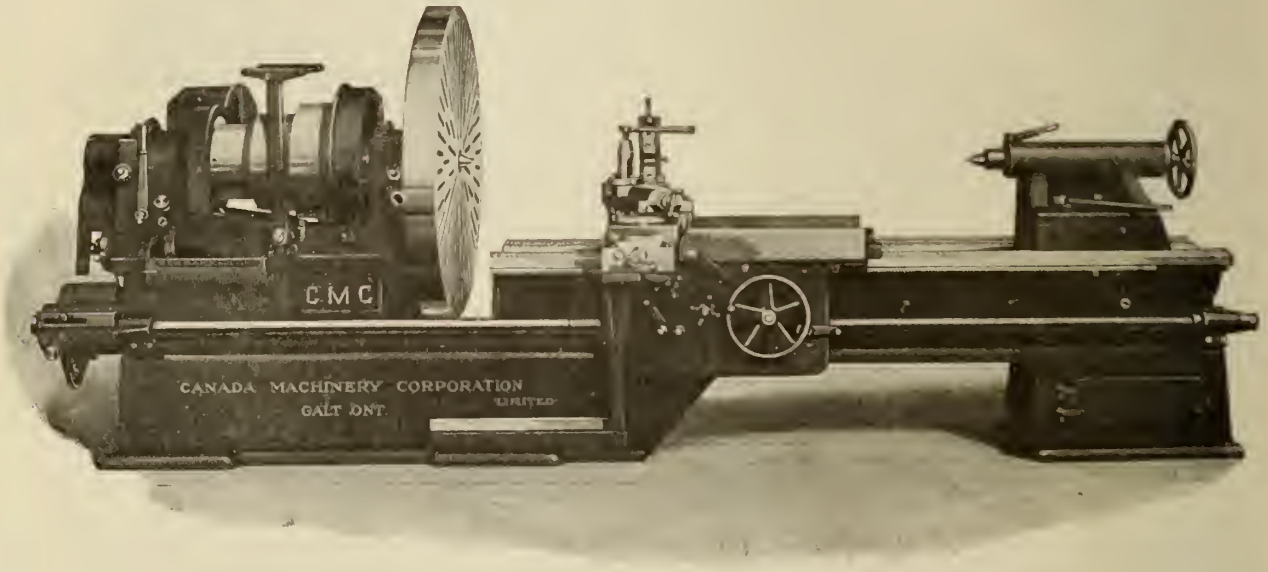

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CANADIAN MACHINERY
AND MANUFACTURING NEWS

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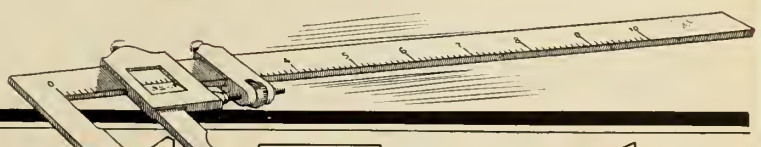

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The BERTRAM Page

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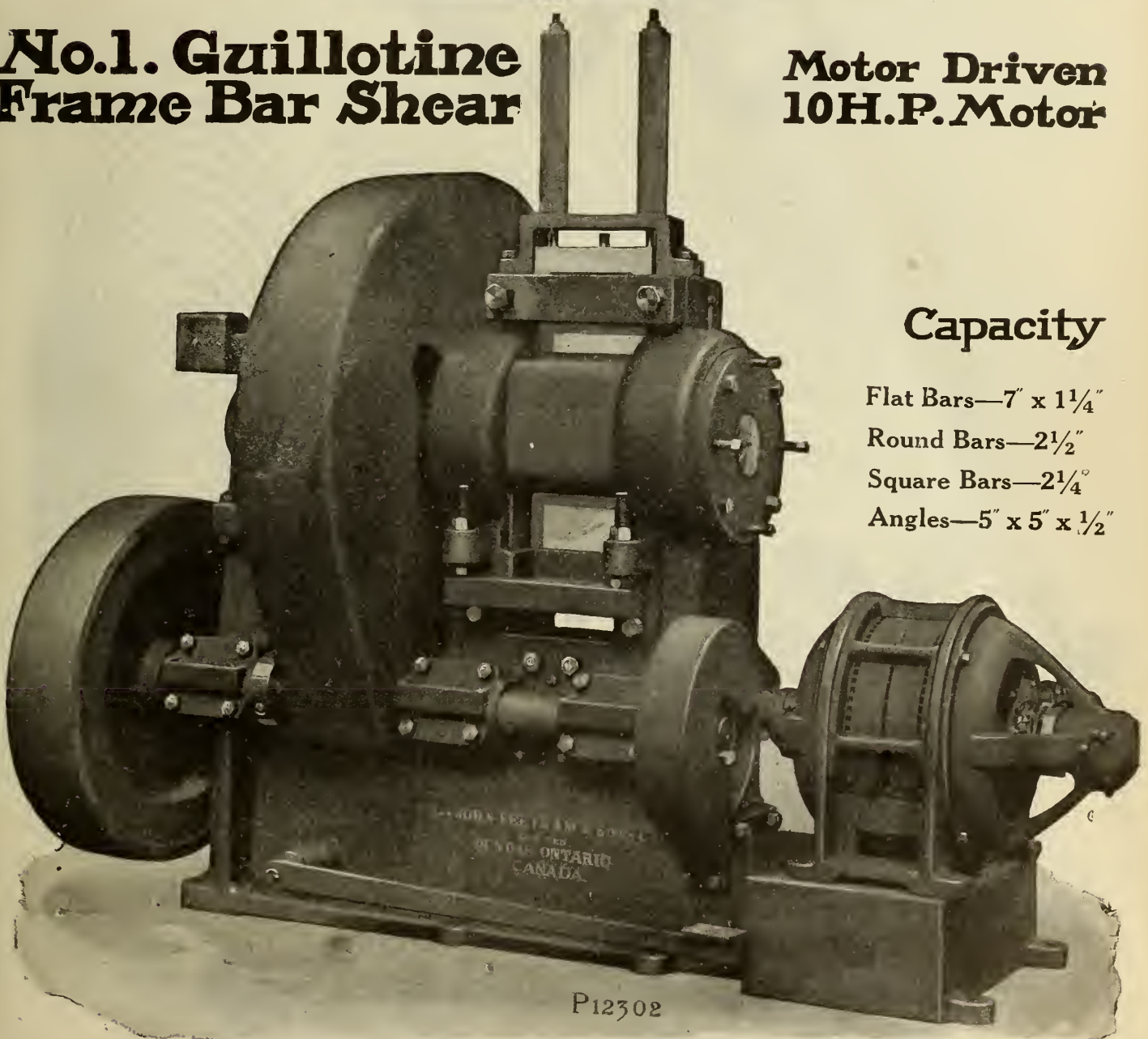
Motor Driven 10 H.P. Motor



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Only the Name is Changed

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(The New Name of EXTRA POWER BELT)

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(The New Name of EXTRA POWER BELT)

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STEEL RAILS
Open Hearth Quality
(All Sections from 12 lbs to 100 lbs per yard)

SPLICE BARS

STEEL TIE PLATES

PIG IRON
BASIC, FOUNDRY-
MALLEABLE

SULPHATE OF AMMONIA

MARK OF ALGOMA O.H. QUALITY

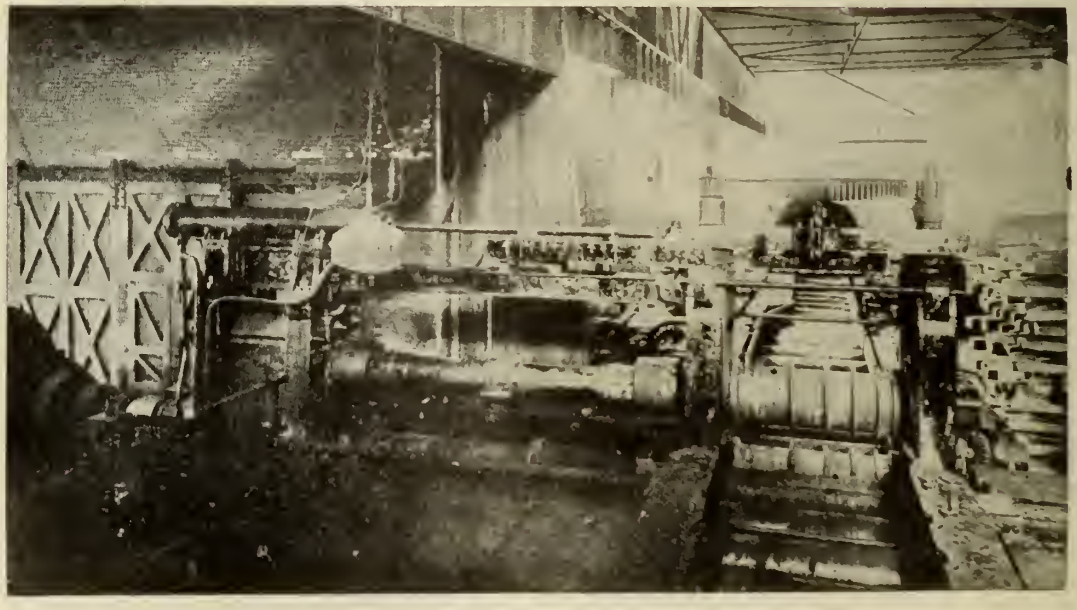
MARK OF ALGOMA O.H. QUALITY

OPEN HEARTH
ALLOY STEELS
Chrome-Vanadium
Chrome-Nickel
Nickel

All of these Steels we supply in HOT ROLLED BARS. We also furnish in BLOOM, BILLET and SLAB form.

SULPHURIC ACID *NITRE CAKE*

BLOOMS,
BILLETS,
SLABS,
STRUCTURAL STEEL
MERCHANT BARS
CONCRETE REINFORCING BARS
IRON, BRASS AND BRONZE CASTINGS



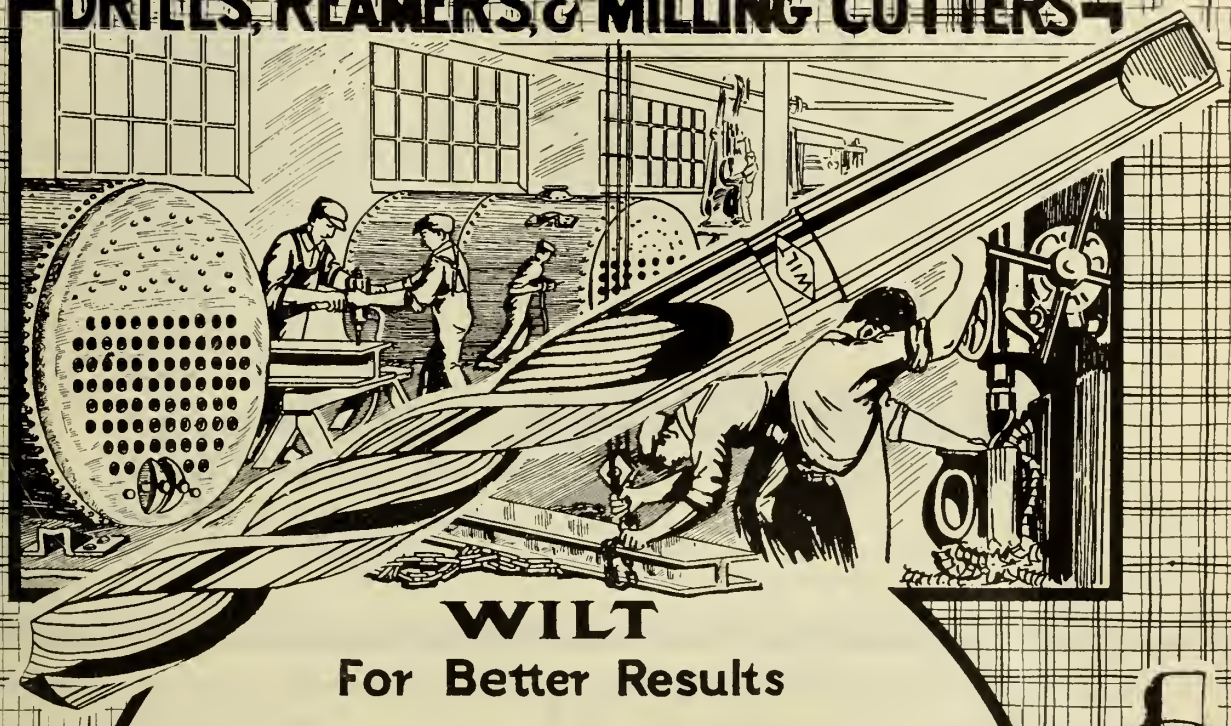
ALGOMA STEEL CORPORATION, LIMITED

SAULT STE. MARIE, ONT.

Sales Offices : Montreal : 606 McGill Building Toronto : Bank of Hamilton Building

WILT

HIGH SPEED & CARBON TWIST
DRILLS, REAMERS, & MILLING CUTTERS



WILT
For Better Results

Made in Canada

Manufacturers who have switched from the use of ordinary tools to WILT TOOLS realize the benefit of the change. They are getting better results from their operations.

Wilt High Speed and Carbon Twist Drills, Reamers and Milling Cutters give longer service, do more work without regrinding and cost no more than ordinary tools.

For a steady volume of work that is satisfactory from the standpoint of both **quantity** and **quality** there are no better tools than the WILT line.

WILT TWIST DRILL COMPANY
OF CANADA LIMITED
WALKERVILLE · · ONTARIO

TRADE WILT MARK

"Where there's a WILT — There's the Way"

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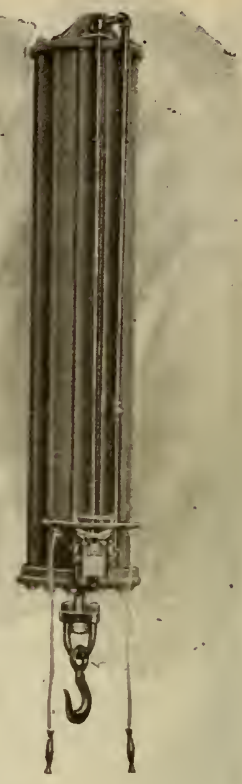
Increasing Production Preventing Accidents Saving Man Power and Reducing Costs

are a few of the things that "CIRCO" Direct Lift Air Hoists are doing in scores of Canadian Industrial Plants.

With a "CIRCO" Hoist mounted on an overhead trolley one man can do the work of three men by hand—and continue to do it, hour in and hour out, quicker, safer, and far cheaper.

Send for bulletin K-602 describing "CIRCO" Air Hoists in detail and let us show you, how you too, can obtain these results.



Canadian Ingersoll-Rand Company Limited

Sydney Sherbrooke Montreal Toronto Cobalt
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Do it with Air

Built For *Service*

This BLOUNT Motor-driven Lathe is well adapted to all speed lathe uses. It is of late design, and has a number of features in which you will be interested. Provided with constant-speed motor. Lathe spindle made of hollow, high-carbon steel, ground to size and bored for Morse taper. Runs in self-oiling bronze bearings.

"We will accept Canadian funds at par"

J. G. Blount Co., Everett, Mass., U.S.A.

Manufacturers:

The Sheffield Twist Drill & Steel Co.
LIMITED

Works: Summerfield St., Sheffield

Telephones:	*LONDON OFFICE:*	Telegraphic Address:
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Sheffield - 712. 710.	5, Laurence Pountney	"Proells, London"
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HIGH SPEED TWIST DRILLS

DORMER BRAND

High-class Drills with IRRESISTIBLE PIERCING FUNCTIONS that stand the WEAR and TEAR—in other words, the DRILLS that are EFFICIENT and ECONOMICAL—are the DRILLS with the "DORMER" Brand.

We are manufacturing SPECIALISTS—Carry large STOCKS—Give PROMPT deliveries, and rely upon our products for REPEATS.

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"WACO"

THE HIGH-SPEED STEEL

MARSHALL, SON & BUNNEY
39 Richmond Street East TORONTO, ONT.

SOLE CANADIAN AGENTS FOR
WM. ATKINS & CO., LIMITED
SHEFFIELD - - ENGLAND

ALL SIZES
IN STOCK

LOCOMOTIVE AND CAR WHEEL TYRES

HIGH-SPEED AND CARBON TOOL STEEL

MISCELLANEOUS SHOP TOOLS

MADE CANADA

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OF CANADA, LIMITED

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Works:
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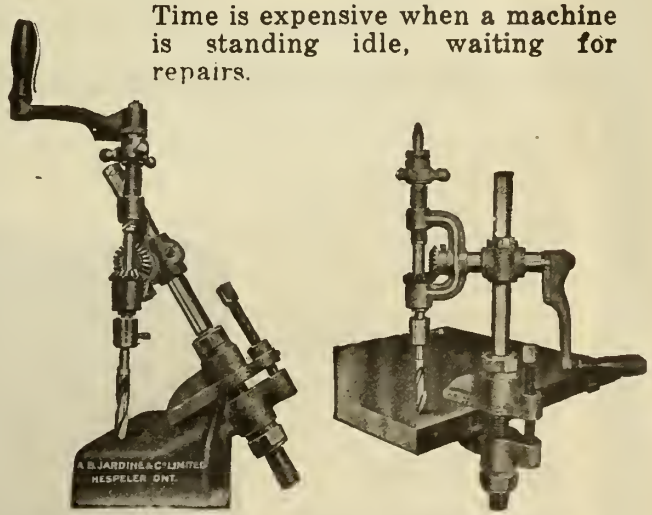
BRANCHES:
126 Wellington St. W. TORONTO
27 King William St. HAMILTON
McArthur Building WINNIPEG

Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.



On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, $26.50 net.

Sold by all Machinery and Supply Houses

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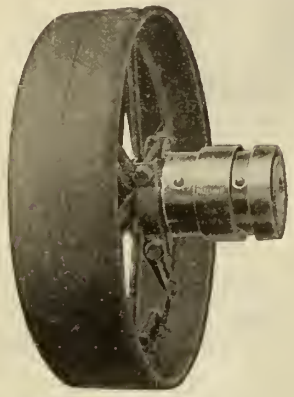
THE JOHNSON FRICTION CLUTCH

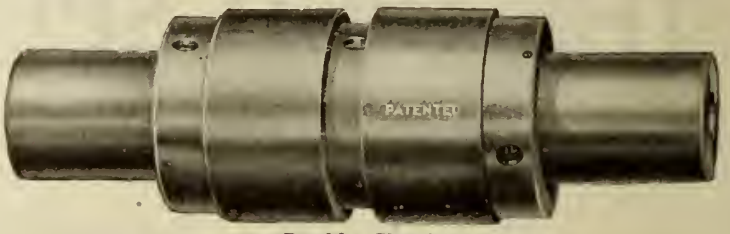


Single Clutch with Steel Split Pulley mounted on the Hub

Are You Getting What You Want In Friction Clutch Service?

Try Johnson Clutches. You will find they make a vast difference in the operation of your machinery wherever you put them. It pays to buy the best.

Every clutch problem has its own correct solution. The advantage of the Johnson Clutch is the readiness with which it can be modified to solve any of them. If you have failed to find what you want elsewhere, let us offer some suggestion. Write for our Booklet, "Clutches as Applied to Machine Building," and our Yellow Catalog.



Double Clutch

CANADIAN AGENTS:

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CANADIAN FAIRBANKS-MORSE CO., LIMITED, Montreal, Toronto, Winnipeg

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.

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Every Commercial Purpose

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.

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Head Offices:

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MONTREAL

Steel Ingots *by the* HARMET Liquid Process

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FOR STEAM AND ELECTRIC RAILWAYS

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Complete layouts of built-up, rail-bound hard-centre or solid manganese steel construction.

TRACKWORK ACCESSORIES

CANADIAN STEEL FOUNDRIES LIMITED

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The Safe Chuck

Defective chucks cause broken drills and loss of time and money. The wise manufacturer uses Jacobs Chucks exclusively because he is sure of their reliability.

You can buy Jacobs Chucks from dealers everywhere.

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THE JACOBS MFG. CO. HARTFORD, CONNECTICUT, U.S.A.

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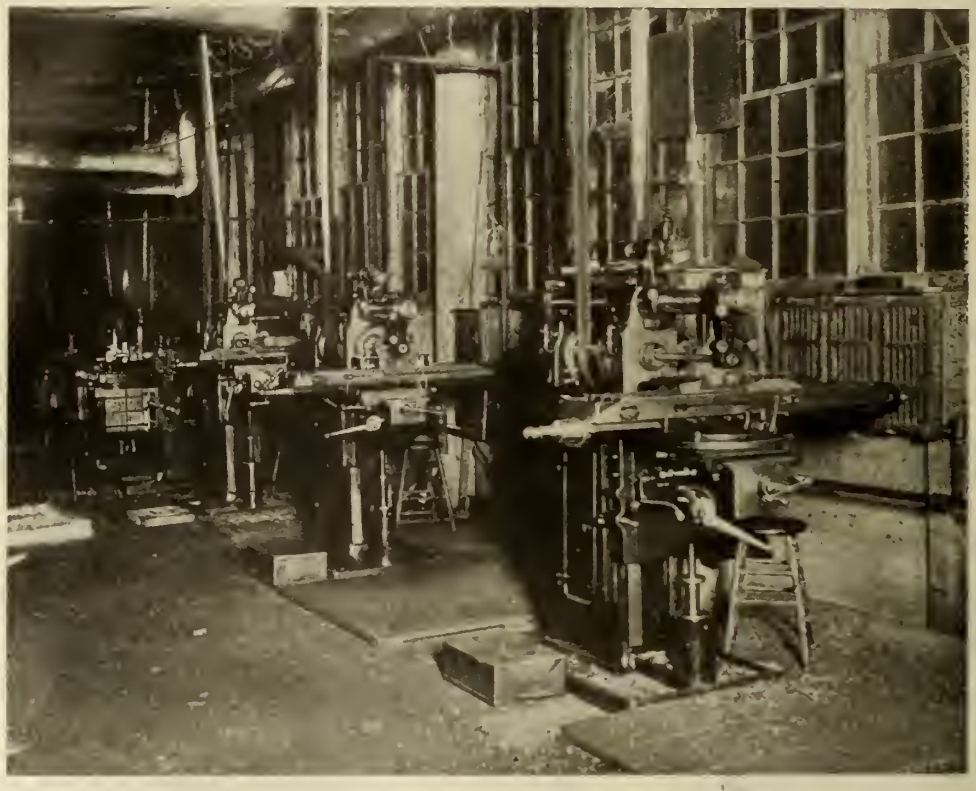
"—are giving perfect satisfaction"

Mr. W. F. Vollans
Gen. Mgr., Fisher Motor Co.
Orillia, Ont.



After the most careful investigation this battery of Ford Smith No. 2 Millers was chosen for use in the die casting department of the Fisher Motor Co., Ltd.

Mr. Vollans, General Manager of the Company, tells the whole story in his letter:

"The Dies which are used for the manufacture of Die Castings must be machined to the greatest degree of accuracy, and the Ford-Smith machines **(illustrated)** were purchased after the most careful investigation. They have been in operation for several months, **and are giving perfect satisfaction.**"

Let us send you a copy of the latest catalog. It explains all Ford-Smith Machines in detail.

The Ford-Smith Machine Company, Ltd.

Hamilton - - Canada

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Tools of Unexcelled Quality

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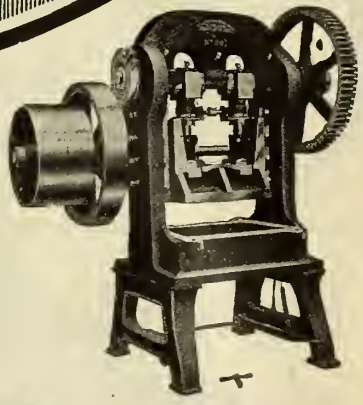
Sheet Metal Workers Machinery

No. 404—Shear

THE Mechanical excellence of Brown-Boggs Tools is proven before they leave the factory. The rigid tests to which each is subjected, guarantees the efficiency of their performance.

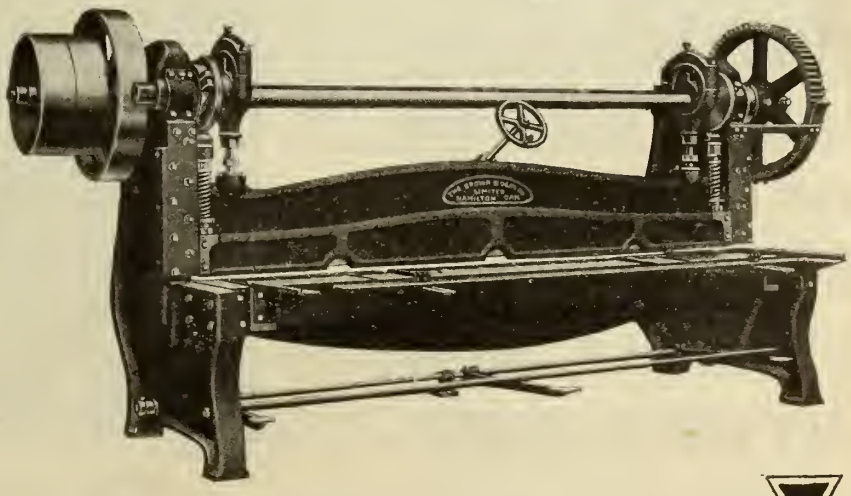
Every tool we manufacture is made of the finest materials throughout, by thoroughly competent workmen.

Specify "Brown-Boggs" for tools of unexcelled quality.



No. 20½—Power Press

No. 126—Deep Throat Power Punch



The Brown-Boggs Co., Limited

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Announcing

the issuance of a new catalog of prime interest to all users of milling and gear cutters and small tools. Herein you will find listed styles and sizes of end mills (special and plain) T-slot cutters. Key cutters, thread mills, gear slots—in fact your needs in the small tool line of this class are sure to be covered. Get your copy and note its completeness.

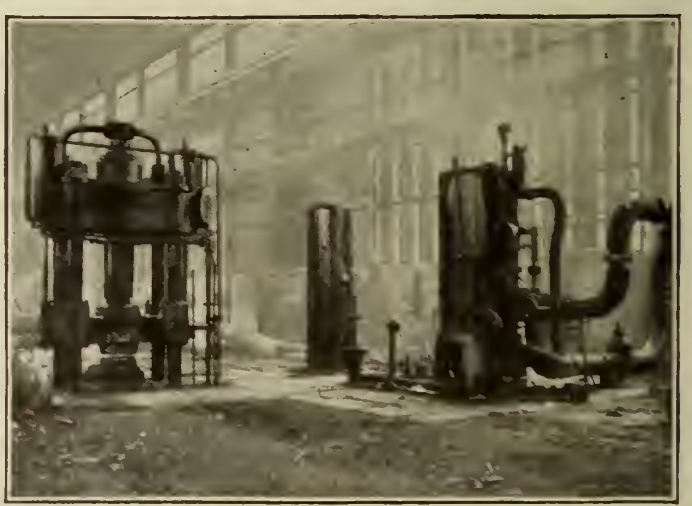
If your special requirement doesn't appear, Bilton can produce it—and in true Bilton Quality.

Just sign your name and address on a card and post it to

The Bilton Machine Tool Company
Housatonic Ave., Bridgeport, Conn.

Steelworks Plant and Hydraulic Machinery

ROLLING MILLS
FORGING PRESSES
BLOOM, SLAB, BILLET and PLATE SHEARS
HOT SAWS
HYDRAULIC PUMPS
ACCUMULATORS



800-Ton Forging Press with Intensifier

DUNCAN STEWART & CO. LTD.

LONDON ROAD IRON WORKS, GLASGOW

Tel. Address: Stewart, Glasgow. Established 1864

Die-Castings Cut Costs

They Require No Machining

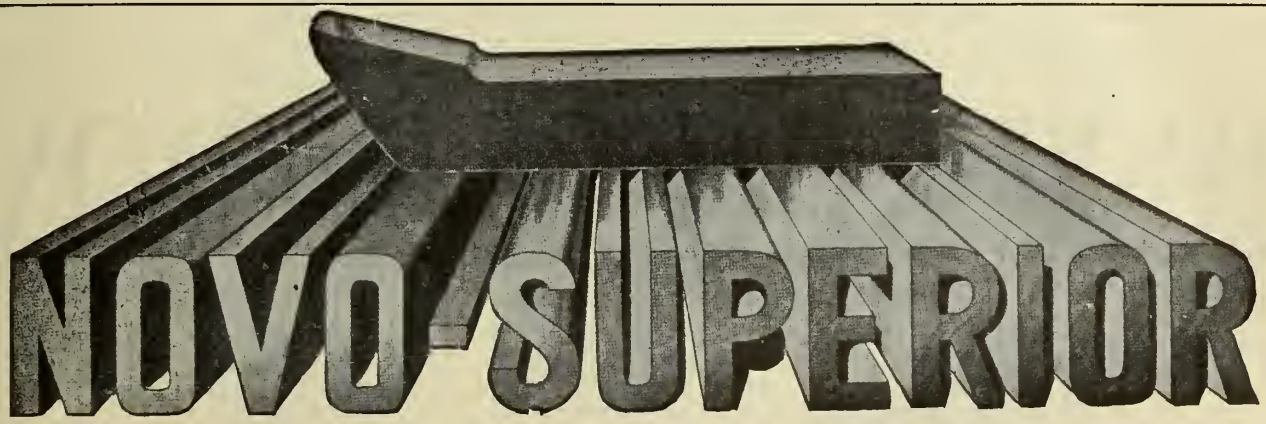
One of the great features of die-castings is that they come to you in a clean and accurate shape—all ready to assemble.

Highly complicated shapes lend themselves readily to the die-casting process. Cores are always the same, gear teeth always correct as to pitch, depth, etc.

Die-Casting Chat No. 16

The above picture shows our final cleaning dept. We take great pains to see that every die casting leaving our plant goes out free from fins, and perfect in every way. After the parts are cleaned and fins removed, we make a final inspection of every casting. You can feel assured that a die casting purchased at our plant is perfect in every respect, defects of any nature rendering a casting scrap.

THE FISHER MOTOR CO., LIMITED, ORILLIA, ONT.



HIGH SPEED STEEL

INTRA STEEL *GIBRALTAR STEEL*

Tool Steel for Every Purpose

SWEDISH LANCASHIRE IRON

Twist Drills, Taps, Hack Saw Blades, Milling Cutters, Files, Etc.
Music Wire for Springs, Steel Balls
Cold Rolled Tool Steel in Strips and Sheets

We call to your particular attention that we make a specialty of and solicit your inquiries for

Circular Saws—for wood and for hot or cold metal cutting;
Machine Knives—for cutting wood, paper, tobacco, agricultural.

PILOT STEEL & TOOL COMPANY, Limited, 322 St. James St., MONTREAL

Sole Agents for JONAS & COLVER, LIMITED Novo and Continental Steel Works, Sheffield, Eng. H. BOKER & CO., Inc. NEW YORK, N.Y.

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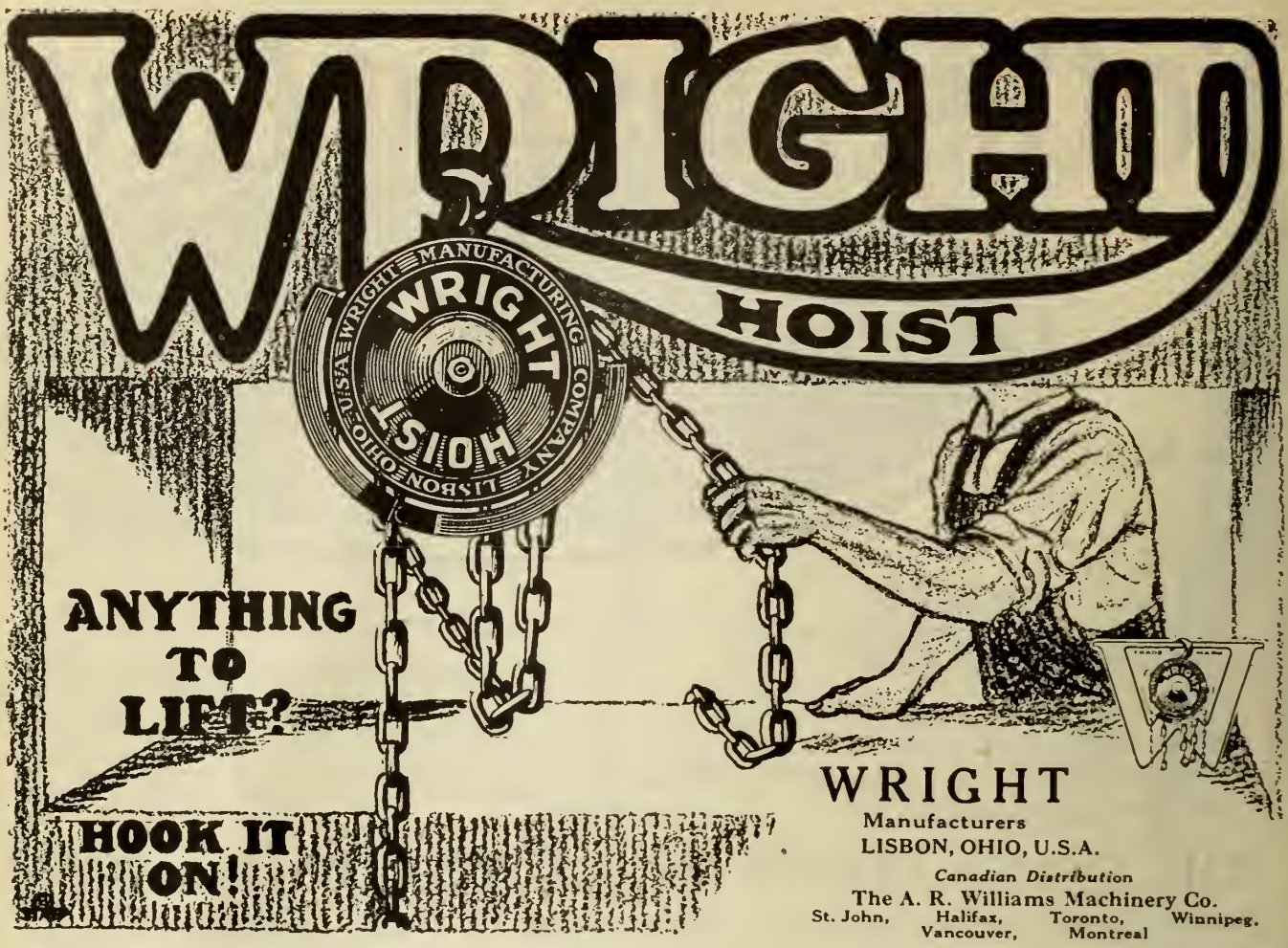
WRIGHT HOIST



WRIGHT
Manufacturers
LISBON, OHIO, U.S.A.

Canadian Distribution
The A. R. Williams Machinery Co.
St. John, Halifax, Toronto, Winnipeg.
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HOSKINS ELECTRIC FURNACES

SIMPLE
EFFICIENT
ACCURATE
ECONOMICAL

Hiram Walker & Sons Metal Products Limited
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BRITISH SMELTING & REFINING Co. Limited.
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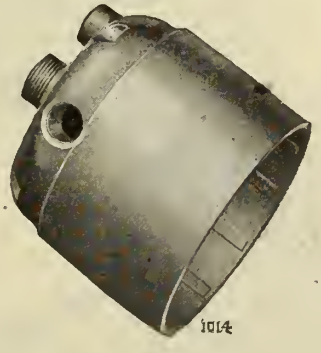
Die Castings

Doehler Service



Die Castings

Doehler Quality

We have purchased the Canadian right for the Doehler process of Die Casting and are now producing these castings in our plant in Hamilton.

Send in Blue Prints or samples stating quantities required and we shall be pleased to quote you.

Enquiries Solicited

Tallman Brass & Metal Limited
HAMILTON, ONT.

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The Real Value of Tools

The condition of Butterfield Taps, Dies, Reamers or Milling Cutters after a long run shows the stuff of which they are made. The accuracy and ease with which they take heavy cuts proves its importance.

BUTTERFIELD

Taps, Dies, Reamers and Milling Cutters

When you buy Butterfield you are assured of tools which will long retain their keen edges under heavy usage. **Give them a trial and see.**

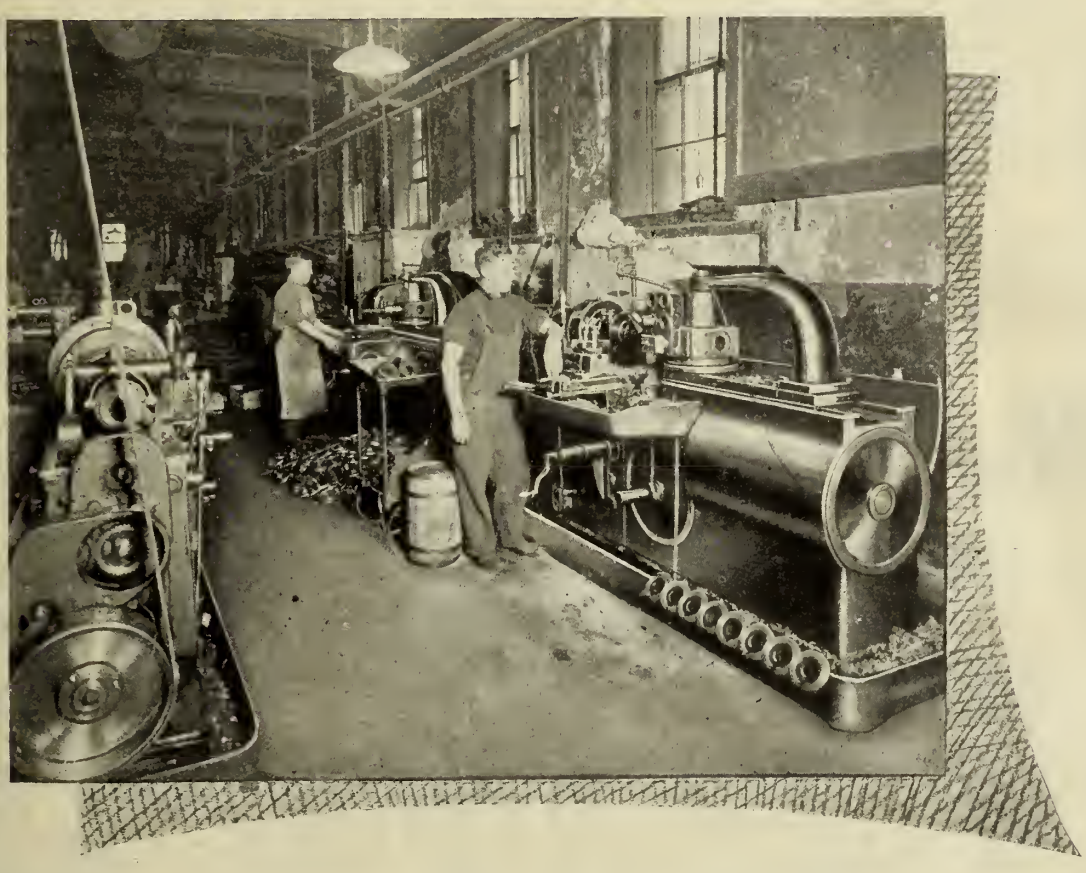
Butterfield & Co., DIVISION
Union Twist Drill Co.
Rock Island, Que.
Toronto Office: 220 King St. W.

BUTTERFIELD

One Man Instead of Six—

the work being done by

P & J Automatics



TURRET and Engine Lathes were used before the P & J got on the job. With one man running two P & J's the output is six times as large.

Flanged Yokes are roughed and finished. Six different tools are required by the number of operations and changes are much less than formerly. The flanges are 5 inches in diameter and made of open hearth machine steel.

Your work may be entirely different. But if it calls for the boring, reaming, facing, tapping, etc., of duplicate parts in quantities, then it is work that P & J Automatics will handle more profitably.

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We shall be glad to supply information on:
Galvanizing
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Wire Goods
Enamelled Signs
Lithographed Ware
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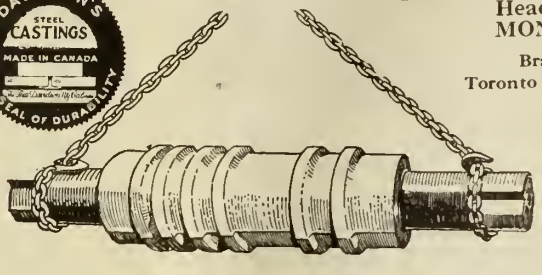
For Shipbuilding, cars, locomotives, and all classes of machinery.

Superior and reliable Steel Castings by the Acid Electric Process can be made up to fifteen tons.

The Thos. Davidson Mfg. Co. Limited

DAVIDSON'S STEEL CASTINGS MADE IN CANADA THE SEAL OF DURABILITY



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Steel Foundry Division:
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DAVIDSON

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QUICK DELIVERIES

High Carbon Steel
Manganese Steel
Chrome Steel
Mild Steel

QUALITY GUARANTEED

Sizes—½ lb. to 5,000 lbs. each

THE WILLIAM KENNEDY & SONS,
LIMITED
OWEN SOUND, ONTARIO
ESTABLISHED 1860

"Hisco" Machine—Molded Gears

The fact that "Hisco" Machine Molded Gears require no pattern is a factor of considerable importance when the price of lumber and labor is so high. "Hisco" quality insures accurate dependable gears. Remember—the price of "Hisco" gears does not include the cost of patterns.

We are also manufacturers of Steel, Chrome, Manganese and Nickel Steel Castings, Annealed and Unannealed; Cement Mill and Mining Machinery; Castings; Stamp Mills; Crushing Plants; Excavating Outfits; Steel Car Wheels; Locomotive Driving Wheels and Frames, etc.

Let us know your requirements—we do the rest

Hull Iron & Steel Foundries, Limited
HULL, Quebec

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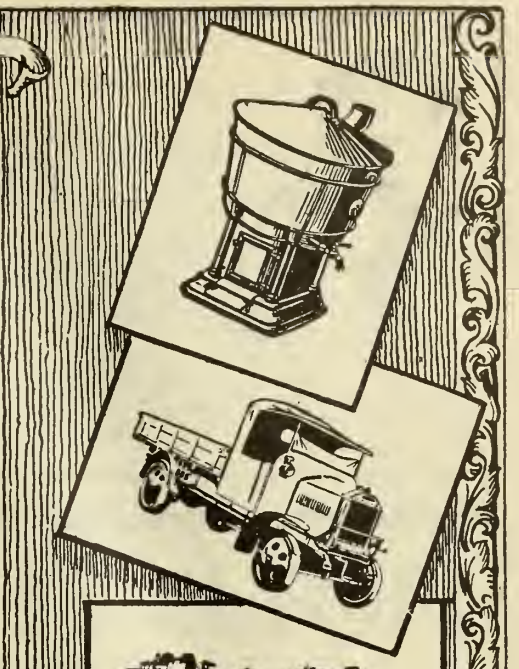

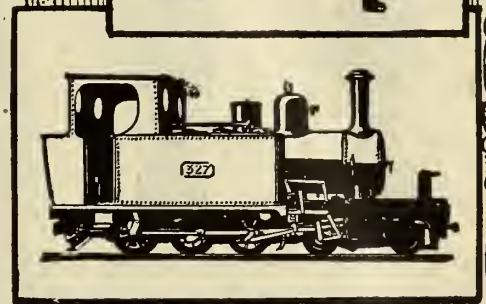

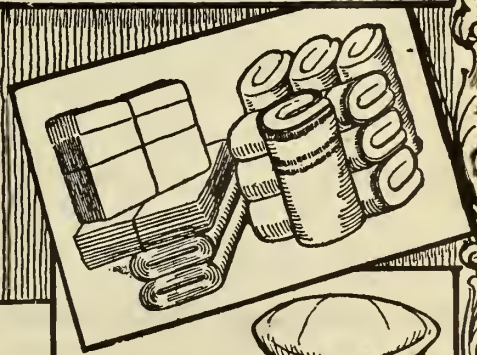

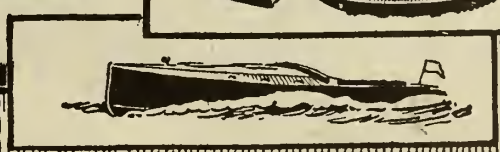
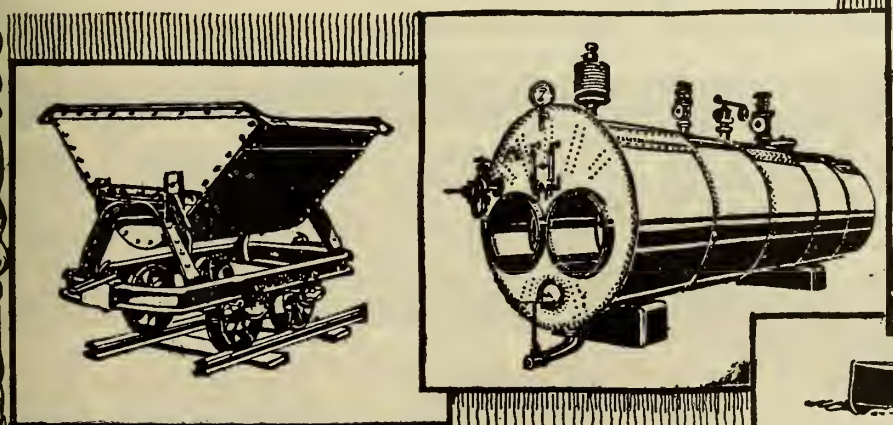

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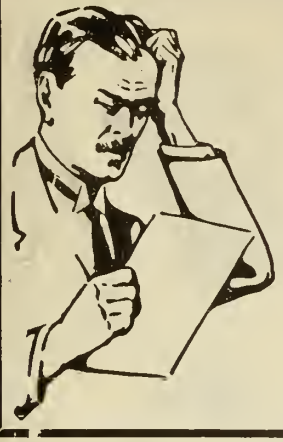

Power Transmission Expenses Reduced by

"Renold" and "Morse" Patent Silent Chains

AS

No Slip, Minimum Journal Friction
Maximum Efficiency, Increased Production

Sole Canadian Agents:

JONES & GLASSCO, Reg'd

ENGINEERS

TORONTO MONTREAL

250 H.P. Renold
Silent Chain Drive

HOLD TITE NUT LOCK

See How Easily Applied

Knowing the size Bolt—use same size Nut Lock. Place over Bolt—as shown above.

Screw another Nut onto Nut Lock and Depress it — as shown above.

Remove Second Nut and Nut Lock will Look — as shown above.

The Hold Tite Nut Lock cannot come loose when it is compressed into the thread of the Bolt. Compressing will not destroy the thread.

Head Office:

Edward A. Robinson Co., Ltd.

228 Craig St. West, MONTREAL, Que.

Branch Office: Bank of Toronto Chambers, 205 Yonge St., Room 32, Toronto, Ont.
U.S.A. Office: 166 Montague St., Brooklyn, N.Y.

Industrial Furnaces of Maximum Efficiency

OILGAS

"The only distinct advance in furnace practice since Siemens' time."

Whatever the process, if it requires **HEAT**, we can supply an **OILGAS** furnace to handle the work with th highest efficiency, safety and reliability of operation.

Bulletin Fifty-Four is now ready.

General Combustion Co. of Canada, Limited

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Canadian Desmond-Stephan Mfg. Co., Limited

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THIS IS ONE OF THE BEST THINGS WE MAKE. INCREASED SALES INDICATE OUR PATRONS' APPRECIATION.

HOYT METAL COMPANY

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ELK FIRE BRICK

We make several varieties of fire brick, each best for the purpose for which it is intended. Let our engineers help you decide which will give **you** the greatest service.

Our Brands

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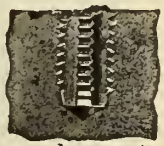
"Elk Steel"
"St. Marys"
"Keystone"
"M. D. Elk"
"Rotex"
"Elk Ladle"
"Elk Dust"
"Keystone Dust"
"Rotex Dust"

When you select Elk Brand Fire Bricks you know you are getting the right quality. Our warehouse is well stocked in various sizes.

Elk Fire Brick Company of Canada
Limited
Sun Life Building, - HAMILTON, ONTARIO

Buried in the Work and Broke!



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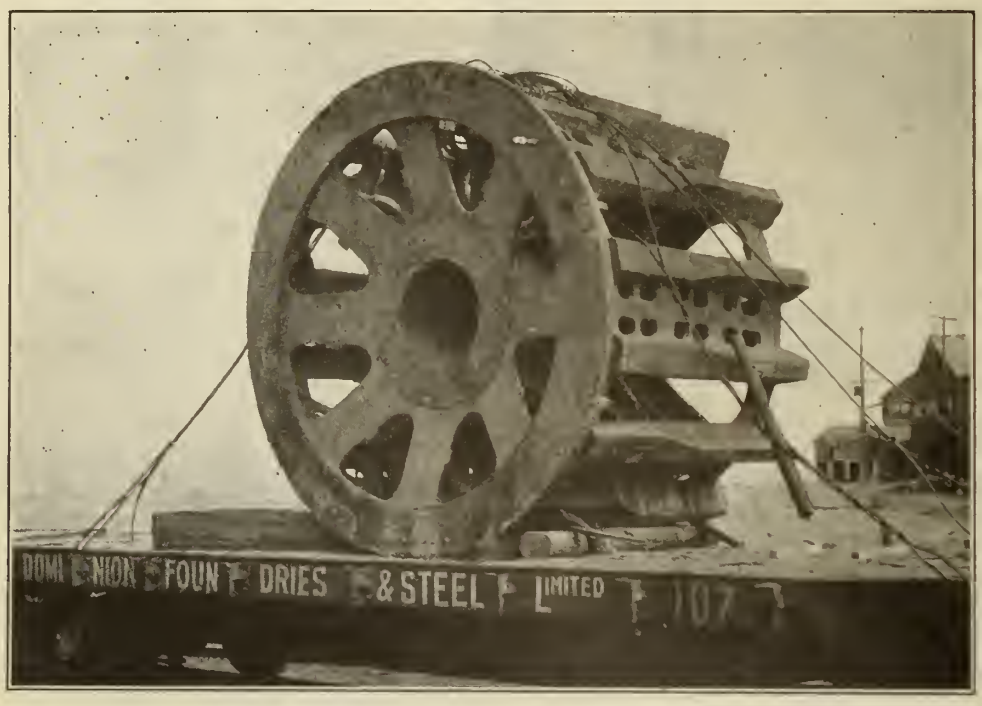

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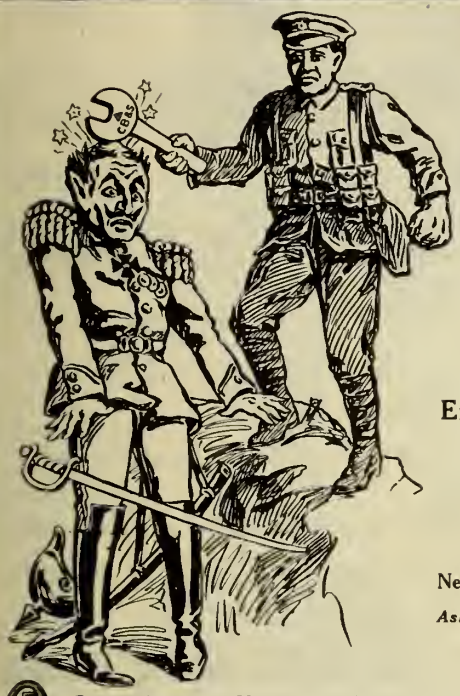

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Two Sizes "Star" Gap Engine Lathes

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Dunbar Springs are thoroughly tested for **accuracy** and **quality**. Send us specifications, for estimates.

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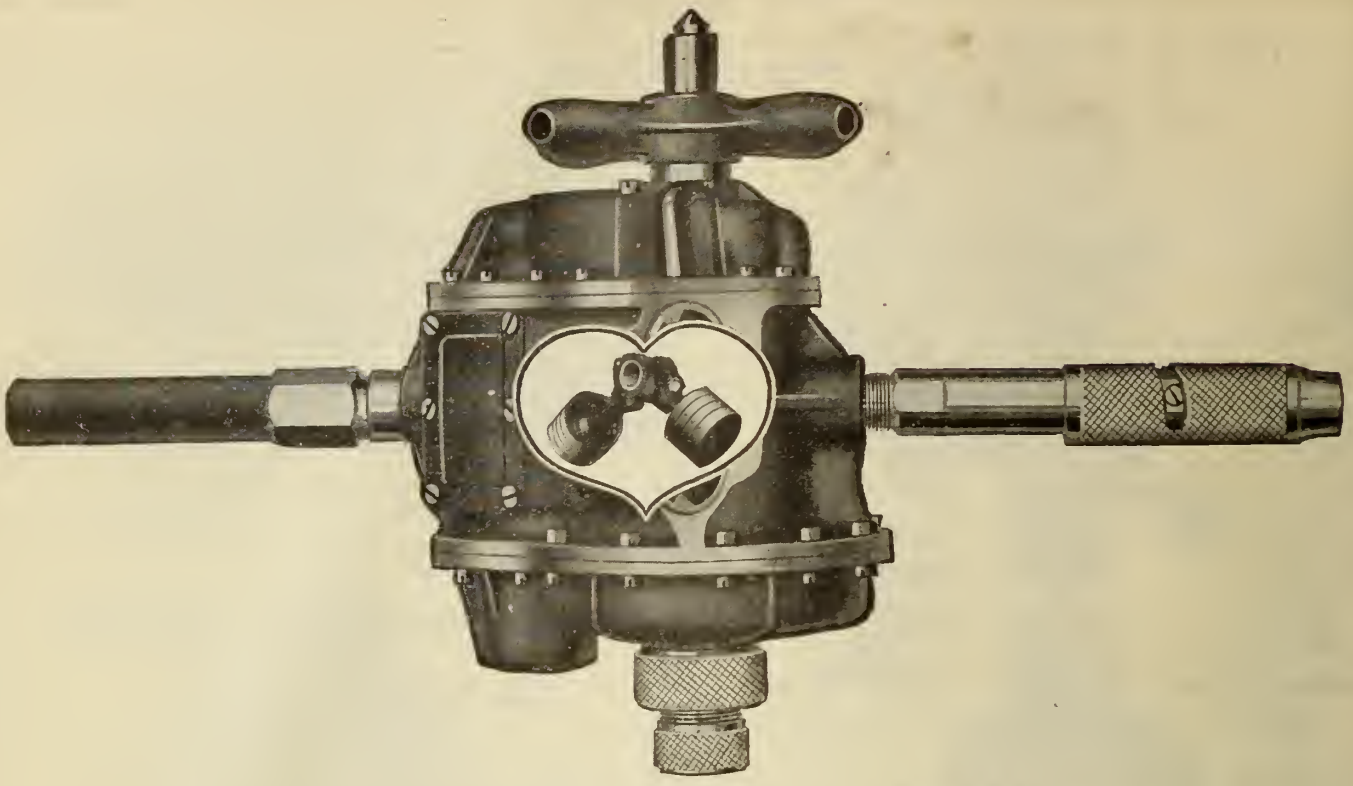

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SCRAPPING an entire toggle because of worn bearings is unnecessary with Little Giant Air Drills.

The toggle construction in Little Giants is an important factor in eliminating drill repairs—in keeping drills *drilling*. The hardened steel crank pin bearing—the *only* part subjected to hard wear—can be quickly replaced without dismantling the drill. The remainder of the toggle continues its indefinite service life. Lengthy tie-ups for repairs are avoided. An expensive stock of renewal parts is unnecessary.

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P-66 H

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Dependable Power at *Less Cost Per Hour*

Don't Be Prejudiced!

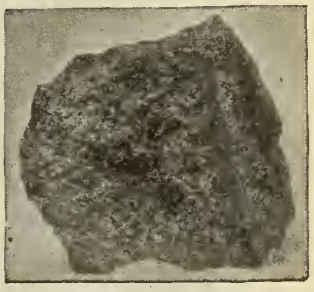
Dominion Grinding Wheels

Made in Canada from the Raw Product to the Finished Wheel.

MADE IN CANADA

Because some inferior grinding wheels have, in the past been put on the market labelled **Made in Canada.** Don't be prejudiced — don't condemn (without a test) all Canadian wheels. Canadian products if equal in quality to foreign brands, are entitled to the preference.

Dominion Grinding Wheels are: carefully and conscientiously made with abrasives from our own furnaces—the quality is thus guaranteed to be uniform. They are rapidly removing the stigma from the "Canada Wheel," making it instead one to be chosen for the more difficult jobs. A trial has convinced many manufacturers; why not you?



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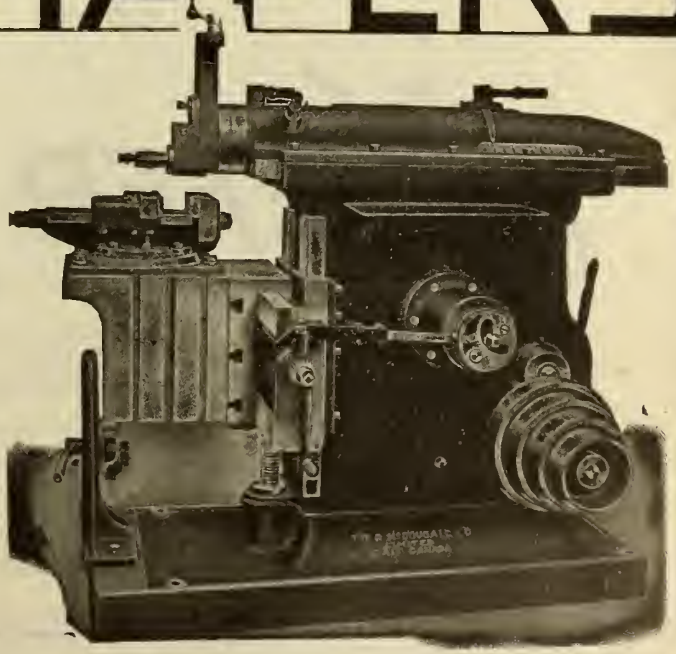
An important feature is the column. It is massive in construction, well braced and reinforced internally. Has ample opening under ram for keyseating or other long work. Bearings for ram extend beyond vertical line of column both front and back. The ram is of exceptional strong construction.

McDougall shapers have other points of interest you should know about. **Write for full description.**



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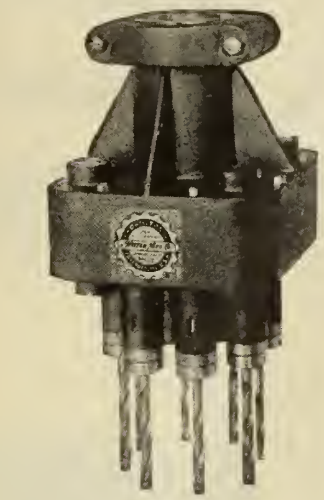
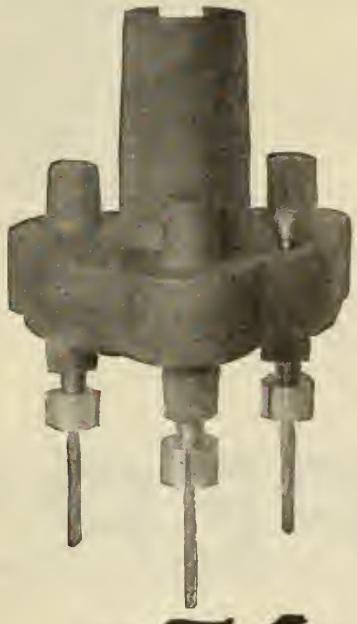
HOEFER Head-Work Will Solve Your Multi-hole Drilling Problems





It stands to reason that where eight holes, for example, are to be drilled in a single plate, a husky saving of time will result from drilling them all at once. That's what you do with a Hoefer Multiple Spindle Driller or Auxiliary Drilling Head. And with Hoefer Drilling Equipment you get besides a 25-year-long experience to help decide the feed and speed that will produce best results, and a guarantee of performance **based on past achievements.**

You'll find Hoefer equipment, advice and performance a time-saving and cost-cutting combination that is bound to surprise you.

It doesn't make any difference how **tough** a proposition you may have or how commonplace it may appear; if it's a matter of drilling holes—any size, any number, in any material—we will study it, show you the best way to do it, and then leave the decision to you without charge or obligation.

We recommend a Hoefer Driller or Auxiliary Drilling Head only when we can **prove** that its cost can be made up over and over again by the savings it will effect.

Investigate now. The Hoefer engineers are at your service.

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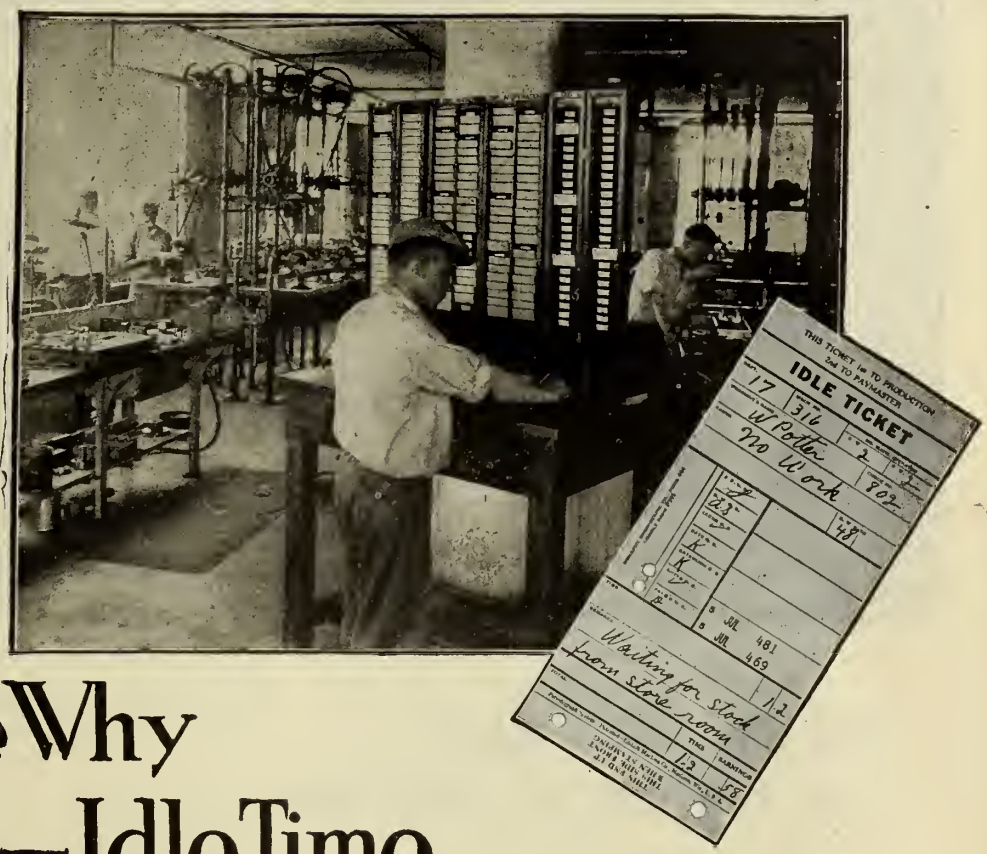
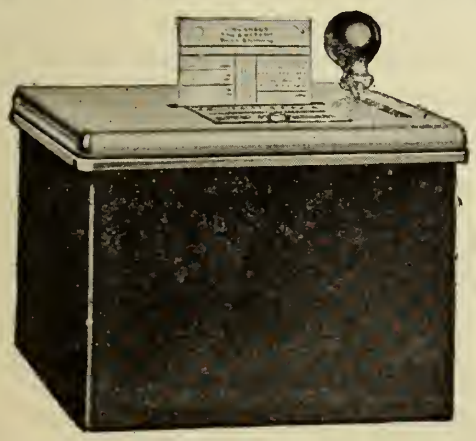


Know the Why of Costs—Idle Time



Do you realize that idle men and machines cost almost as much as when they are busy? And yet most cost systems ignore men and machines.

PERIODOGRAPH control catches this costly idle time and points out how to close up the gaps. If there is no PERIODOGRAPH time ticket in the "Job Ahead" pocket of rack the workman stamps an "Idle" or "Waiting" time card and indicates the reason from the key printed on the card. If his machine breaks down, an "Idle Machine" card is stamped and reason indicated.

This is only *one* phase of PERIODOGRAPH control. A Gisholt Salesman is ready to tell you the whole story.

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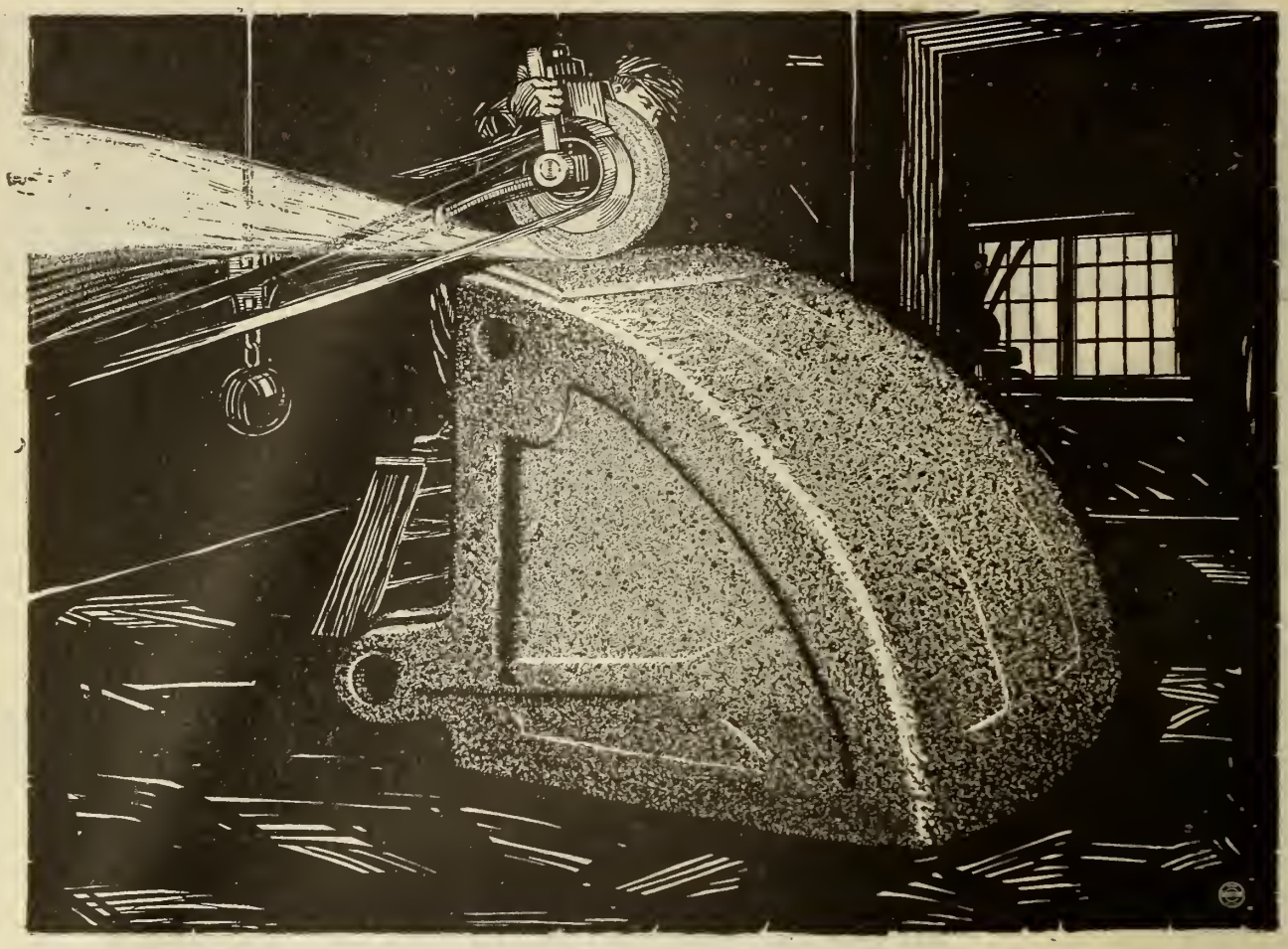

TEARING DOWN MASS AND BUILDING UP STRUCTURE

The great mass of metal comes out of the casting room, a bulk of steel covered with burrs and sprues—

Swing over the wheel. The contact shoots fire as the millions of hardened grains, packed tight in the spinning disc, bite into the dense metal.

There is a quick tearing away of the crudeness of the rough casting. The jagged edges disappear, leaving the casting in smooth, finished condition.

CHOOSING THE GRINDING WHEEL FOR THE JOB

As it is impossible to roll manganese steel, all parts must be cast. These castings can be forged with difficulty at a temperature somewhat above a red heat. They cannot be machined or drilled with steel tools and all finishing must be accomplished by the use of grinding wheels or abrasive grain. The metal is somewhat difficult to cast as all holes must be cored in the casting, and due to its enormous shrinkage, five-sixteenths of an inch per foot, no intricate shapes can be made. The shrinkage is hard to control, making it necessary to have an excess of metal on castings which have to be finished accurately. This makes necessary a large amount of grinding.

The castings as they come from the foundry or cleaning room have had the risers, sprues, and some of the irregularities removed by means of sledge hammers or oxy-acetylene torches. The torch is a very effective tool for doing this work, and entirely replaces the chipping chisels which are used on ordinary steel castings.

At best, however, the castings are very rough, the fins sharp, and the material left where the cutting torch has removed the sprues and risers presents very jagged edges. These conditions, with the properties of the steel itself, make this cleaning operation one of the hardest on which grinding wheels are used.

There are, in snagging operations, two groups of factors affecting the action of grinding wheels. One group tends to make the use of hard wheels necessary, while the other group opposes this tendency. This refers to the use of wheels which will satisfy to the best advantage both sets of conditions.

Under the group calling for hard wheels are included:—

1. Desire for longer wheel life. At first glance it would seem that the longer the wheel life, the cheaper the grinding cost. This is not true, as the use of hard wheels having long life causes a decrease in production, with the accompanying increase of overhead per unit of production.

2. Rough condition of the work caused by sharp fins and sprues. On the large castings which take a long time to cool, the sand from the mould is often baked or semi-vitrified, forming a hard scale on the surface. This condition is particularly hard on wheels and calls for extremely hard grades.

3. Enormous pressure applied to the wheels by the operator sitting or hanging weights on the swing frame arm.

4. Piece rate or bonus systems cause operators to "work the wheels hard" to increase their earnings. The harder the wheel the better it stands up under this abuse, although production suffers, causing an increase in grinding costs.

Tending to make necessary the use of soft wheels are these conditions:—

1. Workmen's desire for high hourly production with a minimum expenditure of energy.

2. Necessity for keeping the amount of heat generated during grinding as low as possible. An enormous amount of heat results from grinding manganese steel, owing to its extreme toughness and high tensile strength. Danger of breakage is always present where a great amount of heat is developed during grinding.

3. Desire for fast cutting or high hourly rate of production, in order to reduce overhead expense per unit of production.

To fulfill the requirements of the two groups, it is necessary for the grinding wheel maker to produce a fast, cool-cutting wheel which will have sufficient life to keep the grinding cost to the minimum limit and be sufficiently hard to stand up under the very heavy grinding.

Norton Engineering Service—the sort of practical advice developed with long years of experience and contact with a variety of grinding problems—is the wheel-user's for the asking.

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Canadian Agents: The Canadian Fairbanks-Morse Co., Ltd., Montreal, Toronto, Ottawa, St. John, N.B., Winnipeg, Calgary, Saskatoon, Vancouver, Victoria. F. H. Andrews & Son, Quebec, Que. Simonds Saw Co., Vancouver, B.C.

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Helping Canada's Great Railways

The industrial development of Canada is measured by its great railroad systems. Thousands of miles of steel, extending from coast to coast, reaching out from the big manufacturing centres, have been pioneer steps in the country's advancement. And The Canadian Fairbanks-Morse Co., Limited, has been a factor in this development.

Wherever construction gangs have followed surveyors, Fairbanks-Morse railway equipment has been used because of its dependability—dependability that made it worthy of its part in this pioneer work.

From the smallest drill to the electric locomotive—the stand pipes and water tanks that feed the great transcontinental engines—Fairbanks-Morse railway supplies render a service backed by the organization's high efficiency.

The 100% quality seal that marks all Fairbanks-Morse railway equipment is the ideal of the Fairbanks-Morse institution—the mark that symbolizes a standard of equipment and service.

Make this mark your guide in buying.

The Canadian Fairbanks-Morse Co. Limited

Canada's Departmental House for Mechanical Goods

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of the material to be cut, and its shape, must be most carefully considered in the design, manufacture and selection of the blade, if the highest efficiency is to be obtained. This is becoming increasingly important with the rapid growth of the practice of power saving.

One manufacturer, in the same spirit of efficiency that pervades the business upon which a world-wide reputation has been built—the manufacture of Precision Tools—has, through painstaking investigation and experiment, determined, step by step, just what features in the saw give greatest efficiency in the cutting of each particular material under various working conditions of hand and machine sawing.

The Hack Saw Chart

Which saw will insure the most economical cutting of any particular material? One has only to consider the multiplicity of factors as represented by the material, the saw and its operation, to realize the difficulties encountered in arriving at the correct solution of this problem.

Practically every saw manufacturer has made some attempt to answer the question. A number have gone no further than to suggest the obvious—that is, that the saw used for cutting brass or sheet metal should have more teeth per inch than that used when cutting steel or round stock. Some, however, go further than this, though not necessarily to the extent of conducting careful tests and the compilation of records over a series of years as one or two have done, but yet far enough to recommend with some degree of definiteness, the employment of blades of certain physical characteristics, to cut certain classes and shapes of metal.

One manufacturer, as the result of experiments and tests, has divided materials and shapes into nine such classes, the distinction being based on observation of the influences exerted by the hardness, ductility, crystalline structure, and chemical composition of the various metals, and the diameter and shape of the material to be cut. For these different classes of materials, different blades have been designed and manufactured, and the classifications, with the blade recommended for each have been embodied in the hack saw chart, which is reproduced at Figs. 2 and 3.

In a more elaborate and technical way this chart might have been made up so as to show the composition and temper of each blade, but for the fact that saw numbers on the chart supply all necessary information where saws of this make are employed.

Getting the Most Out of the Right Saw

In the small shop, where hand sawing is done and each man owns his own frame, and where but few pieces of different materials are cut from time to time, a change in blades is naturally out of the question for each change in the material. Hence the convenience of a blade like the No. 103 (see chart), that

FOR POWER MACHINES

Medium Machine						Heavy Machine						Extra Heavy Machine					
Cat No.	Pitch	Gage	Width"	Lengths"	St. Wt. lbs.	Cat. No.	Pitch	Gage	Width"	Lengths"	St. Wt. lbs.	Cat. No.	Pitch	Gage	Width"	Lengths"	St. Wt. lbs.
262	18	18	¾	12–14	24	Not cut economically on this class of machine						Not cut economically on this class of machine					
255	14	18	¾	10–20	44	Not cut economically on this class of machine						Not cut economically on this class of machine					
255	14	18	¾	10–20	44	254	12	18	1	12–24	44	256	12	16	1	14–24	64
255-B	12	18	¾	10–20	40	254-B	10	18	1	Same as above	34	256-B	10	16	1	14–24	53
255-C	10	18	¾	17–20	35	254-B	10	18	1	12–24	34	256-C	8	16	1	14–24	43
262	18	18	¾	12–14	24	259	18	18	1	14–17 only	44	Not cut economically on this class of machine					
255-B	12	18	¾	Bth. Blds.	40	254-B	10	18	1	12–18	34	256-B	10	16	1	14–24	53
255-C	10	18	¾	10–20	35					12–24		256-C	8	16	1	14–24	43
255	14	18	¾	10–20	44	254	12	18	1	12–24	44	256	12	16	1	14–24	64
262	18	18	¾	12–14	24	259	18	18	1	14–17 only	44	Not cut economically on this class of machine					

All recommendations on this chart and throughout the book must be taken in a general rather than a specific sense and should be applied as the common sense of the user indicates.

NOTE: When testing hack saws for which the manufacturers have made no specific recommendations, it may be convenient to identify them with the number of the Starrett Blade most nearly similar and use according to the recommendations on this chart.

FIG. 3—STILL ANOTHER CHART OF DECIDED INTEREST.

will in a degree meet all ordinary requirements. But there are few mechanics, who, under even these conditions, cannot at times work to better advantage with a flexible back blade, like the No. 250, which has 18 teeth, or who do not sometimes require a finer tooth blade, like the No. 258, with 32 teeth to the inch, for cutting thin sheet metal. In the end, time will be saved and inconvenience avoided if these saws are kept strained up in separate frames, so that one can be picked up and used instantly. The man who will thus equip himself may generally be relied upon to use with discretion the various blades furnished to him, but wisdom should be exercised in their selection and purchase.

Whatever saws are adopted as the standard, a hack saw chart, based on that make of saw, should be established as the basis of selection for the work in hand. Not only should the tool or stock-room from which the saws are issued, be provided with these charts, but definite control should be maintained over the delivery of saws of a given number, according to the requirements of the work and the machine, where power saws are used. Each workman, in turn, should have a copy of the chart, perhaps somewhat modified, so that he too may know the blade which is best suited for each class of material.

To meet the requirements of different classes of work by the selection of the blade designed for that work, to increase thereby the individual efficiency of each saw and reduce the total number of blades required, it is obvious that a complete line should be carried. It is better to carry and issue exactly the right saw for unusual and intermittent requirements, than to do the work inefficiently for lack of the proper blade.

The output with all power blades should be carefully watched and the proper steps taken to insure that a blade is discarded as soon as it begins to lose efficiency to an extent that it cannot be overcome by an increase of pressure.

Testing Hack Saws

Every hack saw test has two distinct objectives. The first point to be determined is, what make of blade shall be selected as most efficient for the work of the shop as a whole? The second point, which is no less important, is—what particular blade made by the manufacturer whose brand has been selected, is best adapted to the conditions governing any particular piece of work?

The difficulties in the way of making sufficiently exhaustive tests to determine the all-round efficiency of various makes of saws has already been mentioned. To reach conclusions that are beyond doubt, every factor must be taken into consideration—the composition, temper, pitch of teeth, "set," gage, depth, and cost of the blade, the tension, pressure, speed and lubrication, and the characteristics of the material cut. As it is a fundamental in comparative tests that only one variable should be changed at a time, the magnitude of the task of making complete comparisons is mani-

fest. The influence exerted by a variance in the composition and temper of the blade and the pitch and "set" of the teeth has already been indicated; these are factors beyond the control of the user of the saw.

The gage of the blade, another of the elements determined by the maker, directly affects the cutting speed. Tests have shown that if two saws differing only in gage are used to cut the same metal, the first few cuts are usually made by both blades in the same time, but about the fifth or seventh cut, the thinner saw will be found to be cutting faster. This is, of course, assuming that both saws are, except for the matter of gage, equally well adapted to use on that particular kind or shape of metal. The first half dozen or so cuts remove the extreme sharpness of the teeth and permit the element of "contact area" to come into play. Obviously, the thicker gage of one saw simply means more friction to be overcome and necessitates greater pressure to make the teeth cut. To make a 14 gage saw cut as fast as one of 20 gage, throughout a long series of cuts on the same material, probably double the amount of weight would have to be put on the thicker blade toward the last of the test.

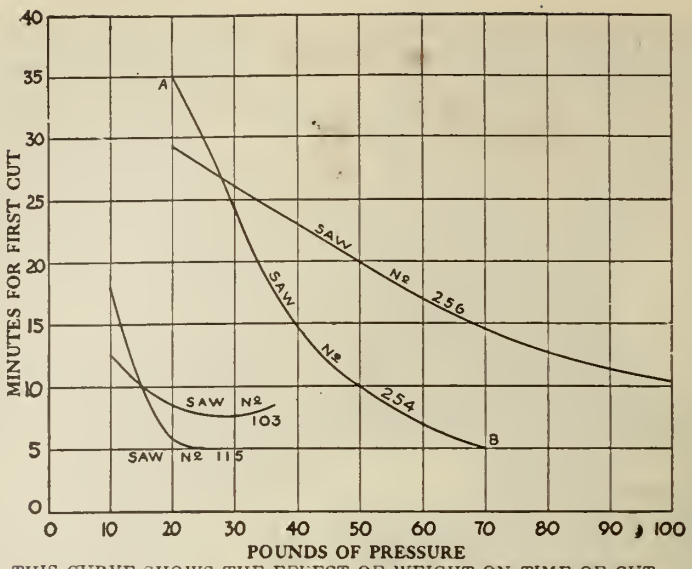
In selecting a saw to use on any particular job it is worth while remembering that a short blade, though of lighter gage, is stiffer in proportion, and consequently can carry a coarser tooth.

Factors Under Control of Operator

Tension, pressure, speed of strokes per minute, and lubrication, or the use of compound, are factors directly under the control of the operator, and have a direct bearing on the worth of any test. Their influence and the proper conditions will be discussed elsewhere later. Time is another factor under the control of the operator, and is a frequent source of abuse through crowding saws far beyond their normal speed, so that they are destroyed in perhaps half a dozen cuts. The unreasonableness of such treatment will be clearly indicated later.

The general consensus of opinion is that the most practical method of testing blades, in order to determine what make or kind of saw, as regards "pitch," gage and "set," is best adapted to the requirements of the purchaser, especially where there is a fairly uniform class of work, is, after all, to compare the run-of-work output of different kinds or makes of saws of exactly the same characteristics, operated under identical conditions. To make such comparisons reliable, each must represent the average of results obtained from a number of saws of the same make and kind.

A great deal has been said and written regarding the testing of hand hack saw blades, and various means have been devised from time to time, the majority of which necessitate the use of a power machine. It is extremely doubtful whether or not any useful purpose is served by testing a blade under conditions which will never be met in actual



THIS CURVE SHOWS THE EFFECT OF WEIGHT ON TIME OF CUT.

work, and for which it is not designed. Nevertheless, the practice is fairly common. Of course, the object of using the power machine for testing hand blades is to remove the human element so far as is possible, although this element is one of the factors directly allowed for in the design of this class of blades. Hand hack sawing, like filing, is one of the most difficult operations. The hand blade, unlike the saw fixed in a power machine, must be guided by hand alone, and the accuracy with which this is done, both with regard to direction and evenness of pressure, will directly affect the efficiency of the blade.

Power sawing differs from hand work in that the regulation of the weight or pressure is purely mechanical, rather than instinctive, as when the hand frame is used. The natural tendency of the workman with a hand frame is to use less pressure on the first few strokes, thereby preventing the breaking or dulling of the teeth, and to increase the pressure gradually as the work progresses and the teeth lose their first keenness. The workman's "feel," when cutting with a hand frame, gives him a decided advantage over the machine in this respect. It is, therefore, necessary, if efficient work is to be done with the power saw, that the principle of gradually increasing the weight, as the work progresses, be understood and correctly applied.

Testing Power Blades

One method of testing power blades, which is at least fair to all, is to purchase several blades of each of such makes or brands as it is desired to test, buying one blade of each kind tested from at least three different merchants if possible, in order to get an average run of the product. The blades tested should be of the same length, gage, depth, and "pitch" for each of the different makes, unless one or more of the manufacturers makes some specific recommendations as to the type of blade to use on the material on which the test is to be conducted. Where such recommendations are made they should be scrupulously observed. The blades should all be tested on the same grade of material and in the same power machine, preferably one with gravity feed. The reason for testing all of the saws on the same kind, size and shape of material is obvious. Should the test be made, as is usually the case, on unannealed tool steel, the blades should be alternated, so that should the steel not be uniform no saw will be placed under a handicap by a hard spot.

One point, however, must not be overlooked. Some manufacturers have given the question of hack saw efficiency sufficient thought to evolve certain specific recommendations as to the blades, strokes per minute and weight to be used on certain classes of materials and with certain machines. If any of the manufacturers of any of the saws to be tested makes any definite recommendations as to what blade to use under the conditions of the proposed test, they should be rigidly adhered to. Otherwise, ignorance of some of the factors that entered into the manufacture of the blade, and the consequent ignoring of the purposes for which it was intended, will make the test, if not directly misleading, at least of doubtful or little value so far as that particular blade is concerned and will result in conclusions being drawn which are unfair to the maker of the saw. Where definite recommendations as to the use of a saw are not made by its manufacturer, some confusion as to the conditions under which it should be tested may be avoided by identifying it by means of gage and pitch, with a blade whose proper use is known, and testing it according to the instructions for that blade, as given in the hack saw chart.

Careful records should be kept as regards the saw used, the material cut, the speed, pressure and work accomplished. For exactness, the time taken for each individual cut should be recorded in minutes and seconds. It is simplest to read the exact time of day at which each cut is completed, and from it subtract the time at which the previous cut was fin-

ished. Of course the elapsed time then includes that required for feeding up and putting in new pieces.

A special form for recording the results of power tests has been prepared by The L. S. Starrett Company of Athol, Mass., for the convenience of hack saw users who wish to make run-of-work tests.

The Effect of Weight or Pressure

The demonstrated advantage that has resulted through the establishment of specific cutting speeds and feeds as most economical in the case of the lathe tool, points to the necessity of likewise determining the best working conditions for efficient hack saw work, as regards speed, pressure and lubrication for each type of saw and class of material.

The most vital variable under ready control is the pressure upon the saw,—which, other things being equal, determines the rate of cutting and the endurance of the blade. The proper weight to be applied on starting the cut, and when and how much it should be increased, varies with different makes of saws, and in the absence of recommendation by their makers can be estimated only by trial and by comparison of results.

The effect of pressure on the life of the saw and how it affects cutting costs is very clearly shown in the succeeding tables and curves. From all of these, it will be at once evident that too light a pressure will allow the saw to slide and wear without doing effective cutting. This may show long life in hours, but also requires long periods per cut, and results in an ultimate low efficiency. On the other hand, excessive pressure is unnecessarily destructive. The saw may cut much faster while it lasts, but it doesn't last long enough to justify the practice. Between these extremes lies the happy mean which represents the acme of hack saw economy.

The actual pressure, in pounds per square inch of "contact area" of the tooth, which has been found to give the most satisfactory results as regards both the time per cut and the number of cuts per saw, varies from 20 to 30 pounds. It has been determined by careful tests that pressures within these limits, while not overloading the saw, are sufficient to avoid any possibility of the blade slipping and sliding over the work, and thereby becoming dull without having done more than a portion of its rated capacity. It has also been found that the basic weight or pressure is directly proportional to the gage of the saw. Standard practice indicates using the 20-lb. unit of pressure for blades not over 0.040-in. thick, 25 lbs. for saws between 0.040-in. and 0.060-in., and 30 lbs. for those whose thickness is 0.060-in. and over. The so-called unit or basic pressure must not be confused with the weight actually resting on the blade when in use, but must be taken as a constant, by the use of which the actual pressure on the saw may be calculated. This weight, or pressure, is measured by attaching a spring balance to the forward end of the saw-frame when the blade is in mid-stroke, and lifting. The amount of "pull" indicated by the needle of the scale is the weight on the blade.

In setting the weight for a new blade it is evident that a higher initial pressure will be used when cutting heavy stock than for light stock. In practice, however, the figures given in the hack saw chart have been worked out for an average size of bar to be cut, and it has become customary to use the weights thus determined for a given saw as the proper pressure at which to commence a series of cuts with that particular blade, regardless of the dimensions of the material to be cut.

The necessary adjustment of the weight, as affected by the diameter of the work, can easily be made after the first cut, or even after a few strokes have been made, while the weight indicated is sufficient to prevent the saw from slipping or sliding, yet not so excessive in any case as to incur the danger of stripping.

The weights given have been figured out for cutting the more common materials, such as machine steel, etc., and must be taken as approximate, rather than absolute figures. For other materials the proper weight to be used in actual practice may vary somewhat, according to the material and the speed at which it was to be cut. The figures are, however, sufficiently accurate for all materials to afford a working basis from which to start.

In using the weights recommended in the hack saw chart, one point which must not be lost sight of is that, to obtain efficiency in hack-sawing, is it just as important to keep the proper pressure on the blade throughout the entire series of cuts, as it is to secure it at the outset. Remember, that a saw wears as it is used, and that the area of the teeth in contact with the work becomes greater as the number of cuts increases, and therefore in order to maintain the same cutting speed, the pressure must be increased from time to time. It may be taken as a maximum of hack saw thrift that, for efficiency, the weight must be increased as the number of cuts progresses.

While speaking of the necessity for the proper adjustment and increase of weight, it may be worth while to note that equal diameters of work of the same material will be cut at about the same rate, without regard to their comparative shapes. That is, 1½-ins. square, round or elliptical bars of the same grade of steel would cut at the same rate. Angle irons, channels and tees of the same greatest dimensions, will cut a' alike, provided they are properly placed in the vice.

Cutting speed on rounds of any given material increases as the diameter of the work and varies in the same proportion as the saw goes through any particular cut. Theoretically, the weight during the progress of each cut should vary directly as the diameter of the work, though this is, of course, impractical. However, it is essentially practical that, when the time required for any single cut becomes greater than the average time required for cutting that particular class of material, with that particular blade, the weight or pressure on the blade should be increased a few pounds before beginning the next cut.

Continued in next issue

INTERESTING FACTS TO BE FOUND IN THIS WEEK'S ADVERTISING SECTION

How to obtain a steady volume of work.

A hammer noted for its blow.

A chemically pure product and where to get it.

What to use in repairing broken machinery.

A chuck that has reversible screws.

A new stirring and stabilizing process.

How to put efficiency into your shop.

A device that is said to increase production, prevent accidents, and reduce costs.

A battery of machines that are giving perfect satisfaction.

An announcement of interest.

What to think of when purchasing belting.

That it never pays to be prejudiced.

How to choose the proper grinding wheel.

A concern that has been a factor in helping Canada's railways.

In a lecture recently delivered before the Institution of Civil Engineers in London, England, Sir Dugald Clerk revived an interesting proposal made by the late Lord Kelvin for the heating of rooms. This proposal is not easy to explain without diving into mathematics and the abstruse laws of heat, but it may be expressed as a process of using an engine to extract some of the heat from the cold air outside a room and adding it to the heat of the air inside the room. The curious and puzzling thing about this process is that the heat so added is, under certain conditions, much greater than the heat equivalent of the work done by the engine. In theory, therefore, an electric motor may be used very efficiently to warm a room. Whether the notion will work out satisfactorily in practice remains to be seen, but in view of the ever-increasing cost of fuel this fascinating problem is likely to be soon attacked by Britich engineers.

Two Efficiency Forms of Decided Interest

It is Only by Exchange of Ideas That We Can Improve Our Present Methods—Perhaps the Suggestions Given Herein May be Suitable for Use in Your Plant

By J. H. MOORE

ANY form, which on being filled out day by day depicts progress throughout a plant, might well be termed an efficiency report. Proceeding on this assumption, we illustrate two very useful forms as adopted by the International Harvester Co., Hamilton, Canada.

At Fig. 1, we show a portion of what is known as their daily report sheet.

This style form is adaptable to any department, but for illustrative purposes we depict the sheet filled out for the sheet metal department. As will be noted, the first item to be filled in is that of the date. Next comes the name of department, also where the material has to be trucked to.

In other words, the chart forms a double purpose. First, it records the amount of material passing through the different departments each day, while it also informs those interested the destination of the parts. The symbol number is of course always given.

Each department has its own truckman, or truckmen (if the trucking demands more than one man), who looks after every load leaving his department. He fills out the form as he delivers each load, when at the end of the day the timekeeper enters these records into a permanent record book.

At the end of each month the timekeepers total up the production of their own particular departments, which shows immediately how the work in all departments is progressing.

The second of these forms (shown at Fig. 2) comes under the name of a manufacturing delay report, and as the name implies, the form is used as a means of recording delays, and the reasons for these occurring.

Again, we will take the sheet metal department as an illustrative example. First comes the filling out of the proper department, together with the date. Following comes a note of importance which reads that the report must be sent to superintendent's office at 7 a. m. daily, whether or not a department was delayed for any reason. The remainder of this notice should be read by every reader, as it covers quite a range of possible, and sometimes unavoidable delays.

The remaining headings are self-explanatory and are not filled out in this case simply because the delay described was of another nature to any of the headings shown.

As will be noticed, the piece 1030N did not arrive at the proper time in the sheet metal department. This delay was caused by the breaking down of a press in the forge shop. This may seem like a strange excuse, but when we explain that the routing of this particular part is from the forge, to sheet metal department, the cause of delay is understood. If a press accomplishing a previous operation on any part breaks down, it stands to reason the parts cannot be forwarded on time.

DAILY REPORT OF DELIVERIES

May 14th 1920

FROM SHEET METAL DEPT. TO ERECT No1 DEPT

CAT. No	DELIVERIES	PIECES	WEIGHT
H 5373	PAINT DEPT	56 & 30	26
F 7639	" "		1.000
B 1101	" "		205
M1-123	ERECT No 2		9000
1 3/16 X 1 3/8	Washer B & R DEPT		3000
1439 N	PAINT DEPT		15

FIG. 1—SHOWING A PORTION OF WHAT IS TERMED THE DAILY REPORT SHEET.

These reports on arriving at the superintendent's office act as an illustrative chart, showing every detail of progress throughout the entire plant. All delays are investigated, and repairs to crippled equipment made at once. It is this fact that allowed us to call these forms efficiency reports, for they make for systematic handling of any product.

The returns issued by Lloyd's Register for the quarter ended March 31st, 1920, show that Britain has regained its lead as the world's greatest shipbuilding nation. The tonnage under construction in Great Britain exceeds that of the United States by over 800,000 tons. New British vessels put in hand during the quarter numbered 229, and aggregated nearly 710,000 tons. There is a notable increase in the number of large ships building, there being 62 vessels of over 10,000 tons under construction, as compared with 55 at the end of 1919.

Important trials with pulverized coal and "colloidal fuels" have been carried out recently on the Great Central Railway, England. Colloidal fuel is powdered fuel suspended in thick oil, and pulverized coal is dry coal reduced to a fine dust. The trials, which were made in comparison with ordinary coal, showed that the special fuels could easily maintain a full head of steam with a high degree of superheat, even on heavy gradients and sharp curves. Locomotives adapted for burning pulverized coal or colloidal fuel show an economical freedom from ashpan cleaning, smoke-box cleaning and repairs, fire cleaning, and so on. Further, when the locomotive is delayed in a siding there is much less waste of fuel than in the case of ordinary engines.

MANUFACTURING DELAY REPORT

Sheet Metal DEPT May 14th 1920

This Report must be sent to Supts office at 7 A M daily whether or not a department was delayed for any reason. Report Shortage of Material, Breakage of Machinery, Stoppage of Power Mistake in Ordering, or anything that interferes with getting out a full days product

Number of Employees sent home	No of Employees transferred to other Dept's	Number of hours idle	Number of day work hours allowed	CAUSE OF DELAY
				1030 N from Press in Forge
				Route Forge to Press
				to Sheet Metal
				Press in Forge Shop broke down

APPROVED A L Bland FOREMAN

FIG. 2—THIS DELAY REPORT HAS SAVED MANY AN EMBARRASSING QUESTION.

WELDING AND CUTTING

Welding is Steadily Gaining Favor in Boiler Industry

By ARTHUR MALET

THERE is no question but that welding in general and oxy-acetylene welding in particular is steadily gaining in favor in the boiler industry, as is evidenced by the number of shops in which its use is gradually being extended in regular production.

This interesting statement is made by the above author in a recent issue of Acetylene Journal; and he goes in the following manner:

Although it has been condemned by some individuals, the causes of failures of oxy-acetylene welding are generally traceable to the inexperience or poor workmanship of the operator. To become a good welder or to be efficient in any line of work, it is necessary that a man must like that work and try his hardest at all times to produce the best results of which he is capable.

In the case of oxy-acetylene welding, the operator must study the action of the metal when subjected to the intense heat produced by the flame and understand why the welding progresses as it does. He must watch his flame and keep it neutral and be sure that he is actually welding and not simply sticking the metal from the filler rod on to the piece being welded. He must learn how to handle his torch and the filler to the best advantage. He must also be a cold-blooded sort of chap to be able to stand the intense heat in which he must sometimes work if he is welding a piece surrounded by a bed of red-hot coals, as happens when preheating is necessary.

In the shops where the writer is located the torch is put to every possible use in the work. In its cutting capacity it is used to burn out all staybolts and old sheets and to cut all rivets. If the operator is careful, he can bevel the sheets to be welded with the cutting torch and save time and labor that would be required to do the same work with a chisel and air hammer.

Ash pans are in a great many cases welded now and seem to give as good service as pans with angle irons and rivets. In building up ash pans the pieces of plate may be riveted to the casting before or after welding. The sides of the pan are held together at the top by a wire clamp. Before the welding is started, thin wedges are driven between the edges of the plates, forcing them apart about ¼ inch.

All tool boxes used by the engine crews are welded. These boxes are built up of No. 12 gauge sheet iron and are 18 inches long, 8 inches wide and 8 inches deep. Welding is done from the inside, the outside edges being smoothed after the operation is completed.

The great speed that can be accomplished in doing any of this shop work by means of welding is very much in favor of the process.

Recently it was necessary for the men in the shop to put a patch in the left back mudring corner of an engine. The patch was to cover an area which included two staybolts, eight mudring rivets on the door sheet, and three mudring where it lapped on to the side sheet, and three rivets in the running seam. It took just eight hours for a boiler maker, a helper and a welder to remove the old piece and weld the patch into place. All that remained after this was to drill the holes for the mudring rivets, drive the rivets, apply the two staybolts, and chip and caulk the patch.

Incidentally, the cutting torch was used to burn off the staybolts and the old sheet, as well as to preheat the patch when it was being laid up.

As yet we have not had to install any new side sheets or flue sheets, but probably will in the near future. When this becomes necessary we intend to try cutting out the top of the back flue sheet just below the braces and weld in a new top piece, as several of the flue sheets are badly worn in the tube area, but perfectly sound below.

Can You Weld Successfully with Ethylene?

THE rapid and successful growth of the oxy-acetylene industry has led, from time to time, to attempts to replace it by some other combustible, often introduced with advertising boom and supported by statements which will not withstand criticism. We have frequently dealt with processes which on paper have appeared to be serious rivals of acetylene welding, but which have failed to survive the formidable test of industrial application. A search in the advertisement columns of technical journals for these processes shows invariably that "they have had their day and ceased to be." Thus comments the Acetylene and Welding Journal in a recent issue.

At the present moment welding with ethylene is receiving a great amount of attention by the technical press, due to the glowing description of its possibilities given by Mr. R. B. Tunison before the American Chemical Society. We cannot do better than quote his statement regarding this process.

Mr. R. Tunison maintained that in many respects the ethylene flame is far superior to the acetylene flame for cutting and welding metals. As far as the heat of combustion is concerned, ethylene has a slightly higher value. It has a rapid rate of combustion, preventing loss of temperature from absorption and conduction of heat by the metal being cut, and it will produce a rapid rate of cutting with a low consumption of gas, making a high efficiency possible from the regular operators of the blowpipe. It is a non-poisonous and safe gas without objectionable odor, and has a clearly-defined cone in the flame, without which a workman would be badly handicapped. In the working of copper it has been impossible to make a satisfactory weld with acetylene because of the formation of carbon and the consequent blistering in the weld. Perfect copper welds have been obtained with ethylene. In aluminium welding and lead burning, ethylene is infinitely better than acetylene. There is no carbon formation, and no kick back in the burner, while a terrific heat may be maintained. Ethylene is much safer to handle than acetylene, since it does not explode spontaneously. It can be compressed and handled in the standard form of gas cylinder with-

out either packing or acetene. For this reason it is possible to make a saving of half the cost of cylinders and about half the cost of freight. Furthermore, ethylene can be compressed so that a cylinder will hold over 200 cubic feet of ethylene. The weight of ethylene per 100 cubic feet, including the container, is only 40 lbs., as compared with 90 lbs. for acetylene. Ethylene is sold at the same price as acetylene. It may be used in an ordinary welding blowpipe, but preferably one with a mixing chamber. A change in the size of tip is also desirable.

A first perusal of this statement might lead to the assumption that at last a process which must displace acetylene has arrived But manufacturers and those familiar in detail with oxy-acetylene welding will have no apprehensions as to it arresting or displacing the acetylene process. Ethylene belongs to the class of compounds known as hydrocarbons, of which there are hundreds, all more or less thoroughly studied. Although ethylene has been known for a very long time it has never been considered as a combustible for welding purposes. It is most conveniently prepared by the action of sulphuric acid upon alcohol. The statement regarding the great superiority for cutting purposes on the grounds of combustion will be found to be mythical. The fact that one volume of the gas requires three volumes of oxygen for complete combustion shows that for comparative purposes of costs this property would become important. The question of safety, carbon deposit, and back-firing made by the writer, are open to criticism. It should be clearly understood that acetylene cannot be exploded, detonated, or otherwise set off, in any manner that could warrant it being called explosive. The mixture of ethylene with the quantity of oxygen required for complete combustion is a powerful explosive, and carbon formation and backfires are just as probable with ethylene as with acetylene. The writer's references to copper and aluminium welding, and lead burning are, as most of our readers will know, incorrect. Ethylene burns in air with a luminous smoky flame, and the statement that it should be used preferably in a blowpipe with a mixing chamber is distinctly good. Enough has been said to show the value of the comparisons made between ethylene and acetylene, and it remains for the supporters of the process to produce the necessary industrial judgment to place it in its proper position as regards being a rival of acetylene welding.

The Large Locomotive Boiler

By F. W. BREWER

THE boiler is essentially the most important part of a locomotive. It must be carefully designed, well made, and constructed of the best material, since, besides the stresses due to steam pressure, it has to withstand the strains caused by expansion and contraction, and also those arising from the severe conditions under which locomotives ordinarily work. Moreover, continues "Locomotive," as it is difficult to determine with absolute accuracy all the stresses to which it is subject, it must be of such strength as to provide an adequate margin or factor of safety. Whatever its defects may be there is no doubt that the ordinary multitubular locomotive boiler, on the whole, is admirably adapted to fulfill the duties peculiar to railway traction. It has one conspicuous advantage in that it enables a large amount of heating surface to be got within a comparatively small compass. This is of the utmost importance, because, other things being equal, the hauling efficiency of the engine is entirely dependent upon the capacity of the boiler, which should be large enough to supply more than sufficient steam for ordinary requirements in order that the engine may be able to respond to special demands upon it for greater power. It being essential, therefore, that steam should be generated as rapidly as may be necessary at all times while the engine is running, the whole heating surface must be arranged so as to effect this object, and this is best accomplished by allowing both steam and water to circulate freely throughout the boiler.

Heating Surface Versus Power

It must not be supposed that a large amount of heating surface necessarily means a high evaporative power, or that a nominally small heating surface invariably implies a low evaporative efficiency. The boiler barrel, for instance, may be so overcrowded with tubes as to render ineffectual the greater proportion of the heating surface presented by them, due solely to the absence of a proper circulation. The disintegration of the steam particles from the water is then consequently retarded, so that the water is apt to rise with the steam and produce what is technically known as priming. Similarly, if the water spaces surrounding the firebox are too narrow, and if the sides of the box are vertical instead of being inclined towards the top, the circulation of the water is again impeded, and the production of steam is consequently injuriously affected. From this it follows that for a boiler of a given diameter and length (including the firebox casing) it is better to employ a relatively moderate number of tubes and to sacrifice some of the width and length of the inner firebox, the alternative advantage being a much better circulation of the water by reason of which a greater quantity of steam is generated in a given time, while the formation of scale is lessened and the tendency to priming reduced. Again, the proportion of firebox surface to tube area, the length and diameter and arrangement of the tubes, apart from their number, and the diameter of the boiler barrel itself are all matters which must be taken into consideration as affecting steam production. Thus the firebox, which is exposed to the incandescent fuel and heated gases, has a much higher evaporative efficiency per square foot than the tubes, so that, within limits, it is always preferable to use as large a firebox as possible, consistent with the work to be done and the quality of the fuel employed. The tubes, however, play an important part in the economy of the engine, since they serve to utilize the heat as it leaves the fire box, and by imparting the heat to the main body of water in the barrel, though necessarily less effectively than the directly heated plates of the firebox itself, they provide, nevertheless, an indispensable contribution to the total heating surface.

Length of Tubes

As regards the length of the tubes, practice teaches us that the minimum for modern express engines should be 12 ft. between tube plates, while this length can often be advantageously increased, because in such engines the velocity of the escaping gases is usually very high, and long tubes, therefore, abstract a greater proportion of heat than do short tubes. The tubes are arranged either in vertical or in diagonal rows. Vertical rows are generally considered preferable as it is thought that they promote circulation and assist the rising of the steam bubbles, at the same time allowing solids in the feed water to pass to the bottom of the boiler. To compensate the lower evaporative power of the tubes, their aggregate area in contact with the water is very large compared with that of the firebox, and may be anything from ten to fifteen times greater.

At one period the size of the boiler as a whole was mainly governed by the mean theoretical tractive force which an engine was calculated to develop with a given load at a given speed. That is to say, a boiler of minimum dimensions was generally provided, and this sufficed for moderate needs. Modern requirements, however, have by degrees reversed this order of things until to-day it may more correctly be said that the hauling power is only limited to the extent to which the size of the boiler can be increased. It is now fully recognized that the actual—as distinct from the nominal—tractive force is appreciably augmented by enlarging the steaming capacity for a given cylinder volume. The dimensions, therefore, can only be said to define the minimum size of boiler necessary for a given theoretical tractive power. They cannot of themselves be taken as a general indication of the absolute power, for that is inseparable from the boiler capacity, and will be greater proportionately to the increased facilities for steam production. Most British locomotives, it is true, have done exceptionally good work, hav-

(Continued on page 64)

DEVELOPMENTS IN SHOP EQUIPMENT

"LETTGO" MECHANICAL OVERLOAD RELEASE

An effective "safety-first" mechanical device that will instantly disengage a drive when the load exceeds a predetermined point, has been developed by the Link-Belt Company, 910 S. Michigan Ave., Chicago, Ill. It is known as the "Lettgo" Mechanical Overload Release, and is especially adaptable for elevating, conveying, and power transmission machinery.

This release will automatically disengage the driving from the driven machinery if the load exceeds the fixed amount, thus allowing the driving motor or other source of power to run free and prevent damage, due to the inertia of the motor armature or other high-speed moving parts.

The construction of this device is such that it will release whether the load is gradually or suddenly applied, but it can

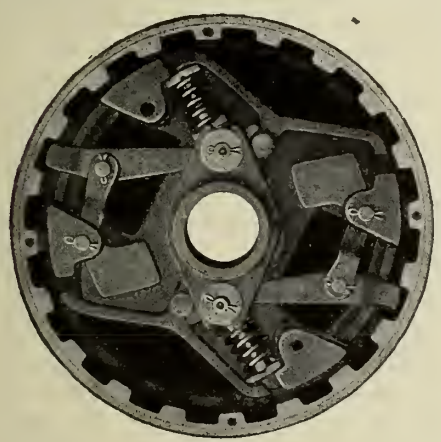


FIG. 1—"LETTGO" OVERLOAD RELEASE WITH PARTS IN POSITION FOR DRIVING.

be set so that it will not trip from jars or shocks.

It is symmetrical, and can be assembled to operate in either direction, and can be adjusted for tension, so that it will operate for any desired overload. The mechanism is entirely inclosed and can be packed with grease for lubrication purposes.

Following is the action of the release:

The spider A, keyed to the shaft B, has triggers C pivotally mounted on the links D, with the ends engaging inside notches in the rim of the drum F, and rollers K.

The springs E, regulated to any desired pressure by the adjusting nuts H, hold the ends of the triggers on the rollers K, under normal conditions, but when the drive is over-stressed, the

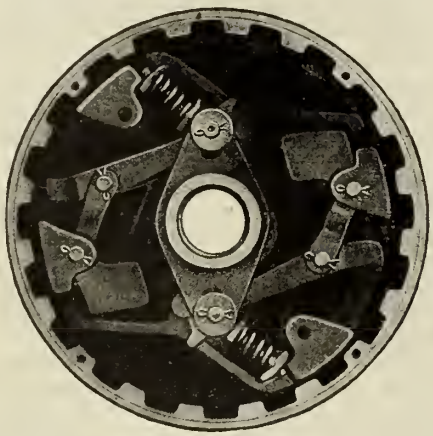


FIG. 2—THE OVERLOAD RELEASE WITH THE PARTS IN RELEASED POSITION.

compression of the springs will permit the ends of the triggers to drop into the position shown in the enlarged section, releasing connection with the rim F, and allowing the driven machine to stop immediately.

To set the triggers again in the driving position, the collar J is provided with fingers that engage the pins on the lower ends of triggers C. By turning this collar with a spanner wrench, the triggers are moved to the original position, and the outer ends at the same time enter notches in the drum F, thus re-establishing the transmission connection. The cover G, fitting the end of the drum F, incloses and protects the entire mechanism. The hub of the drum F may be extended to receive a wheel or gear, and have a bushing for running loose on the shaft; or may be keyed directly to a separate shaft, thus forming a coupling device, in which either element may be the driver.

DIRECT-CURRENT SERIES-WOUND MOTORS

For severe intermittent varying speed service where heavy starting torque is required, such as for cranes and hoists, the Westinghouse Electric & Manufacturing Company has recently brought out the type "HK" direct-current, series-wound motors. These motors are especially designed for use where the load consists of a series of starts, stops and reversals, the motor being idle for only short periods of time.

These motors are of enclosed construction with small openings in the lower part for ventilation. Covered openings in the top half of the frame give access to the brushes and the commutator. The most prominent feature of this motor is its compact construction, giving small overall dimensions, light weight and great mechanical strength.

The motor has a forged open-hearth steel frame and solid forged-steel feet. The motors above three h.p. rating are equipped with commutating poles so that high momentary loads can be carried without series sparking, and long life of commutator and brushes thereby insured. All field coils are thoroughly insulated and impregnated. The brackets are strong and rigid, each complete with oil well and bearing housing. Oil ring

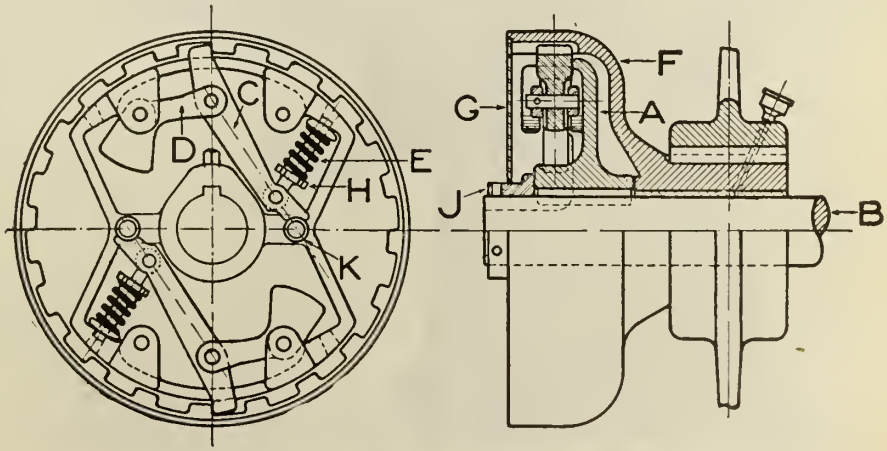


FIG. 3—DIAGRAMMIC VIEW SHOWING THE CONSTRUCTION OF THE DEVICE.

lubrication is used. The brush holders are clamped to insulated rods mounted on the front bracket which are dowelled in place. The position of the brushes is thereby fixed for both directions of rotation.

Armature coils are form-wound and thoroughly insulated and impregnated

GENERAL VIEW OF MOTOR.

before being placed in the slots. A blower is placed in the rotor which effectively ventilates both armature and field windings. This allows a smaller diameter armature to be used, resulting in low flywheel effect, consequently little energy is required to start and stop the motor, thereby reducing to a minimum, wear and tear on bearings and brakes.

Electrically-operated shoe-type brakes are supplied when ordered. They are bolted to the machined lugs on the motor bracket, making a compact unit of motor and brake. The brake is simple and rugged, and provision is made for adjusting for wear of parts.

The company states that the ability of any motor to do its daily work, as far as its temperature rise is concerned, is determined by the continuous rating it will carry at a safe temperature. A ventilated motor has a larger continuous rating than a non-ventilated motor of the same short time rating. A ventilated motor rated 7½ h.p., one-quarter hour, has about 30 per cent. more continuous capacity than the non-ventilated motor rated 7½ h.p. one-half hour.

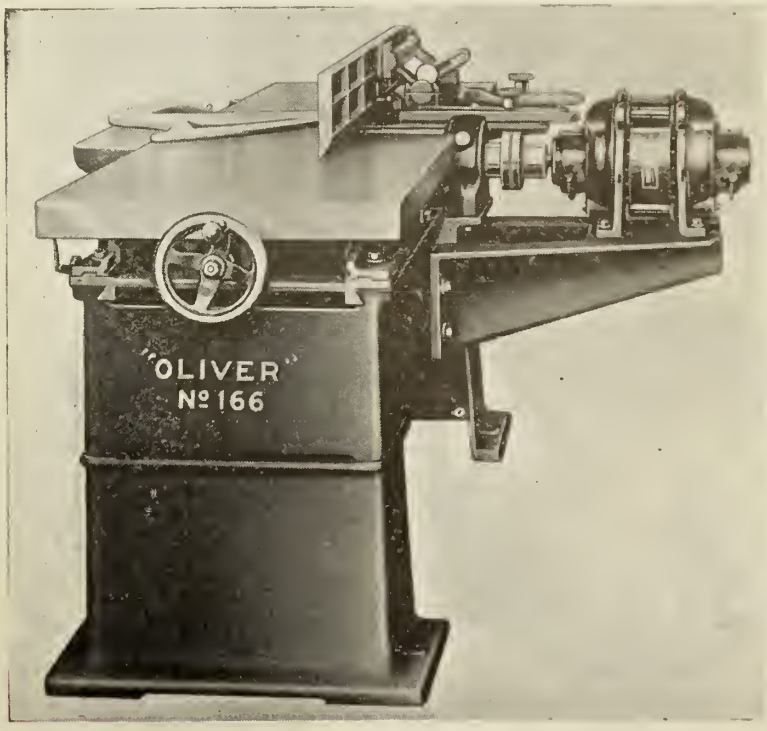
DIRECT MOTOR-DRIVEN PLANER

The Oliver Machinery Co., Grand Rapids, Michigan, U.S.A., have forwarded us some interesting data regarding their new direct-coupled, motor-driven, ball-bearing hand planer and jointer. They comment as follows regarding this machine, which is illustrated herewith:

For some time we have put out a machine with the motor built right into the machine, but being limited to three phase, 60 cycle, 220 volt. We decided to bring out this new type of jointer which would permit the use of any current motor providing the speed is approximately 3,600 r.p.m. That is, we can furnish this type for direct current or for alternating current or for one, two or three phase in the various voltages.

This machine has all the advantages of our No. 166 Ball-Bearing Jointer, at the same time eliminating bothersome belting and the danger that accompanies such belting. There is no necessity for belt guards; it saves room on the floor. It operates at a greater efficiency because of there being less bearings and no belting.

This machine is equipped regularly with three high speed knives in the head, which is of the Oliver round or safety type. The machine above described does especially smooth work and is highly recommended for furniture plants, cabinet shops, pattern shops and other institutions requiring a smooth and accurate cutting jointer.



VIEW SHOWING DIRECT MOTOR DRIVE.

AUTOMATIC HOB-GRINDING MACHINE

The H. E. Harris Engineering Company of Bridgeport, Conn., have placed on the market a new type—No. 815-B—automatic hob-grinding machine that will grind hobs with any number of flutes up to 26, not exceeding 8 inches in diameter and 10 inches long. The adjustment that controls the rotation of the hob can be made within one-half minute of the arc, and can be changed while the machine is in motion. Indexing is automatic and is made while the machine is in one position only. The grinding head is so mounted that it may be swung to the required angle for grinding the flutes of helical hobs. An automatic feed is provided, and this can be disengaged when the desired amount of metal has been removed.

BENCH LATHE PLANING ATTACHMENT

An attachment for the cutting of keyways, small internal gears, slotting, etc., has been brought out by the Elgin Tool Works, of Elgin, Ill., for use on their small bench lathes. The stroke is adjustable from ½ inch to 1 inch, and the feed is regulated by a large knurled knob. A clapper is provided for tool relief on the return stroke. Either round or square tools may be used.

FAIRBANKS TRACK SCALE

Several new features have been embodied in the track scale recently developed by the E. & T. Fairbanks Company. In the new construction a special web section replaces the customary section levers. Unequal loads are more evenly distributed by the adoption of the web type of lever, as the initial load is suspended from the centre of the main lever bearing, and from there is transmitted through the true centre line of the lever to each succeeding bearing. The construction is such that the load on each through the true centre line of the lever are so designed, that there is neither torsional strain in the levers nor any tendency to displace the levers from their bearings, nor to produce unequal wear upon different parts of the same bearings. These scales are built in four sections, and in two capacities of 60 tons and 75 tons per section. The difference between the light and heavy duty scales is mainly in the loading per linear inch on the knife edge, this being 6,000 lbs., and 5,000 lbs. respectively.

The Brush Pilot Gauge Company, of Springfield, Mass., are now making plug gauges with a brush attachment on the nose, that cleans out the hole before the gauge enters, thereby minimizing the wear and assuring greater accuracy in gauging.

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The Week in Passing

NEW stories come in almost every week regarding the manner in which Canadian manufacturers are chasing material across the line. They quit months ago depending on letters, wires, telephone calls, or any such thing, and have substituted the more costly, but more certain, method of placing their own men at various points at the border and at the mills. In some cases the reliable truck is doing great service in getting material direct from the mills to the tracks where freight is moving in the direction of the Canadian border. It is an expensive way of doing business, and it is adding considerable to the cost in Canadian plants, but there is the poor option of doing this or trying to get along with driblets coming in at the receiving end of the plant. The Canadian manufacturers are showing a spirit of determination that is commendable, and it speaks well for the future development of business in this country.

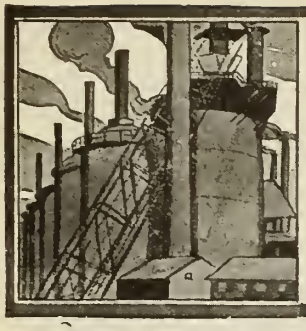
IF transportation facilities were normal, or anything approaching it, it is the conviction of many conservative business men, that the machine tool trade would be in the midst of one of the greatest business seasons it has ever experienced in Canada. Shortage of material, delay in shipping machines, and other well-known conditions have tended to keep the brakes on for some months past. There is a big volume of this trade that is going to stay good. It is not going to pass out simply because it could not be attended to at once. When conditions become such that it is possible to get supplies, a good deal of buying will begin. Building costs have also been responsible for spoiling a considerable amount of business for the machine tool trade. When equipment is purchased to any extent, the chances are that a new house is required to properly care for it in such a way as to secure maximum results. Several propositions that would have called for a nice line of tool equipment have been scared off the market, but not out of existence. Moderating costs will bring them back to life.

THE Department of Overseas Trade in Canada, in the yearly review of business conditions in the Dominion, draws attention to the fact that "there is room for much more advertising by the majority of United Kingdom firms doing business here. The local agents among others, should be consulted as to the best methods of expending the advertising appropriation." This matter has been brought up before, and firms in Canada trying to push British-made goods find that they are handicapped in that they do not get the aggressive and whole-hearted support that American firms put at the disposal of their representatives in this country. The British manufacturer ought to remember that when he comes into the Canadian market he has got to get out and scratch for the business. The printed page often gets a hearing while the salesman is warming his shins on the waiting bench outside the office door.

THOSE who are engaged in the controversy about building or taking over transportation lines in Ontario for the purpose of electrification, should think seriously and well about the changing aspect of transportation. It is folly to overlook the coming of the truck, as well as the passenger car. Banks are recognizing this in many places, and are financing the making of trucks and tractors, but not passenger cars. When well-built highways are put through the country, and the use of trucks is made possible and profitable, there is bound to be a falling-off in the call for electric or steam road service. The form of locomotion that will take the load from the barn direct to the city market is by all odds the most desirable, as the start, the route and the terminal are all capable of being adjusted to the convenience of the truck owner.

ONE writer draws attention to the fact that a number of Canadian firms, which have formerly confined their efforts to home business, do not study all the tariff regulations in order that they may take advantage of them. He states that some firms are not aware of the fact that they are entitled to a rebate on duty paid on material brought in from United States, made up in Canada, and exported. He goes on to cite a case where, when this was found out, the Canadian exporter was able to make a considerable reduction in his export price, which put him in a very favorable position to meet other competition. The Department of Trade and Commerce could well afford to see to it that every manufacturer was advised of these regulations. It is generally taken for granted that all this information is thoroughly known to the trade, but it is possible that firms entering the export field for the first time may not have gone fully into the regulations. A Canadian firm entering the foreign field should be armed with every weapon its government can hand it.

ARE we facing a better steel market from the standpoint of the consumer? There are some who state openly that we are, and give actual cases to back up their opinion. Just how this will come about cannot be stated precisely, but it would be reasonable to suppose that the disappearance of the premium market would lead the way, and there are indications of the shrinkage of this unpopular thing. If there were enough cars at the mills now to take away the material that is piled there, we might find that we would be very close to a normal steel market. Traffic troubles, strikes, and rumors of strikes have been as spring tonics and summer stimulants to the fagging premium market. A re-established freight service would be a real steam roller for the premium business.



MARKET DEVELOPMENTS

Hustling Now to Secure Their Material

Canadian Firms Are Keeping Their Own Men at U.S. Points of Supply in Order to Secure Shipment—New York Market Reported Very Quiet—Scrap Situation Dull and Uninteresting.

CANADIAN industries are displaying no small amount of enterprise and ingenuity in trying to keep a sufficient amount of material coming to their plants. The old order of things is quite reversed, and it is now a case of a firm not only ordering material, but spending money, and lots of it too, in making sure that it comes to their premises. Many of the establishments in this country have men at Buffalo, Toledo, Pittsburg, Youngstown, and other points, as well as between the other producing centres and the border. Their business is to get the material their plants must have to keep going. One firm has two crews with large trucks taking steel from several of the mills to cars on lines that are moving freight with fair rapidity, and making certain that they get started toward the Canadian border. Of course all this adds considerable to the cost of the finished product.

There is a fair volume of business being done in machine tools, although none of the dealers have anything in the line of large orders for equipment. Several firms hold to the belief that an easing off in the price of building will be a good thing for the sale of machinery, as an order for a large amount of equipment generally means new housing for it. Several fairly large expenditures in machine tools are hung up now on account of the too high price of the necessary building.

There is a dull market in the scrap metal trade. Some dealers have had to come out and buy this week, but they have done it at a fraction under the quoted prices. As a general thing those having material to sell are advised to hold, as there may be an improvement in the market.

MONTREAL IS GETTING MORE MATERIAL FROM STEEL MILLS

Special to CANADIAN MACHINERY.

MONTREAL, July 15.—Combinations of circumstances at the present time tend to retain the industrial situation in a more or less disorganized condition. The irregular receipt of material, including fuel, and the general slowing up of activity at this period of the year, are a few of the factors that add to the difficulties of carrying on normal business. Many plants have experienced the troubles on ineffective operation as a result of the inadequate supply of coal and raw materials, some factories to the point of closing down. Shortage of cars has frequently been given as being the cause of delayed shipments, but this is very often counteracted by the appearance of empties standing idle at different points. At the present time about 300 empties are awaiting movement from a siding on the south shore of the river. It would seem that the supply of cars in the aggregate is equal to the situation, but district shortage is pronounced owing to the periodical congestion at terminals, particularly at ocean ports. The application of the railroads to the Canadian Railway Board, for a 30 per cent. increase in freight rates, has created considerable interest in trade circles, and while some time will probably elapse before any definite action is taken, the possibility of higher charges, though no doubt justified, will nevertheless add to the difficulties of trading in general, and will probably mean further adjustments in other directions. Some of the engineering plants in this locality report more normal activity owing to the renewal of regular supplies of castings. The local foundries are quite busy trying to overcome the handicap of a six week's suspension.

The steel situation has not shown any marked improvement, although to some extent the mill output has been increased, but railroad facilities are inadequate to supply manufacturers with needed requirements. The metal situation, with the exception of copper, seems to foretell a buying movement. Machine sales are falling off with general supplies about normal.

Betterment in Steel

Steel dealers in this district report a fair volume of material coming in from the mills, but not more than can be placed in the hands of waiting consumers. It would seem that the general demand for steel lines is not quite so brisk just now, and the impression is that production is gradually getting to the stage when mill and warehouse supplies will show steady accumulation, despite the fact that midsummer operations tend to lower the normal output. There is considerable dissatisfaction expressed by some dealers and manufacturers, regarding the non-delivery of material, both in connection with non-shipment and delay in transit. It is claimed that considerable rolling stock has been diverted for the transportation of coal and raw materials, the result being to assist the producing end of primary industries at the expense of other manufacturers. However, it is anticipated that the improved conditions now developing in the mill districts will be reflected in other directions, so that the early fall will experience a country-wide improvement in every branch of industrial activity. While no actual change is announced in warehouse conditions, the reports of dealers would imply that better inducement is being offered from the sheet mills, and it would seem that lower prices and more favorable shipments would probably rule in the early future. Dealers are still able to place all material coming through, but prospects are for larger surpluses for warehousing. Tubes are still in demand and hard to obtain.

Metals Show Weakness

Recent inquiries for copper for export have been quite encouraging and it is believed that the market will take on some strength, or at least retain the firm position it now holds. The local market is well maintained and sales are reported as seasonable. Other metals are inclined to be easier and the market is reflected in the lower quotations on tin, which is quoted at 62 cents; spelter at 11½, is one cent lower; lead has declined on weaker demand, and the price asked is 10¾ cents, a drop of ¾ cent on the previous quotation. Antimony is quoted at from 13 to 14 cents per lb.

Supply Demand Fair

Apart from the slight betterment reported in supply movement, the machine tools situation shows little change over last week. The summer months, invariably, are a period of lesser activity, and this, along with other conditions, such as curtailment of industrial enterprise, due to insufficient material and fuel supply, tend to put a damper on business, so that sales are usually reported on a lower basis. Orders on heavy tools are less in evidence and inquiries for used machinery have fallen off, Supplies, while quiet, are the feature of the present business, and dealers are apparently well satisfied with accessory requirements. Old country goods are coming to hand readily and delivery from this source is well within the time limits, with few exceptions.

Scrap Movement Restricted

The market is still devoid of any condition with feature characteristics. Some hope was entertained that considerable trade could be developed with Britain, following the reported need there, but the inability to get transportation for this class of freight, and the high rate prevailing, makes the prospect very doubtful, if not prohibitive. While the local movement of machinery scrap continues in fair volume, the business in old materials, generally, is below normal. Non-ferrous metals have their ups and downs, fluctuating both in demand and price, so much so, that quotations are based on sales rather than on actual prevailing condition. Prices quoted are a fair average of what dealers are paying, with the tendency lower.

CANADIANS TRUCK THEIR OWN STUFF

In An Endeavor to Get Material From Mills to the Roads That Are Moving

TORONTO.—"We have no complaint about the business we are getting. Of course at this season of the year we expect there will be a little dropping off, especially if the call for the equipment is not pressing. But we are looking for better business, and it is going to get better just as quickly as the railroad situation gets to the point where it can take care of it. It is our firm belief—and there are others who hold the same view—that had there been good railroad service the Canadian trade would never have seen a greater season for the selling of machine tools than right now. A great deal of this business is still good. One of the things that will help in bringing it into the market is a more reasonable and stable level in the figures for building. From what we can judge, conditions in Canada are fundamentally sound, and early fall will bring all the trade we can possibly get the material to accommodate."

The Scrap for Material

Canadian firms are getting to the point where they know what it means to get out and dig for their material. It used to amount to getting out to dig for the orders, but it is not yet a case of that so much as chasing material. For instance, one well-known Canadian firm has a number of men at one of the Pittsburg mills while another group works around Youngstown, in the steel district. They have a number of heavy trucks, and as soon as they locate any material belonging to their mill they grab it, and run it away to a line that is operating fairly well, fill and seal the cars and see that they get headed out pointing to the Canadian border. This performance is costing them quite a penny, but it means that they are able to get production instead of being at the point of closing down.

One Toronto dealer stated that he had instructions from several firms in this district to get material, no matter how it was sent. They are all willing to stand the added expense of having stakes put in as supports around the sides of flat cars, an unusual way of shipping many lines of steel. The mines are getting the preference on anything that looks like coal-carrying cars now. One Toronto dealer was in Chicago a few days ago at one of the mills there. This mill had a shipment of light rails for one of the mines that was shipping coal to them. They could not hold the cars long enough to get this shipment on board and send it on the return trip to the mines. The claim is made that were an exception made in this case it would create a precedent, and in the end defeat the drastic order that has been put into force to deal with the coal situation.

Little Arriving Here

The warehouses here are getting little assistance from any quarters this week. Shipments are dwindling away from the rather small figures of a few days ago. Reports of cars coming in after having been on the road six weeks and two months are quite common, but it is a healthy sign that practically all this business remains good, and cancellations on account of slow delivery are not often met with.

One view was expressed in the steel market this morning, viz., that many of the cancellations in other lines were not due to the fact that people did not want the goods, but rather that they were using the cancellation option as a club to batter down prices from their present high levels, and that once this were accomplished the orders would come in again. The fact that there is a demand for all sorts of material is one of the best indications of the fundamental strength of the market.

Hardly any class of material owns up to getting good treatment now. One can go over the list of material coming in, or rather not coming in, and be assured that sheets, bars, tubes, plate, etc. are all very slow in arriving, although the trade is getting a little more assistance now in the line of bars from the Canadian mills.

There is a scarcity of labor in some of the local steel warehouses. The work is fairly heavy, and apparently the available men can find easier jobs elsewhere.

No Recovery in Scrap

The scrap market is quiet. Some of the larger dealers had to come into the market a few days ago and take on quite a tonnage in order to cover themselves on promised shipments, and this they were able to do at half a cent under the market. Although it is possible to take on material at fractions off the recognized

POINTS IN WEEK'S MARKETING NOTES

Canadian firms are trying many unusual ways of getting material from U. S. points, and are keeping their plants going fairly well in spite of this trouble.

New York machinery market claims that in several cases large buyers are staying out, waiting for a reduction in prices.

Cancellations in some lines are not because firms do not want the material, but the belief grows that an attempt is being made in this way to batter down existing price schedules.

Warehouses are getting few deliveries this week. This refers to sheets, plates, tubes and bars

Large dealers in scrap are advising their customers to hold their material. Some buying was done during the week to cover contracts, but the material was taken in at a fraction under current prices.

U. S. Steel Corporation's unfilled obligations increased during the month of June by 38,351 tons. The total on their books now is 10,978,817 tons, meaning capacity operation for at least eight months.

price, the yards show no tendency to buy as they do not want to take on any more stock. In most cases they are advising their customers to hold their material. There are very few buyers in the market now, and the demand is weak.

INDEPENDENTS KEEP GOING ON ORDERS WHERE DELIVERY IS OF BIG CONCERN

Special to CANADIAN MACHINERY.

PITTSBURGH, July 15.—Production of steel ingots in June by the 30 companies making monthly reports to the American Iron and Steel Institute was 2,980,690 gross tons, against 2,883,-164 tons produced in May by the same companies, which in 1918 made 84.03 per cent. of the total ingot output. Allowing for producers not making monthly reports, and taking account of the number of actual working days, the rates of steel ingot production for the whole industry appear to have been about 41,050,000 tons a year in May and 42,450,000 tons a year in June, showing an increase in the rate, from May to June, of about 3 per cent.

The production by the 30 companies reporting for the whole half year is 17,634,434 tons, equivalent to a rate for the whole industry of about 42,100,000 tons a year. This compares with estimated production in 1919 (official statistics not being available as yet) of 33,-000,000 tons, and reported production of 43,051,022 tons in 1918 and 43,619,200 tons in 1917, the record year for production thus far. In each of the two best years before the war, 1912 and 1913, production was about 30,280,000 tons, so that production in the half year just ended may be said to have been almost 40 per cent greater than the best average rate before the war.

The half-year's production was, however, far short of capacity, for capacity is between 50,000,000 and 55,000,000 tons a year, given reasonably fair operating conditions. Throughout the half-year there were serious manufacturing difficulties of one sort or another, except that conditions were moderately fair in March. In January there was a serious shortage of coke and this condition was not corrected entirely in February or March. In April came the outlaw rail strikes, greatly decreasing the movement of coal and coke, and after the strikes, as such, became of small moment there was a traffic congestion that greatly interfered with operation. The recovery in production since April has really been greater than might be expected from the loud complaints heard everywhere of insufficient car supplies for moving raw materials. The month of April as a whole showed a rate of ingot production of about 37,550,000 tons a year, but at the worst time in the month the rate was probably down to about 33,000,000 tons, while the rate at the close of June was probably about 43,000,000 tons, showing an improvement from the worst of fully 30 per cent.

Production of pig iron in June was at the rate of about 37,400,000 tons a year, showing an increase over the May rate of about 5 per cent. The production of pig iron increased more than the production of steel, indicating perhaps that the steel works piled pig iron to some extent during June, although it is possible that in May they were consuming some stocks previously accumulated.

In both pig iron and steel the June production was well in excess of the shipments. Pig iron was piled by a number of merchant furnaces, which had plenty of orders but were lacking in cars, while a number of consumers bought pig iron in the open market because they were not getting sufficient deliveries from their regular sources of supply. It has been the common remark of late that buyers of pig iron are really buying deliveries rather than pig iron. What they want is delivered pig iron. No one would at this time buy any pig iron that was to remain in the furnace yard for any length of time.

A rough guess would be that of the steel made in June between 75 and 80 per cent. was actually shipped, the remainder being added to the already large stocks in mill warehouses and yards. Assuming capacity in steel ingots to be 52,500,000 tons a year, the June production was at the rate of 81 per cent. capacity, while if shipments were 75 to 80 per cent. of production they were 60 to 65 per cent. of capacity. Thus whatever scarcity of steel there may be, and there is not as much scarcity apparent as a month or two ago, is to be attributed entirely to the difficulties in making shipments. If the mills could ship at their productive capacity the shipments would be 50 or 60 per cent. greater than they have been of late. A rough guess is that the accumulations of steel at mills now amount to the equivalent of a month's production at the rate lately obtaining.

Corporation Tonnage

The United States Steel Corporation's unfilled obligations increased during June by 38,351 tons, against increases averaging nearly 500,000 tons a month in the three preceding months. The increase in unfilled obligations is, of course, the month's bookings minus the month's shipments, not the month's production. as when the corporation rolls an order to customer's specifications and does not ship the steel it is not a filling of the obligation, the material being invoiced only as actually shipped. The June increase in unfilled obligations was about 5 per cent. of the month's capacity, while the June shipments may be estimated at about 75 per cent. of capacity (actual production in June may be estimated at about 90 per cent.) so that the bookings in a month appear to have been about 80 per cent. of capacity, this comparing with 112 per cent. similarly estimated for May and 94 per cent. for April.

The June bookings, while greatly decreased, were still quite large considering that the steel market as a whole was very quiet. It was only because the corporation has held its prices down to the Industrial Board level of March 31, 1919, while all the independents have advanced their prices, that the corporation's customers are willing, in this quiet market, to place contracts for such indefinite delivery as is now involved in the Steel Corporation's business. The 10,978,817 tons of unfilled obligations on books July 1 is equal almost precisely to the tonnage that would be made in eight months, operating at full capacity,

Montreal Notes

Jas. Coleman, formerly manager of the Boss Lock Nut Factory, of Montreal, has become associated with the Consolidated Equipment Company, with offices in the Transportation Building.

The prospect of a large modern hotel in the uptown district of Montreal, has again been revived by the visit of F. A. Dudley and G. H. O'Neill, president and manager respectively, of the United Hotels Company, to this city. Several sites are under consideration, but no definite action has yet been taken. It is more than likely that further negotiations will take place in an effort to have the limited height restrictions removed.

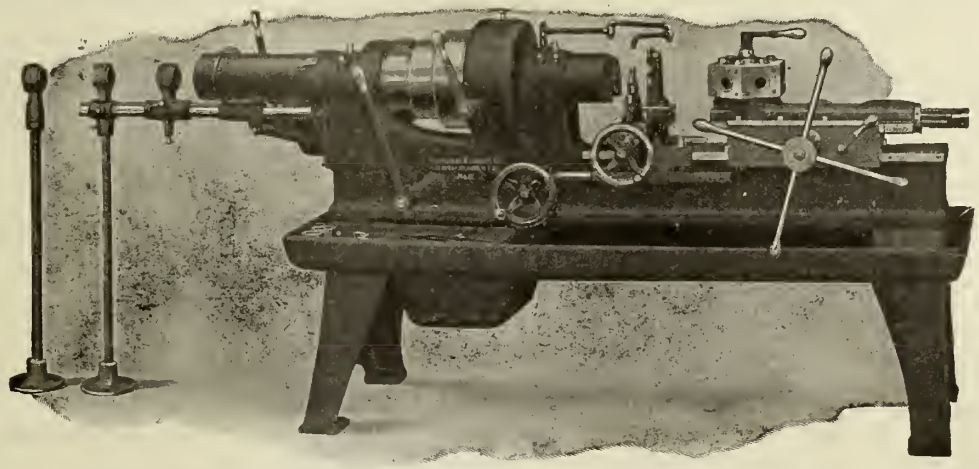
As an indication of what has been done by the Canadian Pacific Railway in re-establishing ex-service men, it has been stated that of the eleven thousand that enlisted from the ranks of the company over seven thousand has been re-employed, many of them in the same capacity as formerly. In addition to the reinstatement of ex-C. P. R. men, the railway company has given employment to over eleven thousand men, making a grand total of returned soldiers now at work of over 18,000.

Last Saturday about twenty prominent American manufactnurers from various points in the United States were in Montreal and spent the day as guests of the Montreal branch of the Canadian Manufacturers' Association. A sightseeing trip along the harbour front, on a special train provided by the Harbour Commissioners, was the feature of the morning. After luncheon the guests were taken for a trip around the city. Heading the party from the States was Stephen C. Mason of Pittsburg, president of the U. S. National Association of Manufacturers.

Warner & Swansey Screw Machines

For large output and close limits—If you are figuring on screw machine work you can depend on W. & S. machines being right for the job.

We can supply you from stock immediately.



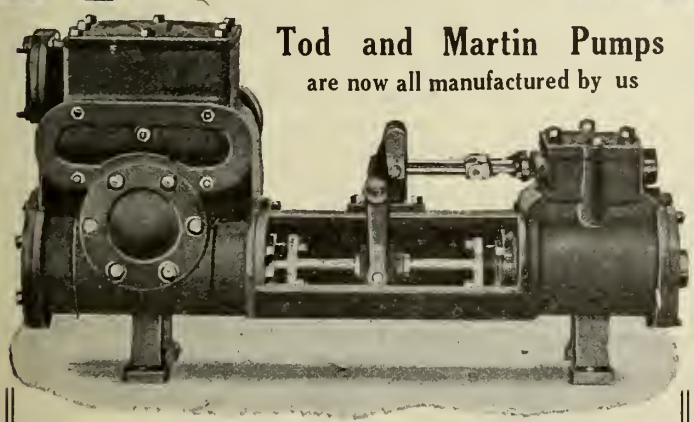
The A. R. Williams Machinery Company, Limited

ST. JOHN, N.B.
WINNIPEG, VANCOUVER

If It's Machinery—"Write Williams"

64 Front Street West
TORONTO

HEPBURN



Tod and Martin Pumps
are now all manufactured by us

Do you contemplate installing additional pumping equipment? We are at your service:

To advise on the type you need.
To estimate the cost.
To take your order.
To build your pump.
To give you satisfaction in every way. We are anxious To help you. Come and see us.

JOHN T. HEPBURN, LIMITED
Engineers and Iron Founders
18-60 Van Horne St., Toronto, Canada

When you buy Files, you buy Cutting Service.

When you buy P. H. or Imperial Files you buy the Best Cutting Service.

P H IMPERIAL

"They cut faster and wear longer."

Be File-Wise.

Ingersoll File Company, Limited.
Jno. Morrow Screw and Nut Co., Ltd.
Sole Distributors,
Ingersoll, Ontario.

INGERSOLL

or to March 1, 1921, as an average date, while operating at 89 per cent. of capacity the unfilled tonnage would carry the corporation to April 1 as an average date. Some departments have more orders than orders, in proportion to capacity, but the general statement can be made that the average customer of the Steel Corporation now placing a contract cannot expect delivery before the first or second quarter of next year. Customers of the independents, on the other hand, are buying for delivery any time from immediate to say three or four months hence. Beyond such a time they do not care to commit themselves, on account of the difference between Steel Corporation and independent prices.

NEW YORK SHOPS LAY OFF MEN AND GET THE SAME PRODUCTION

Special to CANADIAN MACHINERY.

NEW YORK. July 15.—The Norfolk & Western Railroad within the past week has closed for about $150,000 to $200,000 worth of shop equipment, including planers, punches and shears, lathes, wheel presses and other special railroad tools. These orders were placed against an inquiry for 72 machines, which was issued several weeks ago. Not all of the list was bought, owing to lack of sufficient appropriation. The Chesapeake & Ohio Railroad, which issued a list of its requirements some weeks ago, is expected to close soon. Other railroad business is in sight, but it is only prospective at this time, and there is nothing definite as to when inquiries will be issued. Some of the railroad purchasing departments are delaying action because of failure of the directorates to provide finances. Probably there will be greater railroad buying as soon as the new railroad freight rates, on which the Interstate Commerce Commission is now working, are announced. These rates will take effect Sept. 1. next, and will approximate 25 to 30 per cent. advance.

Buying by industrial companies is at low ebb. In many instances manufacturers quite frankly say they are waiting for prices to come down. They are also taking advantage of the present lull to work out a readjustment of the labor situation. Labor has had the upper hand for a considerable time, and now there are evidences of a change. Some plants have deliberately laid off men for the psychological effect it might have upon the workmen who are retained. In certain cases the reduction of working forces has worked like magic. The forces remaining at work have speeded up production so that the loss of men has not had much effect, if any, on the gross output.

COLLINGWOOD MAY ENFORCE THE PROVISIONS OF OLD AGREEMENT

Collingwood Bulletin : — This week there are some discomforting rumors going around in respect to the steel plant which it was recently reported as sold to the Baldwins, of Toronto.

The latest report is that the company propose to scrap the plant and that next week the work of removing it will be commenced.

The presence in town of a couple of strangers whose time was spent around the plant in conjunction with reported hiring of men gave rise to the report. Letters to the firm in Toronto are said to remain unanswered, in fact not acknowledged.

Taking it for granted that something more real was behind the rumors of removal, the town council have been looking into the agreements respecting the plant, with the result that there is ground for believing that removal is guarded against and that under certain conditions the town may step in and enforce payment of certain annual amounts.

It apears that the original agreement was entered into on March 5th, 1900, by Cramp Co., with Charles D. Cramp as president and J. A. Currie, secretary. By this a bonus of $115,000 was voted. On November 10, 1903, a new agreement was made between the Cramp Co. and the town of Collingwood, this being ratified by the act of the Ontario Legislature and assented to on April 26, 1904.

This agreement is signed by Dan Wilson, mayor; J. H. Duncan, clerk; J. Wesley Allison, president; J. A. Currie, secretary, with the seal of the corporation of the town of Collingwood and the Cramp Steel Co., Ltd.

By clause 7 of this agreement, the company covenants and agrees to properly maintain and operate the said works, and such works as shall hereafter be erected upon the said land at the town of Collingwood for a period of thirty years from and after July 1, 1904, and should the said works not be properly maintained and operated within the time intent and meaning of the agreement for a period of twelve months, the company shall, in addition to said taxes, repay to the corporation annually the sum of $2,000 for each year and every year remaining of the thirty years that the said company shall fail to operate the said plant as aforesaid.

A further clause provides that by this agreement the parties are free from the conditions and terms of the agreement of March 5, 1900.

In order to have the matter thoroughly understood, a special meeting of the council was called for Wednesday, when it was expected that Mr. J. Birnie, K.C., would present a legal opinion, this being done upon request of the council through the mayor.

PIG IRON TRADE

There appears to have been a more active demand for prompt shipment in the pig iron industry in general recently.

Recent transactions in the East totalling 40,000 tons were negotiated at mostly $43.

There is an increasingly active demand for prompt iron, but while prices are holding steady this grade iron is increasingly difficult to get.

There has been some effort to secure delivery for first quarter, but most furnaces are unwilling to accept orders so far ahead.

The Chicago market is brighter but the new embargo on shipping without special permit within the Chicago switching district is having a detrimental effect.

The transportation question is not quite so acute, some shippers reporting a better supply of cars, which may be due to accumulation over the holidays.

There is great complaint of the time occupied in transit, it being reported that shipments which used to take ten to twelve days now occupy twice as long.

The average market may be held at $45, small lots having been sold at $45.75 furnace.

Transportation difficulties and the shortage of coke and limestone are still the predominating factors in determining the condition of the pig iron market.

U.S. SCRAP METAL

Transportation difficulties are still acting as a strong deterrent to trading.

Some fluctuations in prices are noticeable, but the general situation is steady.

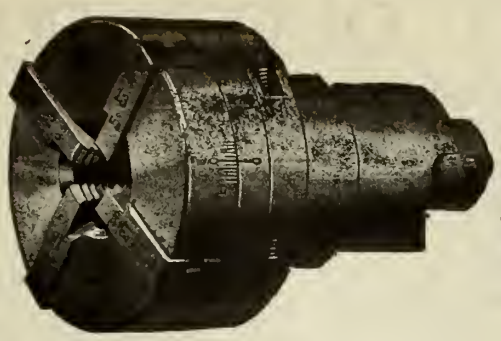
There was a heavy purchase recently of 50,000 tons by a Buffalo mill, half heavy melting steel and half hydraulic compressed; at an average of $25.00.

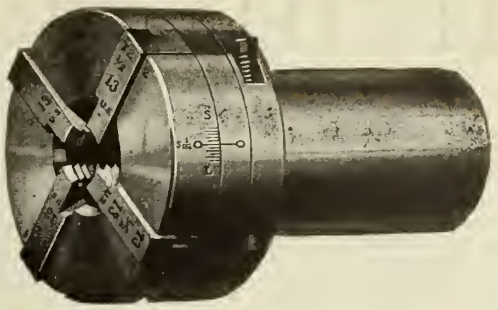
It is understood that heavy melting steel can be generally procured from $25.00 to $25.50.

Consumers in the middle west are confining purchases to materials on which they can get certain and quick delivery.

The dealers of the St. Louis district forwarded a protest to the Interstate Commerce Commission which resulted in a modification of the embargo on the use of open cars. This did not have the beneficial effect hoped for due to strikes and traffic congestion.

On the whole the general condition of the scrap market is steadier than last week.





Geometric Solid Adjustable Die Heads

When one uses the word "ONLY," he needs to be sure of what he is talking about. With confidence we use the word in saying that a Geometric Solid Adjustable Die Head, fitted with a set of milled dies, is the only solid die head that will back off without stripping the thread.

Geometric Solid Adjustable Die Heads may be fitted with either a releasing shank, plain shank, or with special shank for the Gridley Automatics. The releasing shank permits the head to disengage from the shank upon completion of the thread. The plain shank fits the head for use on the turret of a lathe or on a live spindle, such as a drill press.

Apart from the fact that it is not equipped with the self-opening feature or the roughing and finishing attachment, the Geometric Solid Adjustable Die Head is the same in principle and construction and will do equally as accurate work as the other styles of Geometric Die Heads.

Whatever the requirements, there is a type of Geometric Die Head best adapted to the work.

THE GEOMETRIC TOOL COMPANY
NEW HAVEN **CONNECTICUT**

Canadian Agents:

Canadian Agents: Williams & Wilson, Ltd., Montreal; The A. R. Williams Machinery Co., Ltd., Toronto. Winnipeg, and St. John, N.B.; The Canadian Fairbanks-Morse Co., Ltd., Manitoba, Saskatchewan, Alberta.

If interested tear out this page and place with letters to be answered.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$42 40
Lake Superior, charcoal, Chicago.	57 00
Standard low phos., Philadelphia.	50 00
Bessemer, Pittsburgh	43 00
Basic, Valley furnace	42 90
Toronto price:—	
Silicon, 2.25% to 2.75%	52 00
No. 2 Foundry, 1.75 to 2.25%	50 00

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	$ 5 50
Steel bars, base, Toronto	5 50
Iron bars, base, Montreal	5 50
Steel bars, base, Montreal	5 50
Reinforcing bars, base	5 00
Steel hoops	7 00
Norway iron	11 00
Tire steel	5 75
Spring steel	10 00
Band steel, No. 10 gauge and 3-16 in. base	6 00
Chequered floor plate, 3-16 in.	8 40
Chequered floor plate, ¼ in.	8 00
Bessemer rails, heavy, at mill	
Steel bars, Pittsburgh	3 00-4 00
Tank plates, Pittsburgh	4 00
Structural shapes, Pittsburgh	3 00
Steel hoops, Pittsburgh	3 50-3 75
F.O.B., Toronto Warehouse	
Small shapes	4 25
F.O.B. Chicago Warehouse	
Steel bars	3 62
Structural shapes	3 72
Plates	3 67 to 5 50
Small shapes under 3"	3 62
	C.L. L.C.L.

FREIGHT RATES

Pittsburgh to Following Points	Per 100 Pounds.	
Montreal	33	45
St. John, N.B.	41½	55
Halifax	49	64½
Toronto	27	39
Guelph	27	39
London	27	39
Windsor	27	39
Winnipeg	89½	135

METALS

	Gross. Montreal	Toronto
Lake copper	$25 00	$24 00
Electro copper	24 50	24 00
Castings, copper	24 00	24 00
Tin	62 00	65 00
Spelter	11 50	12 00
Lead	10 75	11 00
Antimony	13 00	14 00
Aluminum	34 00	36 00

Prices per 100 lbs.

PLATES

Plates, 3-16 in.	$ 7 25	$ 7 25
Plates, ¼ up	6 50	6 50

PIPE—WROUGHT

Price List No. 44—April, 1920.

STANDARD BUTTWELD S/C

	Steel		Gen. Wrot. Iron	
	Black	Galv.	Black	Galv.
⅛ in.	$6 50	$ 8 50	....	....
¼ in.	5 13	7 26	$ 5 43	$ 7 56
⅜ in.	6 13	7 26	5 43	7 56
½ in.	6 84	8 42	7 27	8 84
¾ in.	8 45	10 58	9 03	11 16
1 in.	12 50	15 64	13 35	16 49
1¼ in.	16 91	21 16	18 06	22 31
1½ in.	20 21	25 30	21 59	26 68
2 in.	27 20	34 04	29 05	35 89
2½ in.	43 00	53 82	....	....
3 in.	56 23	70 38	....	....
3½ in.	71 30	88 32	....	....
4 in.	84 48	104 64	....	....

STANDARD LAPWELD S/C

	Steel		Gen. Wrot. Iron	
	Black	Galv.	Black	Galv.
2 in.	$30 90	$37 74	$34 60	$41 44
2½ in.	45 34	56 16	51 19	62 01
3 in.	59 29	73 44	66 94	81 09
3½ in.	73 14	90 16	82 34	99 36
4 in.	86 66	106 82	97 56	117 72
4½ in.	0 98	1 23	1 24	1 49
5 in.	1 15	1 44	1 44	1 73
6½ in.	1 49	1 86	1 87	2 25
7 in.	1 94	2 43	2 42	2 90
8-L in.	2 04	2 55	2 54	3 05
8 in.	2 35	2 94	2 92	3 51
9 in.	2 81	3 52	3 50	4 21
10-L in.	2 61	3 26	3 25	3 90
10 in.	3 36	4 20	4 18	5 03

Prices—Ontario, Quebec and Maritime Provinces

WROUGHT NIPPLES

4" and under, 60%.

4½" and larger, 50%.

4" and under, running thread, 30%.

Standard couplings, 4-in. and under, 30%.

Do., 4½-in. and larger, 10%.

OLD MATERIAL

Dealers' Average Buying Prices.

	Per 100 Pounds. Montreal	Toronto
Copper, light	$15 00	$14 00
Copper, crucible	18 00	18 00
Copper, heavy	18 00	18 00
Copper wire	18 00	18 00
No. 1 machine composition	16 00	17 00
New brass cuttings	11 00	11 75
Red brass cuttings	14 00	15 75
Yellow brass turnings	8 50	9 50
Light brass	7 00	7 00
Medium brass	8 00	7 75
Scrap zinc	6 50	6 00
Heavy lead	7 50	7 75
Tea lead	4 50	5 00
Aluminum	19 00	20 00
	Per Ton	Gross
Heavy melting steel	18 00	18 00
Boiler plate	15 50	15 00
Axles (wrought iron)	22 00	20 00
Rails (scrap)	18 00	18 00
Malleable scrap	25 00	25 00
No. 1 machine east iron	32 00	33 00
Pipe, wrought	12 00	12 00
Car wheel	26 00	26 00
Steel axles	22 00	20 00
Mach. shop turnings	11 00	11 00
Stove plate	26 50	25 00
Cast boring	12 00	12 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, 7-16 and up	+10
Carriage bolts, ⅜-in. and less	Net
Coach and lag screws	—15
Stove bolts	55
Wrought washers	—25
Elevator bolts	+10
Machine bolts, 7-16 and over	+10
Machine bolts, ⅜-in. and less	+10
Blank bolts	Net
Bolt ends	Net
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	+25
Machine screws, fl. and rd. hd., brass	**net**
Machine screws, o. and fil. hd., brass	**net**
Nuts, square, blank	+25 add $2 00
Nuts, square, tapped	add 2 25
Nuts, hex., blank	add 2 50
Nuts, hex., tapped	add 3 00
Copper rivets and burrs, list less	15
Burrs only, list plus	25
Iron rivets and burrs	40 and 5
Boiler rivets, base ¾" and larger	$8 50
Structural rivets, as above	8 40
Wood screws, O. & R., bright	75
Wood screws, flat, bright	77½
Wood screws, flat, brass	55
Wood screws, O. & R., brass	55½
Wood screws, flat, bronze	50
Wood screws, O. & R., bronze	47½

MILLED PRODUCTS

(Prices on unbroken packages)

	Per Cent.
Set screws —20% 25 and	5
Sq. and hex. hd. cap screws	12½
Rd. and fil. hd. cap screws	plus 25
Flat but. hd. cap screws	plus 50
Fin. and semi-fin. nuts up to 1-in.	12½
Fin. and Semi-fin. nuts, over 1 in., up to 1½-in.	—5
Fin. and Semi-fin. nuts over 1½ in., up to 2-in.	+12½
Studs	+5
Taper pins	—12½
Coupling bolts	+40
Planer head bolts, without fillet, list	+45
Planer head bolts, with fillet, list plus 10 and	+55
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	+60
Collar screws	list plus 20, 30
Thumb screws	40
Thumb nuts	75
Patch bolts	add +85
Cold pressed nuts to 1½ in.	add $1 00
Cold pressed nuts over 1½ in.	add 2 00

BILLETS

	Per gross ton
Bessemer billets	$60 00
Open-hearth billets	60 00
O.H. sheet bars	76 00
Forging billets	56 00-75 00
Wire rods	52 00-70 00

Government prices.

F.O.B. Pittsburgh.

NAILS AND SPIKES

Wire nails, base	$6 10
Cut nails, base	7 00
Miscellaneous wire nails	50%

ROPE AND PACKINGS

Plumbers' oakum, per lb.	0 10¼
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 35½
British Manila rope	0 28
New Zealand hemp	0 28

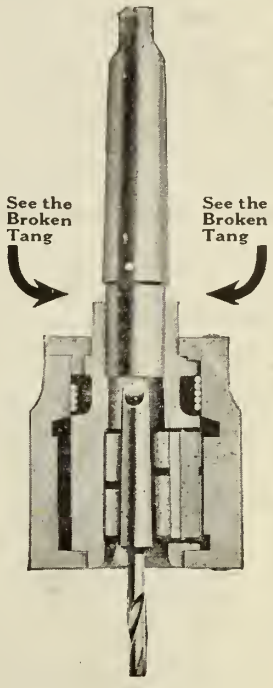
POLISHED DRILL ROD

Discount off list, Montreal and Toronto ..... net

We Can Supply Everything in Tools

Aikenhead's

Wahlstrom Automatic Drill Chuck



Change Tools in Two Seconds Without Stopping the Spindle

With a Whalstrom your operator can drill any number of holes of different diameter, one after the other, simply by grasping the chuck with one hand and replacing the loosened drill with another—**and two seconds does it.** Figure out the labour-saving in your plant on drilling jobs alone.

This Wahlstrom Automatic self-centres the tool perfectly and its instant-acting jaws close on the entire shank in a grip that becomes firmer as the resistance to the tool increases. The clutch can't slip and the jaws never mark a tool.

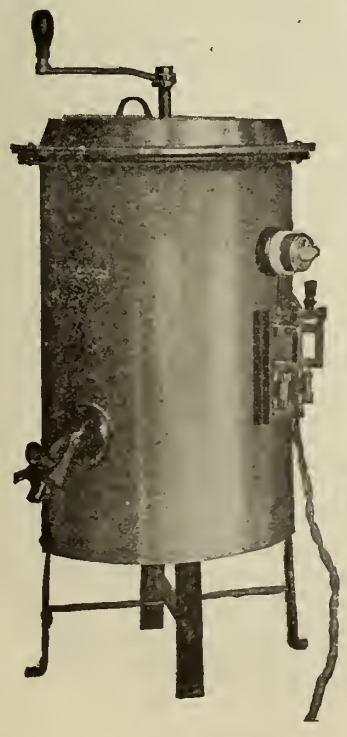
In addition to regular drill press work they will increase production of lathes for burring, turning, filing, etc.

Made in two different styles. One style holds No. 1 2013 Morse Taper Shank Drills—**with or without a tang.** The other style is made in three sizes, which hold all sizes of straight shank tools from ¼ to 1-inch.

Sent on ten days trial.

International Electric Glue Heaters

Cost Less Than the Ordinary Electric Flat Iron to Operate



Aikenhead's International Electric Glue Heater is designed to operate on **dry heat** without the use of water and is built in a variety of sizes which make it adaptable to the requirements of all classes of shops large and small.

With the International it is possible to get three distinct degrees of heat—full, medium and low, a feature that will be appreciated by all practical glue men.

The "INTERNATIONAL" not only keeps the glue in more perfect condition but soon saves its cost in time, glue saved, and more economical current consumption. The one quart heater consumes only one cent's worth of current per day while the 5 **gallon quart consumes less than the ordinary electric flat iron.** Try the "INTERNATIONAL" under your own conditions, better working results, greater efficiency and economy are assured. **Prices and full information on request.**

Aikenhead Hardware Limited

17 Temperance St., TORONTO

If interested tear out this page and place with letters to be answered.

MISCELLANEOUS

Solder, strictly	$ 0 35
Solder, guaranteed	0 39
Soldering coppers, lb.	0 62½
White lead, pure, cwt.	20 35
Red dry lead, 100-lb. kegs, per cwt.	16 00
Gasoline, per gal., bulk	0 38
Pure turp., single bbls., gal.	3 15
Linseed oil, raw, single bbls.	2 37
Linseed oil, boiled, single bbls.	2 40
Wood alcohol, per gal.	4 00
Whiting, plain, per 100 lbs.	3 00

CARBON DRILLS AND REAMERS

S.S. drills, wire sizes	32½
Can. carbon cutters, plus	20
Standard drills, all sizes	32½
3-fluted drills, plus	10
Jobbers' and letter sizes	32½
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	50
Sleeves	50
Taper pin reamers	25 off
Drills and countersinks	net
Bridge reamers	50
Centre reamers	10
Chucking reamers	net
Hand reamers	10
High speed drills, list plus	20 to 40
Can. high speed cutters, net to plus	10
American	plus 40

COLD ROLLED STEEL

[At warehouse]

Rounds and squares	$7 base
Hexagons and flats	$7.75 base

IRON PIPE FITTINGS

	Black	Galv.
Class A	60	75
Class B	27	37
Class C	18	27

Cast iron fittings, 5%; malleable bushings, 22½%; cast bushings, 22½%; unions, 37½%; plugs, 20% off list.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$ 8 50	$ 9 50
Sheets, Blue ann., No. 10	8 50	9 00
Canada plates, dull, 52 sheets	8 50	10 00
Can. plates, all bright	8 60	9 00
Apollo brand, 10¾ oz. galvanized	....	....
Queen's Head, 28 B.W.G.	11 00	....
Fleur-de-Lis, 28 B.W.G.	10 50	....
Gorbal's Best, No. 28	....	....
Colborne Crown, No. 28	....	....
Premier, No. 28, U.S.	11 50	10 50
Premier, 10¾-oz.	11 50	10 90
Zinc sheets	16 50	20 00

PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13.00; 5-16, $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.20; ¾ in., $9.30; ⅞ in., $9.50; 1 in., $9.10; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $13.00; 5-16 in., $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.50; ¾ in., $9.30.

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

BOILER TUBES.

Size.	Seamless	Lapwelded
1 in.	$27 00	$.....
1¼ in.	29 50	.....
1½ in.	31 50	29 50
1¾ in.	31 50	30 00
2 in.	35 00	30 00
2¼ in.	35 00	29 00
2½ in.	42 00	37 00
3 in.	50 00	48 00
3¼ in.	.. ..	48 50
3½ in.	63 00	51 50
4 in.	85 00	65 50

Prices per 100 ft., Montreal and Toronto

OILS AND COMPOUNDS.

Castor oil, per lb.	
Royalite, per gal., bulk	27½
Palacine	30½
Machine oil, per gal.	54½
Black oil, per gal.	28
Cylinder oil, Capital	82½
Petroleum fuel oil, bbls., net	18

BELTING—No 1 OAK TANNED

Extra heavy, single and double	6½
Standard	6½
Cut leather lacing, No. 1	2 00
Leather in side	2 40 3 00

TAPES

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	$4 60
Polishing wheels, bull-neck	2 00
Emery in kegs, Turkish	09
Pumice, ground	06
Emery glue	30
Tripoli composition	09
Crocus composition	12
Emery composition	11
Rouge, silver	60
Rouge, powder, nickel	45

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	.08½
Grits, 80 and finer	.6

BRASS—Warehouse Price

Brass rods, base ½ in. to 1 in. rod	0 34
Brass sheets, 24 gauge and heavier, base	$0 42
Brass tubing, seamless	0 46
Copper tubing, seamless	0 48

WASTE

XXX Extra	.24	Atlas	.20
Peerless	.22½	X Empire	.19½
Grand	.22½	Ideal	.19
Superior	.22½	X Press	.17½
X L C R	.21		

Colored

Lion	.17	Popular	.13
Standard	.15	Keen	.11
No. 1	.15		

Wool Packing

Arrow	.35	Anvil	.22
Axle	.28	Anchor	.17

Washed Wipers

Select White	.20	Dark colored	.09
Mixed colored	.10		

This list subject to trade discount for quantity.

RUBBER BELTING

Standard ... 10% Best grades... 15%

ANODES

Nickel	.55 to .60
Copper	.38 to .40
Tin	.70 to .70
Zinc	.16 to .17

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	$42 50	$43 00
Copper wire, list plus 10		
Plain sheets, 14 oz., 14x60 in.	46 00	44 00
Copper sheet, tinned, 14x60, 14 oz.	48 00	48 00
Copper sheet, planished, 16 oz. base	46 00	45 00
Braziers', in sheets, 6 x 4 base	45 00	44 00

LEAD SHEETS

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$10 75	$14 50
Sheets, 3½ lbs. sq. ft.	10 50	14 00
Sheets, 4 to 6 lbs. sq. ft.	10 25	13 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS

Acid, boracic	$ .23
Acid, hydrochloric	.04
Acid, nitric	.11
Acid, sulphuric	.04
Ammonia, aqua	.15
Ammonium, carbonate	.23
Ammonium, chloride	.22
Ammonium hydrosulphuret	.75
Ammonium sulphate	.30
Arsenic, white	.14
Copper, carbonate, annhy	.41
Copper, sulphate	.15
Cobalt, sulphate	.20
Iron perchloride	.62
Lead acetate	.30
Nickel ammonium sulphate	.20
Nickel carbonate	.32
Nickel sulphate	.22
Potassium sulphide (substitute)	.42
Silver chloride (per oz.)	1.30
Silver nitrate (per oz.)	1.25
Sodium bisulphate	.14
Sodium carbonate crystals	.06
Sodium cyanide, 127-130%	.38
Sodium hyposulphite per 100 lbs	8.00
Sodium phosphate	.15
Tin chloride	.80
Zinc chloride, C.P.	.30
Zinc sulphate	.10

Prices per lb. unless otherwise stated

Quality

CONFIDENCE

THE GREATNESS OF BRITAIN IS FOUNDED ON HER INTEGRITY.

HER STRENGTH SHE DERIVES FROM WORLD COMMERCE—HER ENDURANCE FROM CONFIDENCE.

THE WAR TEMPORARILY RETARDED HER CONSTRUCTIVE EFFORTS, BUT THE POWER OF THE CONFIDENCE OF THE PEOPLES OF THE WORLD WILL RESTORE TO HER IN MORE BRILLIANT FORM THE LEADERSHIP SHE HAS JUSTLY EARNED AND PROUDLY HELD.

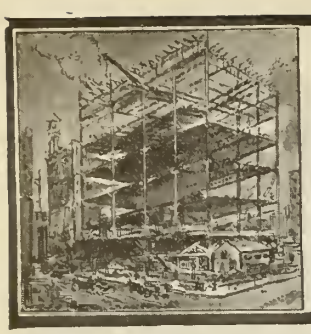
CONFIDENCE IS THE FOUNDATION OF OUR POSITION IN THE WORLD OF IRON AND STEEL—OUR PROGRESS DEPENDS ON IT.

WE HAVE BEEN SUCCESSFUL IN THE PAST—THE FUTURE IS BEFORE US. TO ADVANCE, WE MUST CONTINUE TO MERIT THE CONFIDENCE OF THE BUYERS OF STEEL AND IRON PRODUCTS OF EVERY DESCRIPTION IN CANADA, AND WE ARE DETERMINED TO ADVANCE.

THE
STEEL COMPANY
OF
CANADA
LIMITED
HAMILTON MONTREAL

Service

If interested tear out this page and place with letters to be answered.



INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS PERSONAL AND TRADE NOTES

TRADE GOSSIP

Want a Machine.—The Telfer Biscuit Co.. Limited, 139 Sterling Road, Toronto, are in the market for a wood working machine, similar to the Elliott woodworker, made in Belleville.

Canadian Plant.—A new factory is being erected by the Coleman Lamp Company of Wichita, Kansas, at the corner of Queen East and Don roadway, for the manufacture of all kinds of portable lamps.

Sold Outfit.—The Hanson Van Winkle Co. have just sold to the Kelsey Wheel Co., of Walkerville, a large generator plant, including a 2,000 amp. dynamo, which they are using for electro-plating automobile wheels and accessories.

Extending at Preston.—The McKenzie Machinery Co., Preston. have plans out for extending the main shop an additional 125 feet. It is expected that work will be started at once as the extra space is urgently required.

Amalgamation of Plants.—An important tool company merger has been announced in the affiliation of the Mann Axe & Tool Co., Ltd., of St. Stephen, N.B., with the James Smart Manufacturing Company of Brockville.

Sold Property.—The Gurney Foundry Company have sold No. 740 and 742 Yonge Street, Toronto, but as yet the name of the purchaser is not disclosed. The sale price is reported to be around $90,000 and the lot has a frontage of 33 feet by a depth of 325 feet to Balmuto Street.

Selling Stock.—The Dillon Crucible Alloys, Ltd., are advertising in the Welland paper, giving to citizens an opportunity to buy a small block of stock, which will pay dividends of not less than eight per cent., at the price of $100 per share, cumulative preferred, with bonus of 50 per cent. common at $5 per share; for instance, $1,025 would buy ten shares preferred and five shares common.

Need Crane Runway.—The Cincinnati Iron and Steel Co., are in the market for a self-supporting steel crane runway, carrying a bridge, with two five-ton lifts. The crane runway is to be arranged so that later on a roof and siding could be put on, making it a completely enclosed warehouse. Length of crane runway to be either 500, 600 or 700 feet, height approximately 25 feet, span 85 feet, quoting a price on each.

Shipments Up. — The shipments of feldspar from Frontenac are now double what they have been in past years. The centre of the feldspar mining industry is now at Tichborne. Feldspar is being found at other places in this district, but the Frontenac County rock is said to be much better in quality. An American company has been developing an iron pyrites mine at Flower, Ontario, in Frontenac. The material is mostly sent to Hamilton.

Chatham's Water.—At a meeting of the Chatham Water Commissioners it was decided to submit a referendum to the ratepayers of Chatham at the earliest possible moment asking them to decide between Lake Erie and the River Thames as the permanent source of a civic supply of water, with the understanding that the city council will apply to the Railway and Municipal Board for permission to issue debentures for raising money to carry into effect the scheme selected.

Paid for One Week.—The Renfrew Machinery Company on Saturday last closed down for a period of two weeks, partly in order to provide their employees with the opportunity of taking a summer vacation and partly to take stock. In making the announcement with reference to closing down, the firm also announced that any of their employees who have been with the firm for three years or over would receive one week's pay during the holiday.

Take Toronto Lease.—The Keasbey Mattison Company, one of the largest manufacturers of asbestos and magnesia products in the United States, have leased for a long term of years the entire building at No. 25 Front Street East, Toronto, formerly occupied by the Colville Cartage Company. The parent plant of the lessors is at Ambler, Pa., and they have branches in eleven large American cities and a foreign branch at London, Eng. No manufacturing will be carried on here, the building being taken over for a Canadian distributing depot, under the resident managership of B. A. Simon.

Destroyed by Fire.—New Glasgow, N.S., had one of the most serious fires of years, when in a few minutes flames converted the main workshop of the Maritime Bridge Company into a mass of ruins. The fire started in the northern end of the large building where the riveting shop is located in a wooden annex. A strong wind was blowing from the south, and the flames worked back against the wind through the long shop. The roof of the whole structure was of wood, but the walls for the greater part were concrete. So quickly did the flames spread that almost before the alarm had ceased sounding the main building was doomed.

Increasing Plant.—Butterfield & Co., Division of the Union Twist Drill Co., Rock Island, Quebec. are increasing their office and shipping room capacity by the addition of a 2-storey brick building, 160x40 feet. J. J. Powers, of Worcester, Mass., who has the contract for their new United States factory, just across the International Boundary line in Derby, Lim, Vt., has received the contract for this building and expects to have it roofed over before snow flies. The necessity for the increase in both plants of the Butterfield Co. is due not only to the demands of domestic trade, but fully as much to the influx of orders from foreign buyers.

London's New Scheme.—The Public Utilities Commission, of London, Ont., in an endeavor to maintain the city's spring water supply, has secured a drill-

TREATING IRON ORE BY NEW METHOD

Big Future is Assured for the Low-Grade Ores of the Dominion

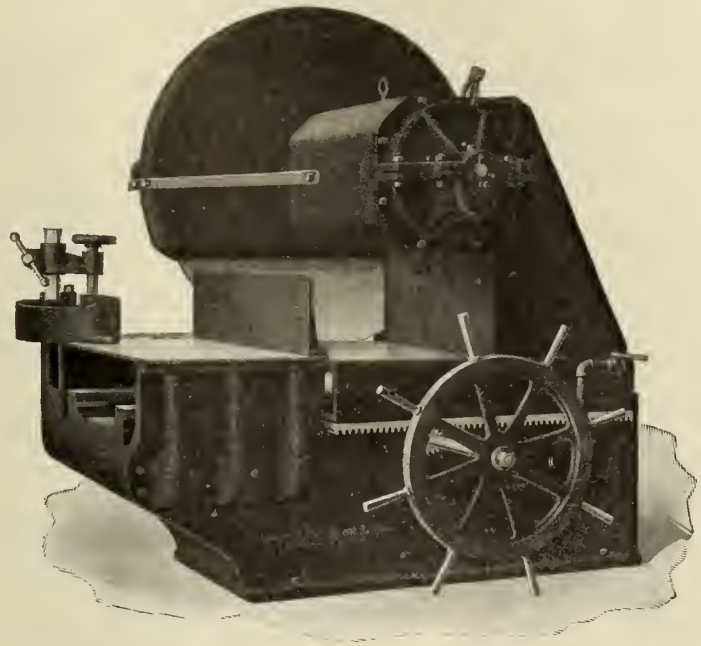
Ottawa.—Satisfactory results have been obtained from the investigations carried out by Prof. Alfred Stansfield of McGill University into the reduction of iron ores by gases at low temperatures and with the electric furnace.

This research was assisted by a grant of $1,200 from the Honorary Advisory Council for Scientific and Industrial Research. On some of the findings, the council states, patents have been applied for by permit of the commercial development in Canada of the methods which will make the low-grade ores of Canada utilizable and of the greatest value.

Iron ore, iron and steel and their products are annually imported into Canada to the value of more than $150,000,000. Such methods of utilizing Canada's low-grade ores would render the greater part of this importation unnecessary, in the opinion of the council, which, it states, if it had the funds available to do so, would make provision for such investigations as the importance of the subject warrants being undertaken.

High Speed Friction Saws

Cut Steel Shapes in Seconds—Investigate!



No. 1 Ryerson Patented High Speed Friction Saw

Low initial cost.

No adjustment necessary for cutting various shapes.

No clamping required for straight cuts.

Cuts faster than any other method.

No expensive foundation necessary.

Small floor space required.

We are manufacturing these machines in five sizes, from No. 1 to No. 5, with capacity to cut from the smallest to the largest sections rolled.

Write for Bulletin No. 9127

ESTABLISHED 1842 INCORPORATED 1888

JOSEPH T. RYERSON & SON

CHICAGO, ILL., U.S.A.

Canadian Representatives: MACHINERY

GARLOCK-WALKER MACHINERY CO., 32-34 Front Street, TORONTO

MONTREAL WINNIPEG

ing outfit and has commenced prospecting for new artesian wells on the pipe line road near the second cove. It is reported that there are large quantities of pure water available there, and if the claim is substantiated it is the intention of the commission to forthwith install deep well turbine pumps on each well. No separate pumping station would be maintained at the field, the machines being equipped with remote control apparatus, the scheme having worked out in a satisfactory manner at the Foster wells.

Departments Combined. — Announcement is made of a combination of the sales, purchasing, accounting and executive departments of the Reed-Prentice Co., Worcester, Mass.; Becker Milling Machine Co., Hyde Park, Mass., and the Whitcomb-Blaisdell Machine Tool Co., Worcester. This arrangement took place a week or so ago, and the main offices are now permanently located at No. 53 Franklin Street, Boston, Mass. The Canadian agencies of these firms remain as formerly, viz., Reed-Prentice Co., represented by the Canadian-Fairbanks-Morse; Becker Milling Machine Co., represented by the Rudel-Belnap Machinery Co., of Montreal, and the A. R. Williams Machinery Co., of Toronto; Whitcomb-Blaisdell Machine Tool Co., represented by the A. R. Williams Machinery Co.

Put in New Hammers.—Two 6,000-pound hammers and their equipment arrived at Canada Forge Companies plant in Welland. All preparations had been made for their arrival, work on the beds having been in progress for some weeks, and it is expected that this new section of the plant will be in operation by August 1. Automobile forgings will be manufactured, and this output, combined with that of the Billings & Spencer plant will bring Welland well up to the top in this particular line of industry. With

CZECHOSLOVAKIA AGENTS VISIT CANADA TO SEE WHAT TRADE CAN BE DEVELOPED

MEMBERS of the Czechoslovakia party, now in Canada are receiving a good impression of this country as a place where trade can be developed. Many of the Canadian centres have groups of these people in them now. Marcel Zoltan, M.E., who has been making his headquarters in Toronto for some days, believes that there should be a good business developed between this country and the new kingdom that has been brought into being since the close of the war. M. Zoltan, speaking to Canadian Machinery to-day, stated that he had been much impressed with what he had seen in Canada, and also with the kindness and courtesy that had been shown to him wherever he went.

"The new country, Czechoslovakia," he said, "is made up of two peoples. The Bohemians, while to a certain extent an agricultural people, can more properly be described as an industrial race, while the Slovaks, who were in Hungary as it existed prior to the war, are more of an agricultural force. Before the war we made a lot of machinery, especially for textile purposes, heavy special machinery, and the chemical industry was also in a high state of development. Then we have the largest deposits so far known of radium. The coal mines are very important, also the deposits of gold and silver. What we must do now is to take care of the trade that used to go to Germany, and that is why we have been looking all over Canada to see what there is here. One of our parties is at Vancouver, another at Calgary, and one at Winnipeg. We have been gathering information and will report back to the home government, and after that I expect that some of us will come back to this country to see what can be done in the way of making permanent trade connections."

GETTING A BIT RESTLESS

"What can Canada send you?" inquired Canadian Machinery.

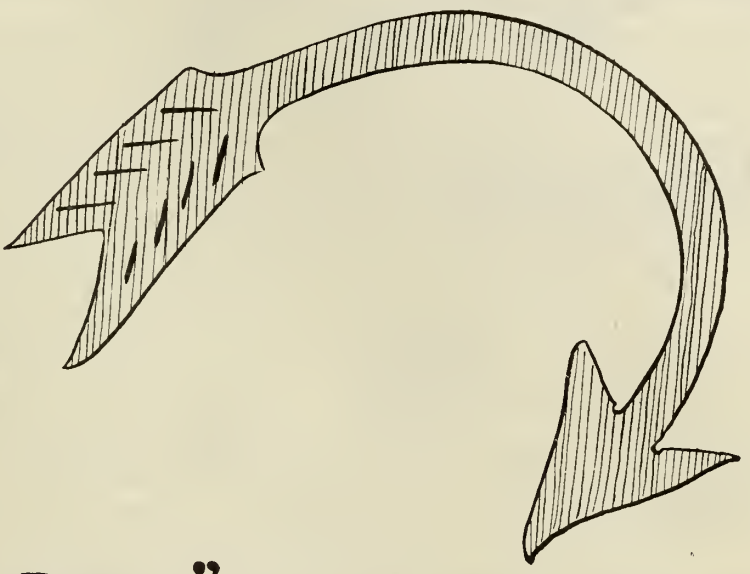
"Well, that is something that I cannot answer right offhand," answered M. Zoltan, "and it is for that reason that we are looking around and asking questions, but there are certain kinds of salt for paper making, your cobalt and nickel, many lines of farm implements, wires and cables, that we have found here. I have had the opportunity of calling on several of the plants and found them all very anxious to do everything they could for our nation. In a short time we should be in a position to have for export from our own country special machinery, especially for metal working industries, special hoists, chemicals and dyes, textiles, etc."

The Czechoslovakia country is much the same as Canada, as far as climatic conditions are concerned, although it is hardly likely that they get the same extremes in the winter.

"There is one thing," stated M. Zoltan in conclusion, "and that is that the people of Canada do not appreciate the safety and security in which they live—the security of their homes and of their business places. In Russia it is very uncertain, although we believe that conditions will work out there for the best, and that political recognition will be given to the government there. But it is so different in this country. It is quiet, safe and pleasant, and the people of Canada should appreciate it."

The average banker is over forty. The hustling business man who borrows is usually under forty. Nature gives the young man ambition, ability, and willingness. Nature gives the middle aged man judgment, experience and conservation.

I Want Every Large Shop to Use "MORROW" Forged High Speed Drills



"The Ad-Writer"

We claim "Morrow" Drills will give more holes with less regrinding—try out this statement at our risk. If *you* are not satisfied after you try them, you get your money back.

Buy from the Jobber

No Reliable Jobber Will Substitute

The John Morrow Screw & Nut Co., Limited

INGERSOLL, CANADA

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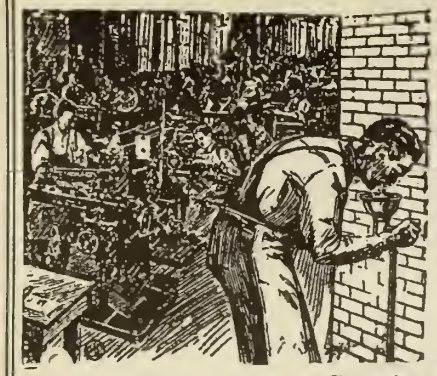
Confederation
Life Building

Vancouver
1290 Homer St.

7 Hop Exchange, Southwark St., London, England

If interested tear out this page and place with letters to be answered.



A Drinking Water Service that will last a LIFETIME

What you pay for a few ordinary drinking cups will meet the cost of the

PURO SANITARY DRINKING FOUNTAIN

(MADE IN CANADA)

DRINKING CUPS ARE UNSANITARY but the "Puro" delivers clean, fresh water at a reduction of 15 per cent. to 35 per cent. in water bill.
"PURO" WILL SAFEGUARD THE HEALTH OF YOUR EMPLOYEES and protect your staff against disorganization by sickness.
Easily attached. Simply unscrew the ordinary faucet and put on the "Puro."
Write us to-day for full information regarding the cost of installation of the "PURO" Sanitary Drinking Fountain Service.

Puro Sanitary Drinking Fountain Co.

Canadian Agents:
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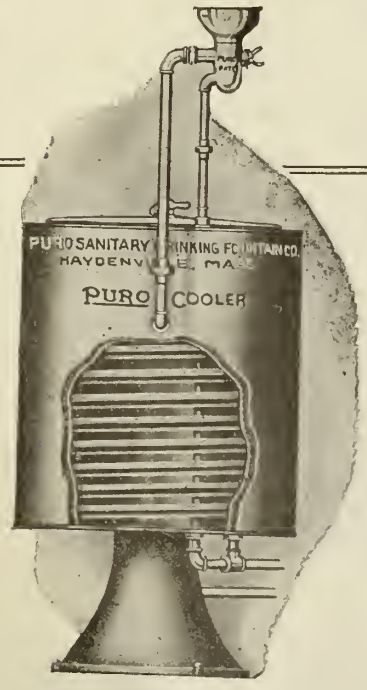
18 St. Alexis St., Montreal, P.Q.



Eclipse Interchangeable Counterbores, Core Drills, Connecting Rod Cutters, Countersinks, Inverted Counterbores, Spot Facers, Adjustable Length Holders
See first issue of each month.

Eclipse Counterbore Co., Ltd.
Walkerville, Ont.

the ever-increasing demand for cars, a ready market will be available. A good number of orders are already on hand and will be started on as soon as possible. Mostly skilled men will be employed.

MARINE

Kingston:—Owing to delay in dredging considerable trouble is being encountered by vessels in Kingston harbor. One result is that vessels loading at Oswego and compelled to go with only part cargo to avoid trouble.

Sarnia:—The "Harmonic" left for Detroit under her own steam to be dry docked for examination after being aground. The "Harmonic" was not seriously damaged, but she will be docked and the hull examined, also the propeller and tail-end shaft. Sshe will soon be in commission again.

Kingston,—The big dredge, "Kennequhair," which was bought from the Great Lakes Dredging Co. by the Dominion Government back in 1917, has been made ready for a voyage. Originally bought for work on the Hudson Bay Terminals, she has been lying in Cornwall dry dock for nearly three years. She will now be employed at Cape Tormontine, P.E.I., on the terminal there for the

Toronto:—The Dominion Shipbuilding Co., successfully launched the steamer "Floraba" from their yard at the foot of Spadina Ave. This is the second vessel for the Gulf Navigation Co., of New Orleans, the first having been launched about three weeks ago, and now ready for delivery. The vessel is of the usual dimensions for passing the Lower St. Lawrence Canals. A large and influential gathering witnessed the launching ceremony.

INCORPORATIONS

"The Jolliette Castings and Forgings, Ltd., is incorporated with effect from July 3rd, for the purpose of the manufacture in steel and iron products, and to act as importers and exporters for same. Authorised capital stock of $1,000,000, divided into 10,000 shares of $100 each. The chief place of business to be Montreal, P.Q.

Authority has been granted with effect from June 19th, for "The Anglo-Canadian Malleable Steel Manufacturing Co., Ltd.," to increase their capital from $50,000 to $200,000, such increase to consist of 15,000 shares of $100 each, and sub-dividing six unissued shares of the company now of the par value of $1,000 each, into sixty shares of the par value of $100 each.

Notice is received of the incorporation of "The Belanger Foundry, Limited," with effect from June 11th, for the purpose of acquiring the firm of O. Belanger, Inc., and to engage in the manufacture of iron and steel in all its branches. The company to have a capital stock of $100,000, divided into 1,000 shares of $100 each. The chief place of business to be Montreal, P.Q.

A. SMITH BLEAKNEY
138 YORK ST. TORONTO

PERSONAL

Mr. Harvey C. Rose, son of City Treasurer J. O. Rose, has been appointed as resident engineer, with headquarters in Guelph, in connection with the construction of Provincial Highways in Western Ontario. Mr. Rose will have as his section of the highway the road between Guelph and Hespeler, which has been designated as a provincial highway, and the road from Hespeler to Kitchener, by way of Kossuth; also the road from Kitchener to Galt, via Preston, and from Guelph to Puslinch Station, on the Brock road. The road from Guelph to Mount Forest and Owen Sound has also been designated as a provincial highway and some construction work will be done on it this year.

One of the latest British patents applied for is a 10-ton hydraulic jack made with a 4.5 high explosive shell and an 18-pounder shell as the principal parts. The big shell forms the body and the other the ram. The pump plunger is out from a length of .303 rifle barrel. As a means of using up old war stock this invention is very ingenious and interesting.

THE LARGE LOCOMOTIVE BOILER

(Continued from page 80)

ing regard to their nomiral tractive force and heating surface, and while there are many other conditions which have their influence on the hauling efficiency (such as the setting of the valves, the diameter of the blast-pipe, the weight on the driving wheels, and so on), the fact remains that it is now generally advisable to use a much larger boiler than that determined by the former methods of calculation. The most that can be said is that cylinder volume is an approximate guide, while the maximum size of boiler possible is determined by considerations which lie quite outside. These are the restrictions due to height, width, length, and weight. Generally speaking, the height of the chimney-top above rail-level must not exceed 13 ft. 6 in.; the width, or space available transversely between the tires of the driving wheels, so that it will be seen that these two limitations are the primary ones, and being interdependent are alone sufficient to fix the size of the boiler diametrically. Owing to difference in the vertical loading gauge, what

might be possible on one line might be out of question on another, but it may be taken as a general rule that large-diameter boilers and large driving wheels cannot go together. The diameter of the one or the other must be kept down, and since the boiler capacity is of paramount importance, it may be preferable to use relatively small driving wheels, more especially as the tractive power for a given cylinder diameter and piston stroke will then be correspondingly greater.

As regards the length of the barrel and firebox combined, this must be such as to permit of the rigid wheelbase being short enough to enable the engine to traverse safely the shortest curve on the line over which it will be required to run. There is also an assumed limit to the length to which tubes can be usefully extended. The same may be said respecting the length of the firebox, as, although the objection to the use of long coupling rods is removed by placing all the driving wheels in front of the box and employing a supplementary carrying axle underneath it, yet very long grates are difficult to fire efficiently. The condition as to weight depends upon the strength of the permanent way and bridges, but on all the more important main-line railways a reasonable allowance is now made for the probable development of the locomotive in this respect.

But it will be understood, no doubt, that there are certain other factors which have to be reckoned with in connection with the increase in boiler capacity. For example, in the case of express engines the limit to which a boiler can be advantageously enlarged for a given cylinder diameter is reached when the cylinders, owing to back pressure and the necessarily reduced port opening high speeds, can use only a comparatively small quantity of the steam generated. This limit will be determined by the particular type and arrangement of the valves and valve gear, by the respective areas of the steam and exhaust passages, and by the diameter of the blast-pipe, which details ought to be planned with a view to increasing the positive pressure on the pistons, without, however, reducing the compression below the amount necessary to absorb the momentum of the moving parts at the end of each stroke. It is not easy to adjust these matters to a nicety, but the big boiler, if provided with adequate grate area, is of itself a help in this connection, since it allows of a larger blast nozzle being used; and the latter, by diminishing back pressure, permits the cut-off to be later, and this, in turn, enables the engine to haul a heavier load at a given speed, or to take a given load at a higher speed, as may be required.

Nothing has been said about superheating, for the reason that it is not, as a rule, now deemed, advisable to reduce the size of the boiler in consequence of the adoption of that excellent feature, the advantages obtained being by way of relative economy in coal and water consumption.

DOMINION CHUCKS

STEEL OR CAST-IRON BODY
BUILT FOR HEAVY DUTY

All Screws Are Reversible

SCREWS are made of the best grade steel. Both ends are broached and are heat treated after machining. They are reversible, so that either end may be used, are large enough in diameter to stand the torsional strains applied by operator when setting up his work. They are made to give the best service—and may be depended upon to stand up under the hardest usage.

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DROP FORGE DIES
Send us your blueprints and specifications. Entrust your requirements to experienced workmen and up-to-date equipment. Have your dies made in Canada. First-class workmanship guaranteed.
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HEAVY DUTY MACHINE TOOLS
Planers, Engine and Axle Lathes, Slotters, Boring and Turning Mills, Horizontal Boring and Drilling Machines.
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Rubber Making Plant
BERTRAMS LIMITED
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Classified Opportunities

FOR SALE

FOR SALE—DEFIANCE AUTOMATIC HANDLE polishing machine, slightly used, good as new. Vancouver Handle Co., Vancouver, B.C. (c6m)

BARGAIN FOR IMMEDIATE PURCHASER

Two 24" x 12', practically new, "Whitcomb-Blaisdell" Quick Changer Gear Engine Lathes, Double Back Geared, Heavy Duty. New Lathes would be no better and are worth $2500; but to immediate purchaser we offer these Lathes at $1600 each, subject to prior sale. Williams & Wilson, Limited, 84 Inspector Street, Montreal. (c5m)

Used Machine Tools For Sale

1—38" Boring Mill, single head.
1—17" x 8' LeBlond Lathe with taper attachment.
2—26" x 10' CMC Engine Lathe.
1—12" x 6' Willard Lathe.
Marvin & Casler Offset Boring Heads and Twin Screw Drill Chucks. Complete stock of all sizes.
Special prices on 10" Power Hack Saw Blades.

CHARLES P. ARCHIBALD & CO.
Machinery and Supplies
285 Beaver Hall Hill, Montreal

HELP WANTED

SALESMAN FOR MACHINE TOOLS SUPplies. Must be a high grade man of engineering knowledge, and good address; for such there are excellent prospects. Address giving full particulars in confidence. Jas. Buckley Co., St. Nicholas Bldg., Montreal. (ctfm)

ONE OF CANADA'S LARGEST AND MOST aggressive manufacturing organizations desires to engage a representative between the ages of twenty-eight and thirty-five, to extend present connections in special lines for the automotive industry; to introduce and develop special lines offering sufficient volume to justify mass production. Mechanical ability desirable, but not imperative. The opportunities are unlimited for one with the necessary executive ability and initiative. Apply with full particulars of age, experience and salary required to Box 698, Canadian Machinery. (c5m)

MACHINE WORK WANTED

MACHINE WORK WANTED FOR LATHES, shapers, milling machine and planer, etc. Hourly or contract basis. Prompt delivery. W. H. Sumbling Machinery Co., Toronto. (ctfm)

AGENCIES WANTED

QUALIFIED ELECTRICAL AND MECHANIcal sales engineer. Technical graduate having travelled and made connections in South America, France, Belgium, India, China, would like to represent Canadian manufacturing and export house. Box 694, Canadian Machinery.

FOR SALE

CLEARANCE LINE—GENUINE "SLOCOMBE" Drills are offered at a sacrifice, sizes "C," "E," "F," and "G." Wholesalers and dealers will find it of interest to communicate their requirements to Box No. 692, Canadian Machinery. (ctfm)

FOR SALE
Metal Products Business

To close an Estate, the undersigned offer for sale as a going concern all the shares of the capital stock of a very successful metal products business being carried on in Toronto.

This is a splendid opportunity for anyone to acquire a business of this character. Inventories and statements of affairs may be inspected or had upon application to,

The Trusts and Guarantee Company, Limited, or, Lionel Davis, Executors.

Davis & Mehr
12 Richmond Street East - - Toronto
Solicitors for Executors.

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UNIVERSAL
TOOL ROOM GRINDER

An unlimited variety of cutters, gauges, reamers, dies, etc., can be ground quickly and accurately. Any job met in the ordinary tool room can be readily handled.

RANGE—

Saws 6 to 36 in. diameter.
Cutters to 18 in. diameter.
Work to 10 in. diameter by 17 in. diameter on centers.

Send for book on tool grinding.

The A. R. Williams Machinery & Supply Company, Limited
326 St. James Street, Montreal

If interested tear out this page and place with letters to be answered.

Classified Opportunities

MACHINERY WANTED

SMALL POWER PRESS SUITABLE FOR trimming light forgings. Apply Wheeler Needle Works, Paris, Ont. (c3m)

FIFTY OR SIXTY-LB. DROP HAMMER, POWER lift if possible, not automatic. Must have "ways" curved back at least 6 inches, leaving space 12" to 15" high around die when in position. Box 697, Canadian Machinery. (c3m)

MACHINERY WANTED — DOUBLE CRANK, single-action press, weight from 5 to 10 tons. Fairgrieve & Son, 50 Davenport Road, Toronto.

WHEN WRITING ADVERTISER KINDLY MENTION THIS PAPER

PATTERNS

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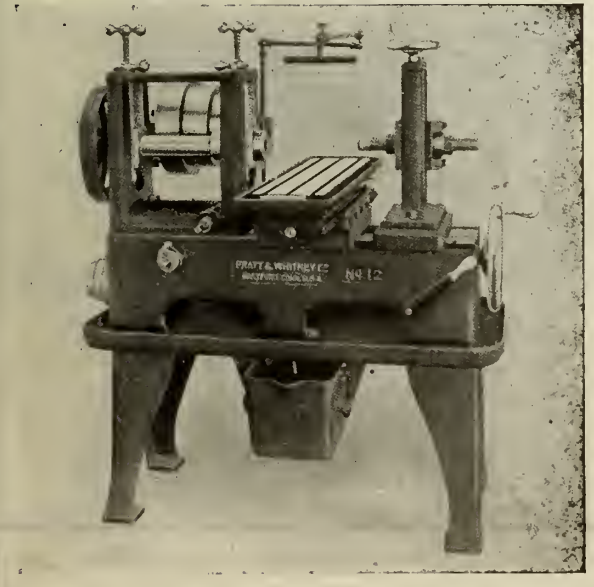

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It is a fearless, interesting vital story, that will be one of the literary sensations of the year.

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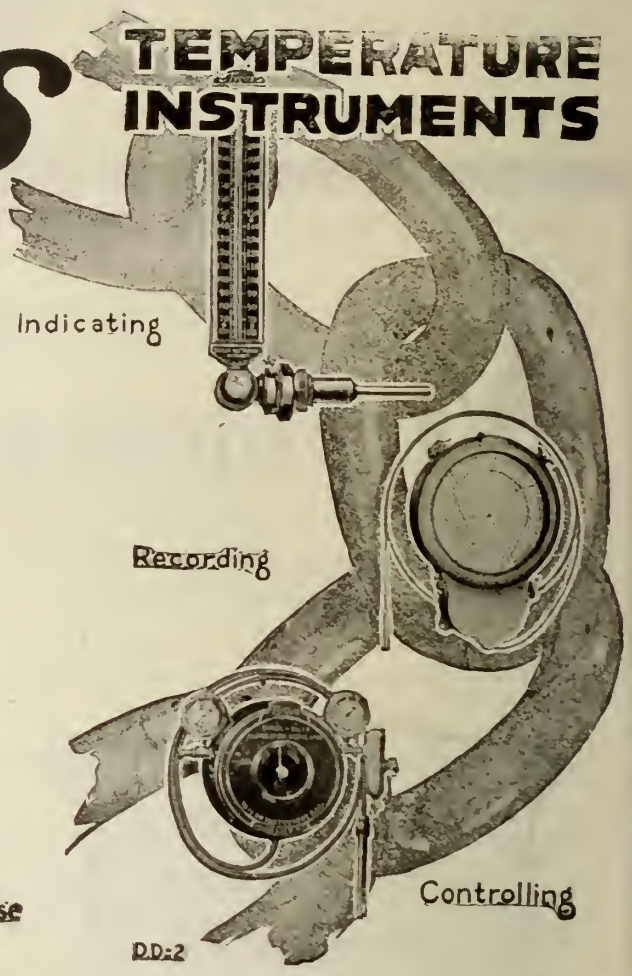

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By using Armstrong Tool Holders in your shop you will make one pound of High Speed Steel do the work of ten pounds in forged tools, save all forging and 70% of grinding.

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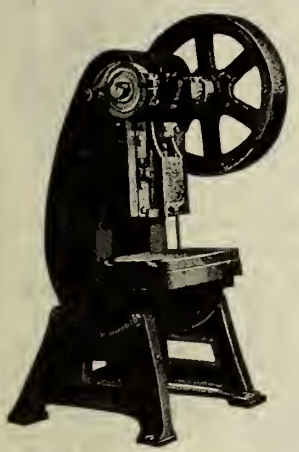

Their record of performance extends over a period of 40 years.

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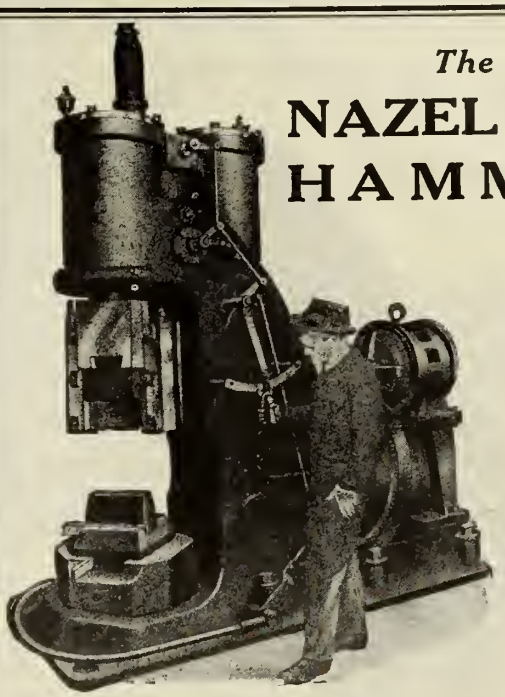

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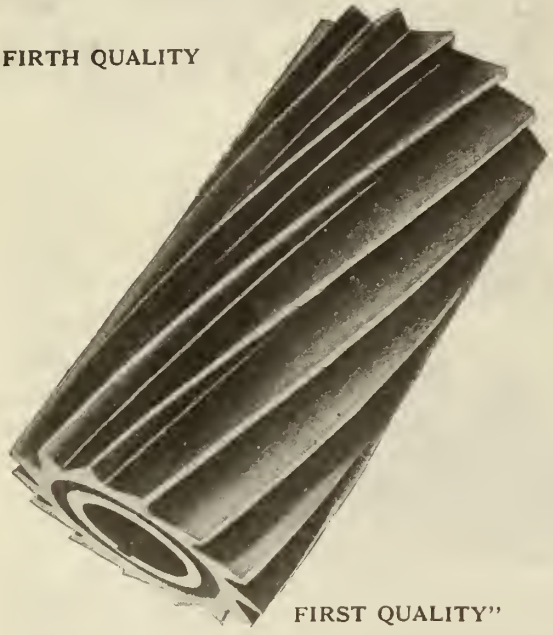

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For Drilling Square Hexagon or other Angular Shaped Holes

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They have solved the problem of cheap and efficient drilling of square, hexagon or other angular shaped holes. The BIG advantage is, they can be used on any drill press or lathe.

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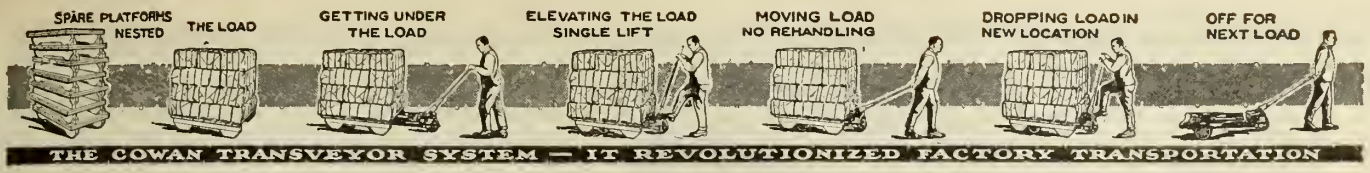
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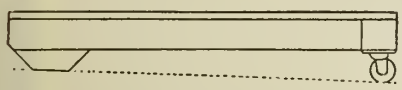
MOVING LOAD NO REHANDLING
DROPPING LOAD IN NEW LOCATION
OFF FOR NEXT LOAD
THE COWAN TRANSVEYOR SYSTEM — IT REVOLUTIONIZED FACTORY TRANSPORTATION

TO THE POINT

Miscellaneous data relating to the use of Lift Trucks in modern factory practice. Boiled down for the busy business man.

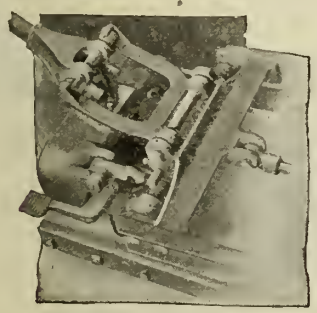


LENGTHY LUMBER

YOU may have been puzzled over Transveying lumber on lift truck platforms. This difficulty can be met by constructing a special length platform supplied with casters at one end. The Transveyor is pushed under the uncastered end, the load can then be elevated and moved along a-la-trailer.

HIGHER LEVELS

LARGE factories using electric elevating trucks for long hauls will be glad to learn that an 11-inch Transveyor may now be secured which will handle the same platforms as the electric. This Transveyor is built with 9-inch wheels.



HEAD HUNTERS

EXPERIENCED buyers of lift trucks give close examination to the "head," the point of greatest stress, strain and wear. The above illustration shows the rugged construction of the front of the Transveyor. The lifting link is engaged with the lifting pins on the handle and the platform is in process of being elevated.

BOTTLED GOODS

IN Illinois a large factory making glass bottles wrote: "Since installing the Transveyor System four years ago our trucking cost has decreased fifty per cent., beside speeding up the loading of cars by eliminating congested aisles and shipping platforms." Four years ago they had four Transveyors—now 43, used in practically every department of the works.

HAVE A CHAIR

"WE are frank to say," writes a prominent furniture factory, "that the Transveyor means so much in our business with its saving of time and labor, that its use is absolutely indispensable."

YOU WILLING NEED THIS WORKER

THE COWAN TRANSVEYOR

TRADE MARK REG. U. S. PAT OFFICE

THIS first of all lift-and-carry truck never fails to win the unqualified endorsement of its users. Marked superiority of design and all-steel construction, backed by a five-year guarantee, make the TRANSVEYOR the best buy in the market.

YOUR business may be "different," but the TRANSVEYOR, with its wonderful adaptability, will handle your factory trucking and storage requirements as if it had been invented for your business alone. A few months' use will repay the purchase price in the saving of labor alone.

Pin the Coupon to your letter head and Mail to Truck Headquarters.

COWAN TRUCK COMPANY

Originators of the Lift Truck System

HOLYOKE, MASS.

Representatives in Principal Cities—refer to Donnelley's Red Book for Local Addresses

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I am interested in reducing the cost and increasing the efficiency of hand trucking. Send a copy of "HOW TO APPLY THE TRANSVEYOR TO YOUR BUSINESS."

NAME .....

ADDRESS .....

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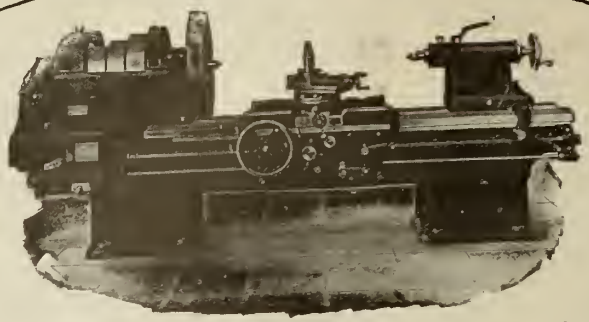
Heavy Duty Lathes



SIDNEY for Service

Easy Masters of Big Jobs

Dependence put upon Sidney Lathes is never misplaced. Very heavy work can be done without apprehension.

The 25-inch Heavy Duty Quick Change Sidney here shown is the last word in lathe construction. Every possible improvement will be found in this model. Bed lengths of 10, 12, 14, 16, 18 and 20 feet are available. Build also with 27 inch swing.

Write for full particulars of the more suitable machine to-day.

Canadian Agents:
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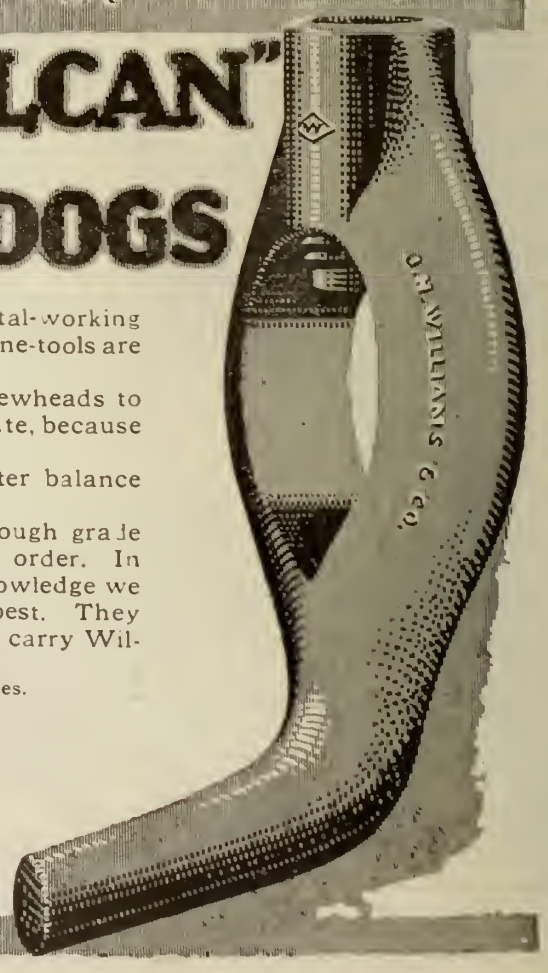

ARE invariably specified by a host of the world's better metal-working plants. They are found in every land where modern machine-tools are used, for three reasons.

1. SAFETY. There are no projections, no dangerous screwheads to catch the operator's clothing. They provide safety that is absolute, because it is inherent in the design.

2. BALANCE. Their design and proportions insure better balance when on the lathe.

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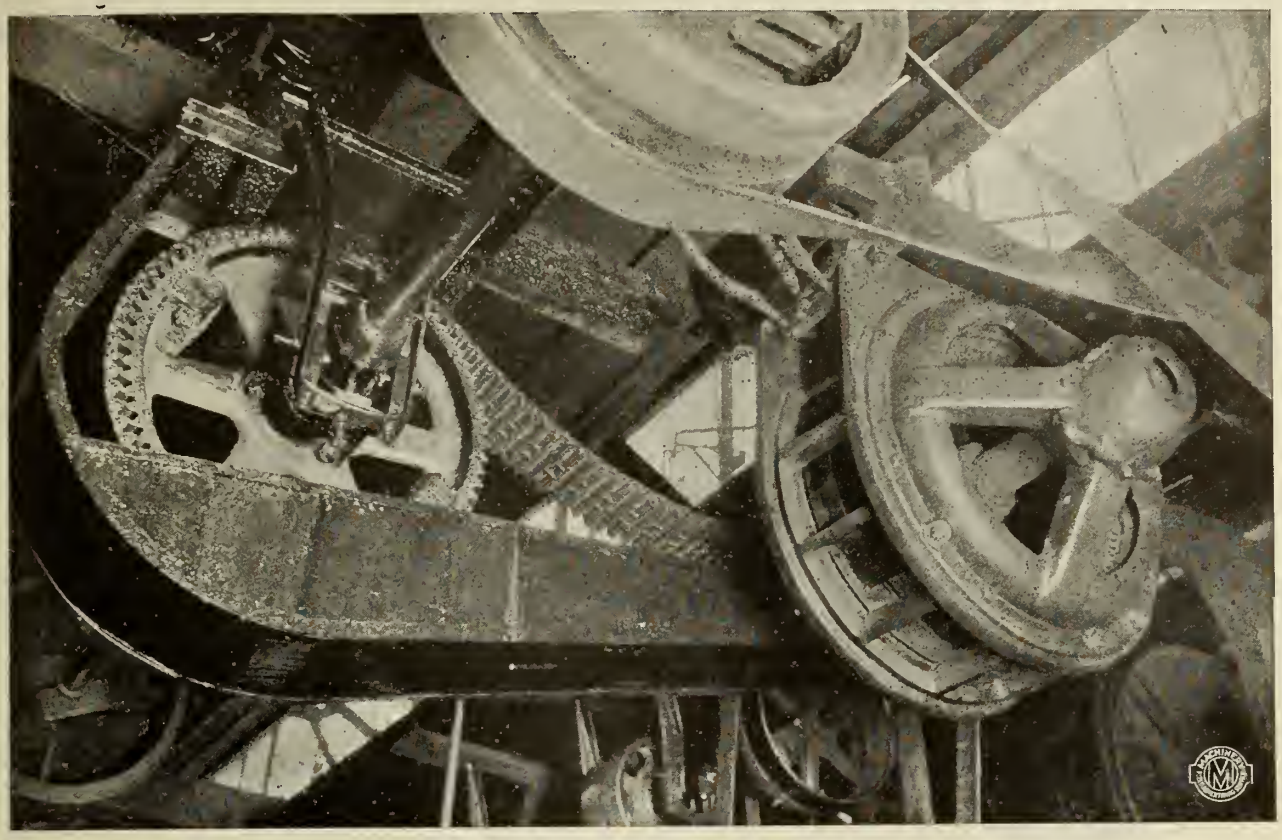
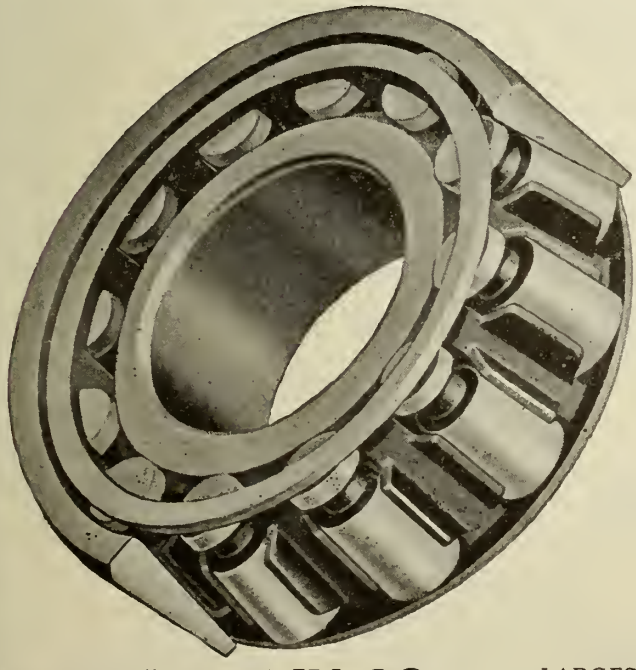


FORTY MORSE CHAIN DRIVES



Help Make Timken Roller Bearings

This particular installation which is typical of the whole 40, supplies power to a group of machines in the automatic machine department. It consists of a 50 H.P. motor and a Morse Silent Chain 7″ wide. Motor pinion has 17 teeth, line shaft sprocket 71 and the distance between centers is 54″. Line shaft speeds throughout the plant are standardized at 200 R.P.M. and motors range from 35 to 75 H.P.

Morse Silent Chains transmit full power generated at minimum cost — quietly smoothly and with negligible attention.

Consider Morse Chain in connection with your most important drives. We'll furnish the necessary data.

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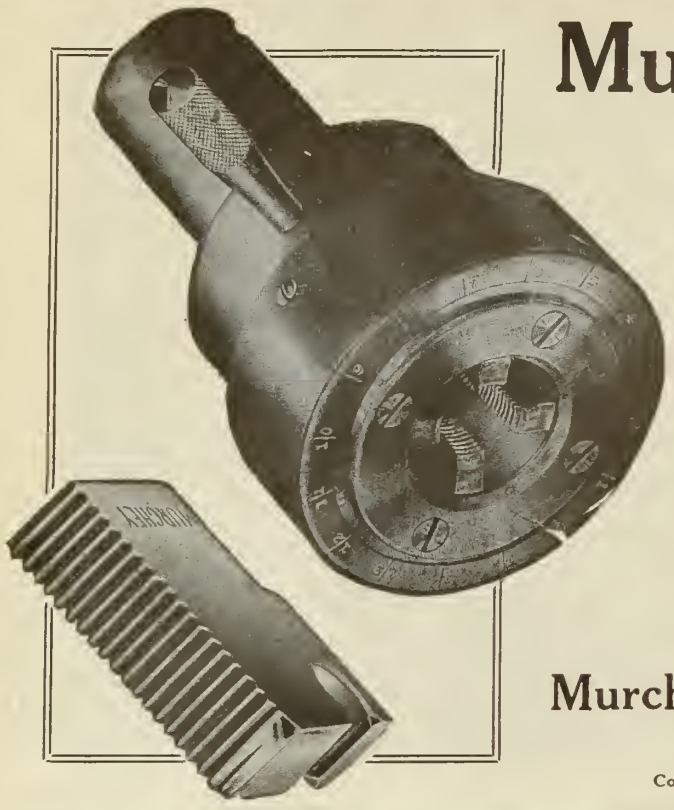

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Prompt service on chasers is an important feature to the user of collapsing taps and self-opening dies.

Quick delivery of chasers is a Murchey specialty. No waits—no shutdowns—no annoying delays.

Murchey tools can boost your production about 50%—with no risk of an expensive shutdown.

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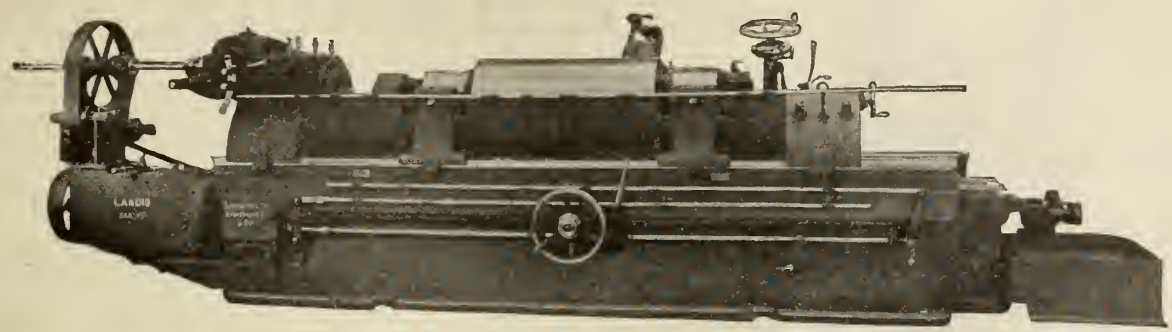

VERSATILITY

THE BIG LANDIS GRINDERS HAVE IT TOO

For instance, this is one of the larger Landis plain grinders—a 30 in. x 96 in. roll grinder. This machine is adapted to any kind of external grinding and will handle cylindrical and taper work on rolls, shafting, plungers, pistons, etc.

This versatility and the other Landis features of accuracy, rigid construction, and ease of operation combine to make this powerful machine essential on all heavy manufacturing work where accuracy or interchangeability is necessary.

All of the usual Landis features are found in this machine, including the traversing grinding wheel carriage. There is a choice of single motor, triple motor, or countershaft drive.

The Landis catalogue goes into details. Shall we mail it to you?

LANDIS TOOL COMPANY, WAYNESBORO, PA.

Canadian Agents:

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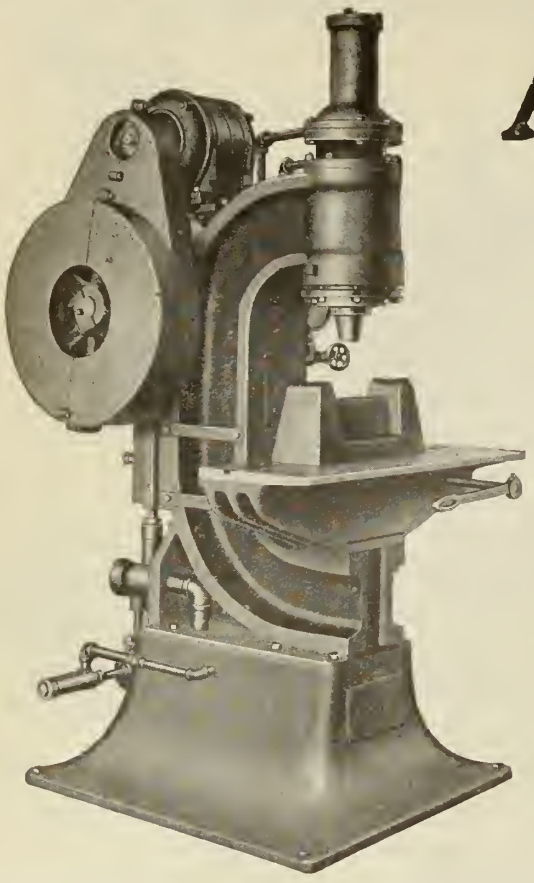

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EASTERN UNIVERSAL HYDRAULIC PRESS. Supplied in 20-35 and 50 ton capacities, full hydraulic depending on no springs or weight for return of ram delivering pressure instantly at a speed of 1½" per second, return of ram 3" per second.

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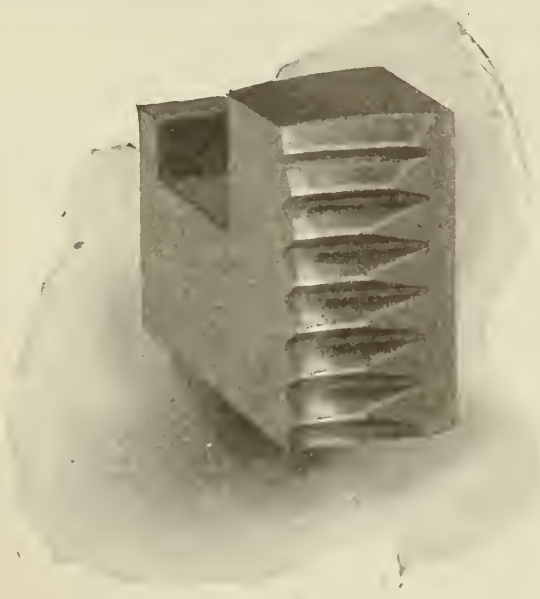

Don't Scrap the other Chasers

If one in a set breaks

Put in a New Chaser

Grinding set to uniformity.

This *Is* Practicable *If* You Use

HARTNESS AUTOMATIC DIES

Jones & Lamson Machine Company

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Cleveland Sand Rammers

FOR FLOOR, BENCH, PEIN AND FLASK RAMMING

Cleveland Sand Rammers are made in several sizes and weights, and are adapted for all kinds of Ramming in general foundry service.

The Piston Rods are packed with a resilient packing that conforms to the shape of Rod without retarding its free action, and prevents any dirt from entering piston chamber and working parts—Rammers are fitted with either Round or Flat Rods as required. Cleveland Rammers are light in weight, have high speed and practically no vibration, making them ideal foundry tools.

CLEVELAND CHIPPING HAMMERS

For General Foundry Work. Are furnished in any required size or weight for grey iron or steel castings; they have high speed, and are particularly adapted for fast chipping now required by piece-work operators.

BOWES AIR HOSE COUPLINGS

Standard Equipment Everywhere

Bowes Couplings are instantly connected or disconnected.

Bowes Couplings are absolutely air tight under all pressures.

Above cut shows the Never-Slip Clamp attached to Bowes Coupling.

In Stock:—RIVETING HAMMERS, DRILLS, REAMING, TAPPING AND FLUE-ROLLING MACHINES, CORNER DRILLS, PORTABLE AND BENCH GRINDERS, ETC.

Write for Bulletins, 43-44-45 and 46

ADDRESS ALL INQUIRIES TO:

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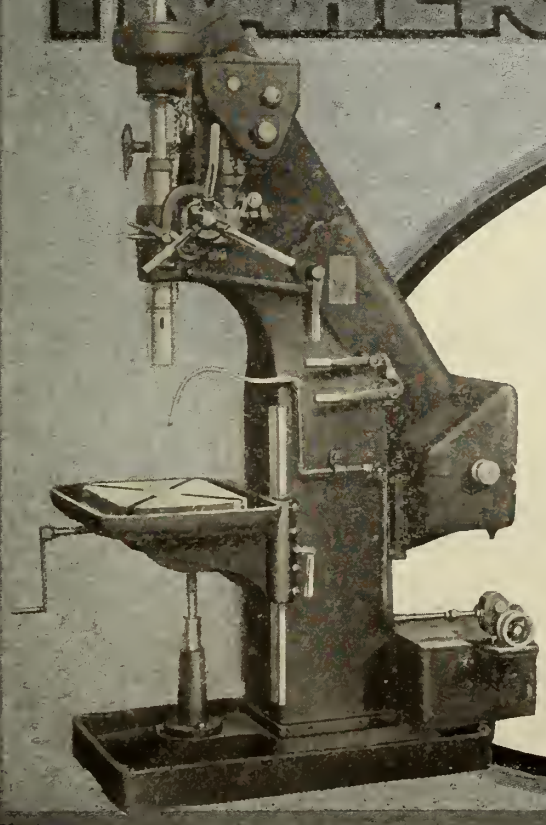
84 CHESTNUT STREET, TORONTO. ONT. 337 CRAIG ST. W., MONTREAL, QUE.

Agents: A. R. WILLIAMS MACHINERY CO., TORONTO, ST. JOHN, N.B., VANCOUVER, WINNIPEG
WILLIAMS & WILSON, MONTREAL.

Sand Rammer in operation

TRAHERN PUMPS



A TRAHERN PUMP

on the Barnes 22" Self-Oiling All-Geared Drill

Barnes Drills are known through the industry as Quality Tools and we are proud of the fact that Trahern Rotary Geared Coolant Pumps were selected by the Barnes people as being the most efficient for installation on their product.

Ninety per cent. of sales of Trahern Rotary Geared Circulating Pumps are to Machine Tool Manufacturers who furnish them as regular equipment on their product. They take the initiative, install Pumps which are KNOWN to be efficient, and thus leave nothing to chance.

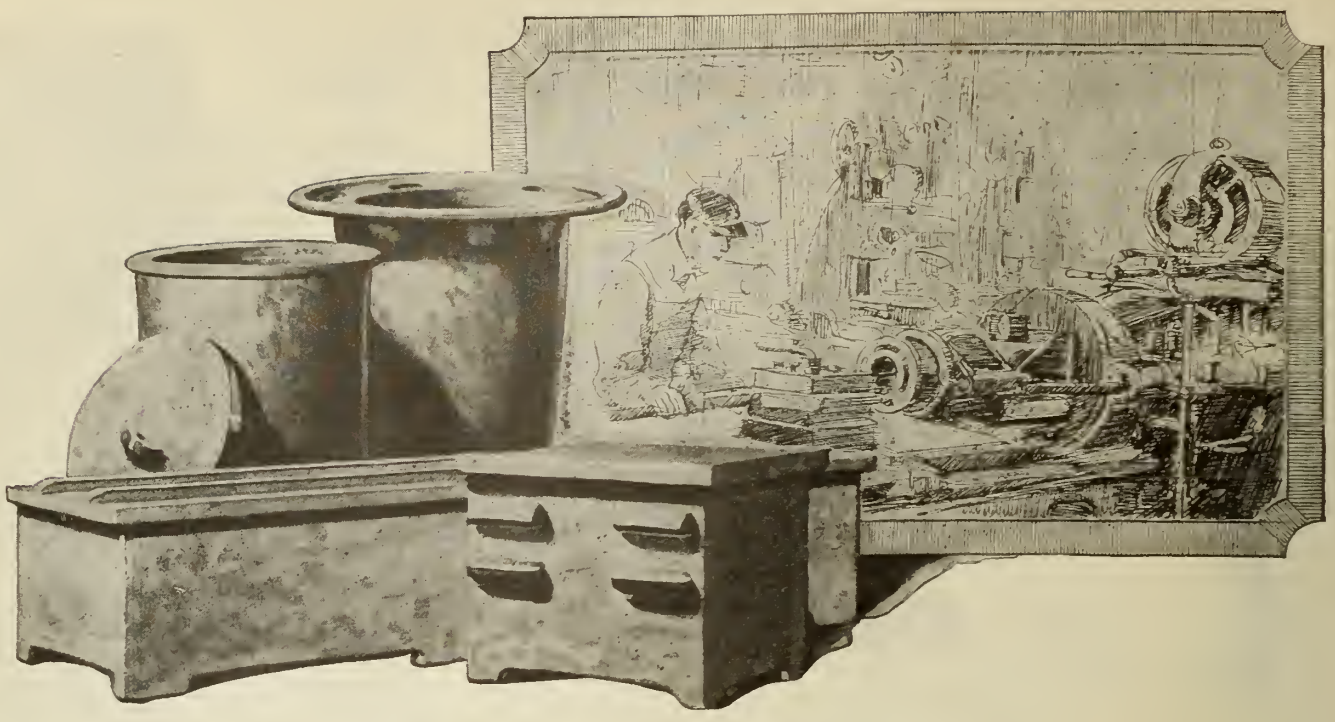
May we send you a sample pump at our expense?

TRAHERN PUMP DIV.

Geo. D. Roper Corp.

ROCKFORD, ILL.

U.S.A.



The Stamina of the Spindle and the Gear

CASE hardening and other heat treating operations give stamina to the extent that they are uniform in their results.

Cast Nichrome Containers have *proved* themselves a decided aid to uniformly dependable results. They do not warp, grow, crack or scale under repeated heating and cooling, and last for thousands of hours at 1800°F. Shorter heats, larger furnace capacity and less fuel consumption are added advantages. The Nichrome Service Guarantee assures your economy. Ask for Bulletin N-21.

A type for every requirement
Manufactured under HENDERSON Patents by

Heat Treating Containers of

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We are Exhibiting a Full Range of

"J.&S." British Made Small Tools

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and shall have inquiries from buyers in your district. Get the **"J. & S."** range of Small Tools in stock at once and so enable us to pass inquiries and orders to you for

Centre Drills
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Mandrels, etc.

Cutting-off Tools
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Ask us immediately for samples and literature

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The New Stirring and Stabilizing Process

Perfectype COMPLETE WELDING and CUTTING Equipment

Safe *Saves Money* *Makes Better Welds*

Regulators *Torches for Every Purpose* *Generators*

Canadian orders for Perfectype Special Type "A" Cutwelding Torches with 90 degree cutting head and 2 cutting tips, standard angle welding head and 5 welding tips of pure red copper will be delivered, duty and postage prepaid, from nearest jobber at the special price of $65.00.

Will consider inquiries from live dealers and jobbers who care to stock torches in lots of five or more. Territory granted. Inquiries confidential.

Address all orders and correspondence

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CHIPPING WILLSON GOGGLES WELDING

WRITE FOR CATALOG

Willson Goggles Inc. *Canadian Office:* 23 Scott St., Toronto.

WELDING AND CUTTING DAVIS APPARATUS DAVIS-BOURNONVILLE CO. "MADE IN CANADA"

Davis-Bournonville Oxy-Acetylene Welding and Cutting Apparatus

"Made in Canada"
AT NIAGARA FALLS, ONT.
DAVIS-BOURNONVILLE COMPANY

Sales Offices: 168 King St. W., Toronto: 44 Craig St. W., Montreal. Factories in Jersey City, Elkhart, Ind.; Niagara Falls, Ont. Sales Offices in all principal United States cities.

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AMERICAN ARMCO INGOT IRON

ARMCO IRON is the standard welding wire for both electric arc and oxy-acetylene welding. It has unequalled welding qualities, due to chemical and physical uniformity; 99.84 per cent. pure iron content (minimum) guaranteed. Distributors in all industrial centres. 66

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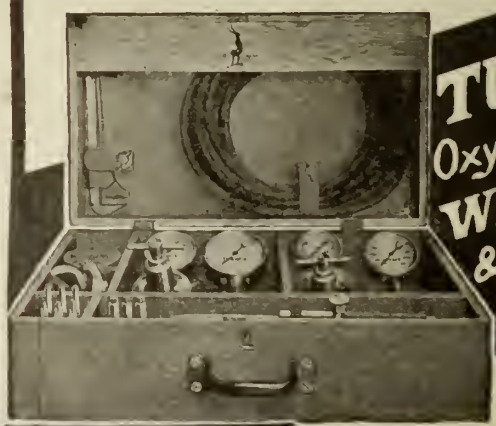
For Repairing Broken Machinery or Tools of Medium Size



TURNER Oxy-Acetylene WELDING & CUTTING Equipment

These outfits will soon pay their cost in machine parts or tools reclaimed. The sectional extensions of the torch enable the operator to adjust it to any desired length or angle. The location of valves is such that the flame is controlled by one hand, leaving the other hand free for the work at all times.

For full particulars write

The Turner Brass Works

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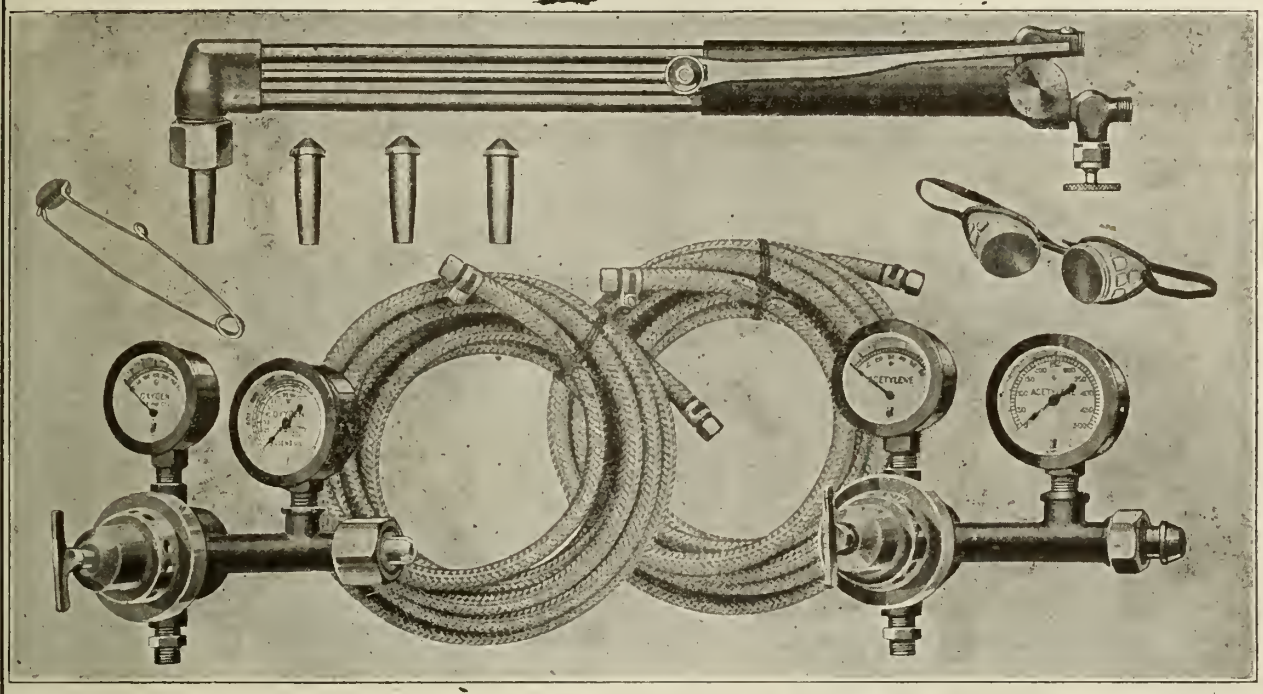
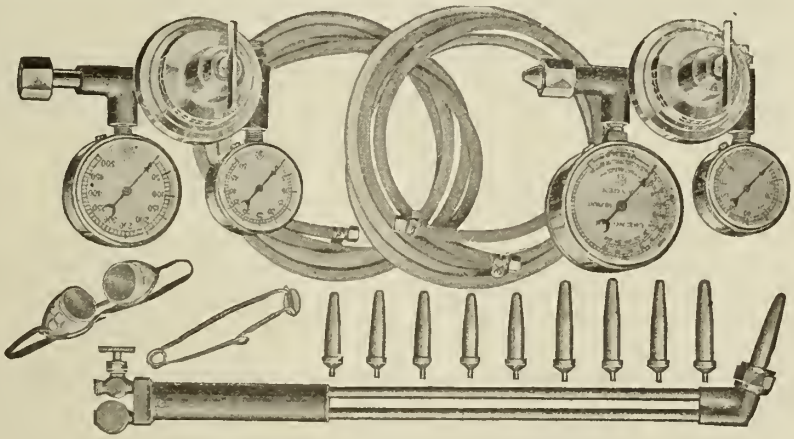
The Rego Famous NON-FLASH Torch

Better Cutting and Welding at Lower Cost

Immediate delivery made from Stocks carried in Toronto



Cutter Outfit, complete $165.00



Welding Outfit, complete $135.00

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The Carter Welding Co. of Toronto, Limited

9-11 Sheppard St., TORONTO, ONTARIO Telephones Adelaide 1524 Adelaide 2841

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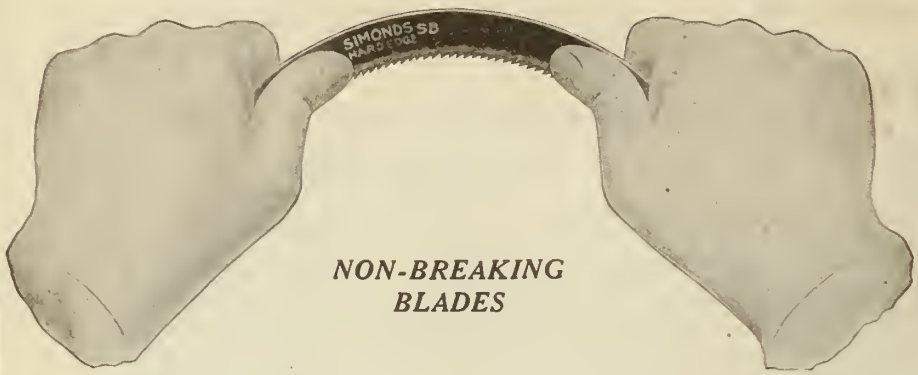
SIMONDS HACK SAWS



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For Machine or Hand Use
Any Size or Length

Simonds Canada Saw Co.
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IMPERIAL CARBIDE

For Welding Cutting and Lighting

HIGHEST GAS YIELD
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MADE IN CANADA

It insures **effectiveness** and **economy** by **invariably** producing acetylene gas of **unusual purity.**

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Large Stocks maintained at convenient distributing centres throughout Canada

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Electrolytic Process

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Supplied in 100, 200 or 300 cubic feet cylinders.

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Head Office : Toronto

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ALL SIZES—STANDARD AND MISCELLANEOUS

Made to a fine degree of accuracy

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Guaranteed Purity Reliable Service

OXYGEN AND ACETYLENE

BLOWPIPES - REGULATORS
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8 FACTORIES IN ACTUAL OPERATION AT
HALIFAX-MONTREAL-TORONTO-LONDON-SUDBURY
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Additional Factories in course of Erection

Announcement

Our new plant at London, Ont., is now operating at full capacity. All Oxygen orders for consumption in the London district and in Western Ontario will, from now on, be executed from London, and our customers will derive the full benefit of the saving in freight, while being assured of an unsurpassed service.

All orders for Ontario to be sent as usual to our Toronto Office, Confederation Life Building.

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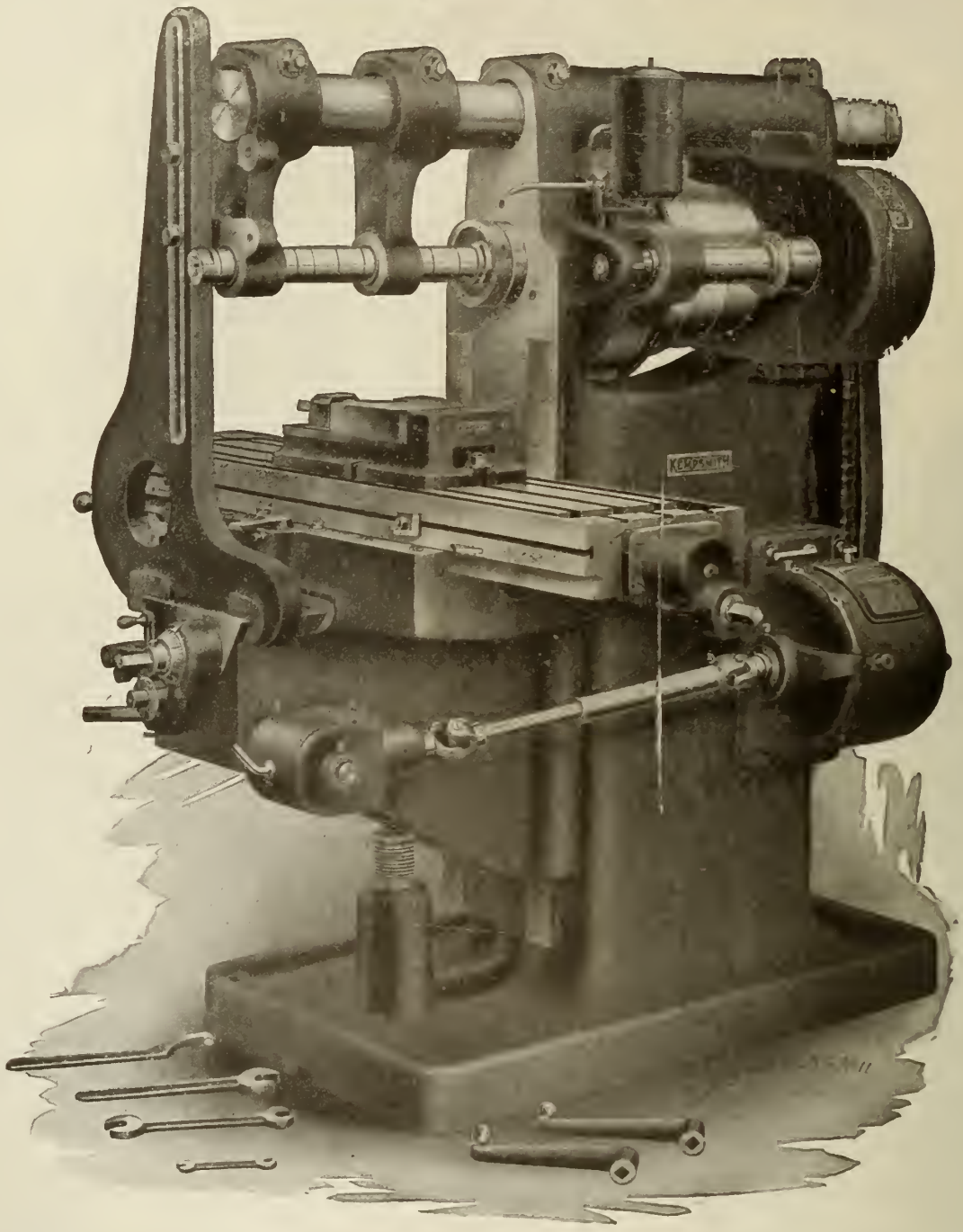
KEMPSMITH



KEMPSMITH No. 3 Plain Milling Machine

Double Back Geared

A heavy, powerful tool with double back gears and wide driving belt running on a three-step cone of large diameter. Our catalogue "B" describes and illustrates many notable features of the Kempsmith Miller. Write for a copy to-day.

THE KEMPSMITH MANUFACTURING CO.

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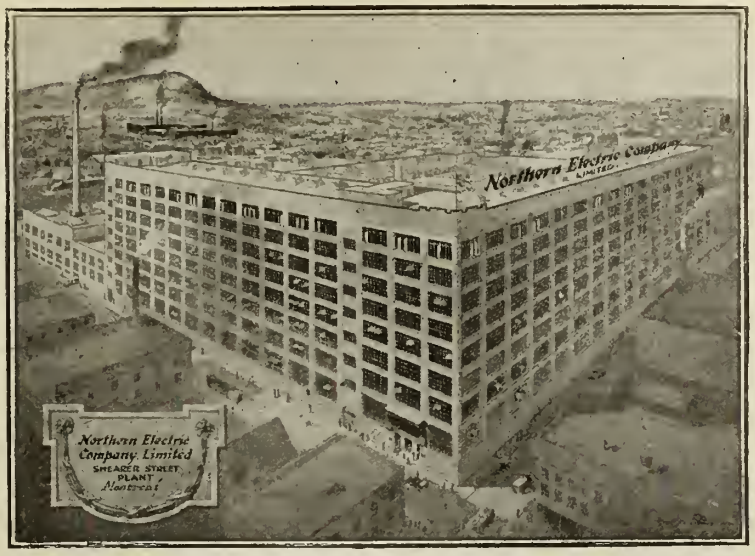
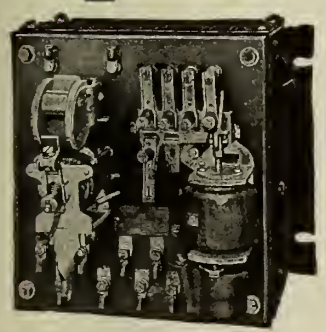
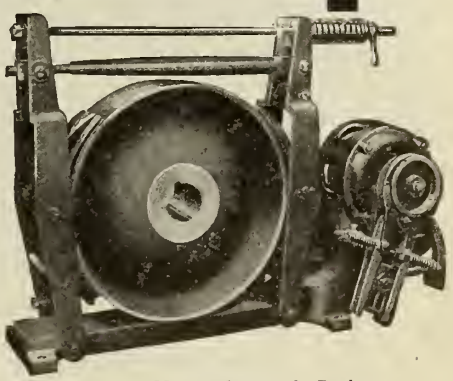


Exclusive Canadian Outlet for CUTLER-HAMMER Apparatus



7021 Electric Controller



Motor Operated Brake

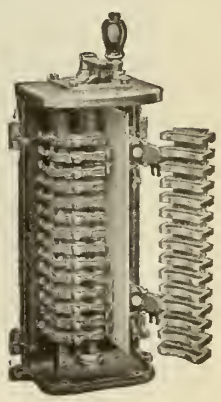
Lifting Magnet

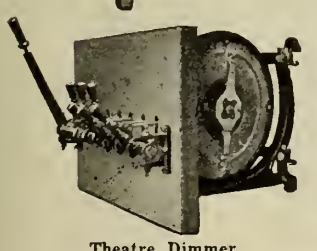
The Cutler-Hammer Company has been the recognized leader in the design and manufacture of Control Apparatus and kindred lines, from early and experimental days to its modern development.

We take a natural pride, therefore, in announcing the appointment of our Company as the sole Canadian distributor of the equipment made by this reputable manufacturer.

A most valuable link is thus added to our chain of Power Equipment and because of our Nation-wide distributing facilities, a most effective service will be rendered.

Drum Controller





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Northern Electric Company
LIMITED

Montreal Halifax Toronto London Winnipeg Edmonton
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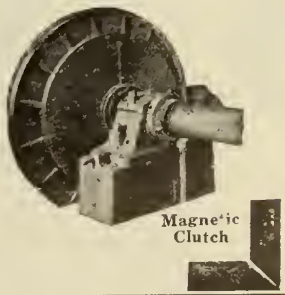
Separator



Magnetic Clutch

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Have This Working for You While You Are on Vacation

THERE is real gratification in feeling that a duty has been well done. It will add much to the enjoyment of your vacation to feel that you have left things working profitably for you even while you are gone.

Reserve space before you go and approve copy to be run in HARDWARE AND METAL, and particularly in the 32nd Annual Fall Number, so that wherever you may be, and whatever you may be doing, the whole Canadian hardware trade will be made more familiar with your product, your trademark or your name through your weekly-message in HARDWARE AND METAL, the hardware trade weekly to which the trade turns for business information on hardware.

The trade purchases invariably those products with which they have become familiar in the pages of HARDWARE AND METAL — make yours one of them!

Be sure to reserve space in the 32nd Annual Fall Sales and Directory Number appearing August 21st, 1920. It is kept by the trade and ordered from for many months. These Fall and Spring Numbers are not "freak specials," but have been established institutions in Canada's hardware trade for over 30 years.

The trade will look for your advertisement in the August 21st number —make sure of its publication before you go. Forms now closing.

HARDWARE AND METAL reaches all the wholesalers and jobbers, 90% of the retailers, and many travellers, salesmen and clerks of the Canadian hardware trade, and is the only Canadian hardware paper that furnishes a circulation statement audited by the Audit Bureau of Circulations. The rates are moderate: $65 per page; $36 for half page; $21 quarter page, and $120 for two pages. Cost of color, and inserts on special stock, supplied on request.

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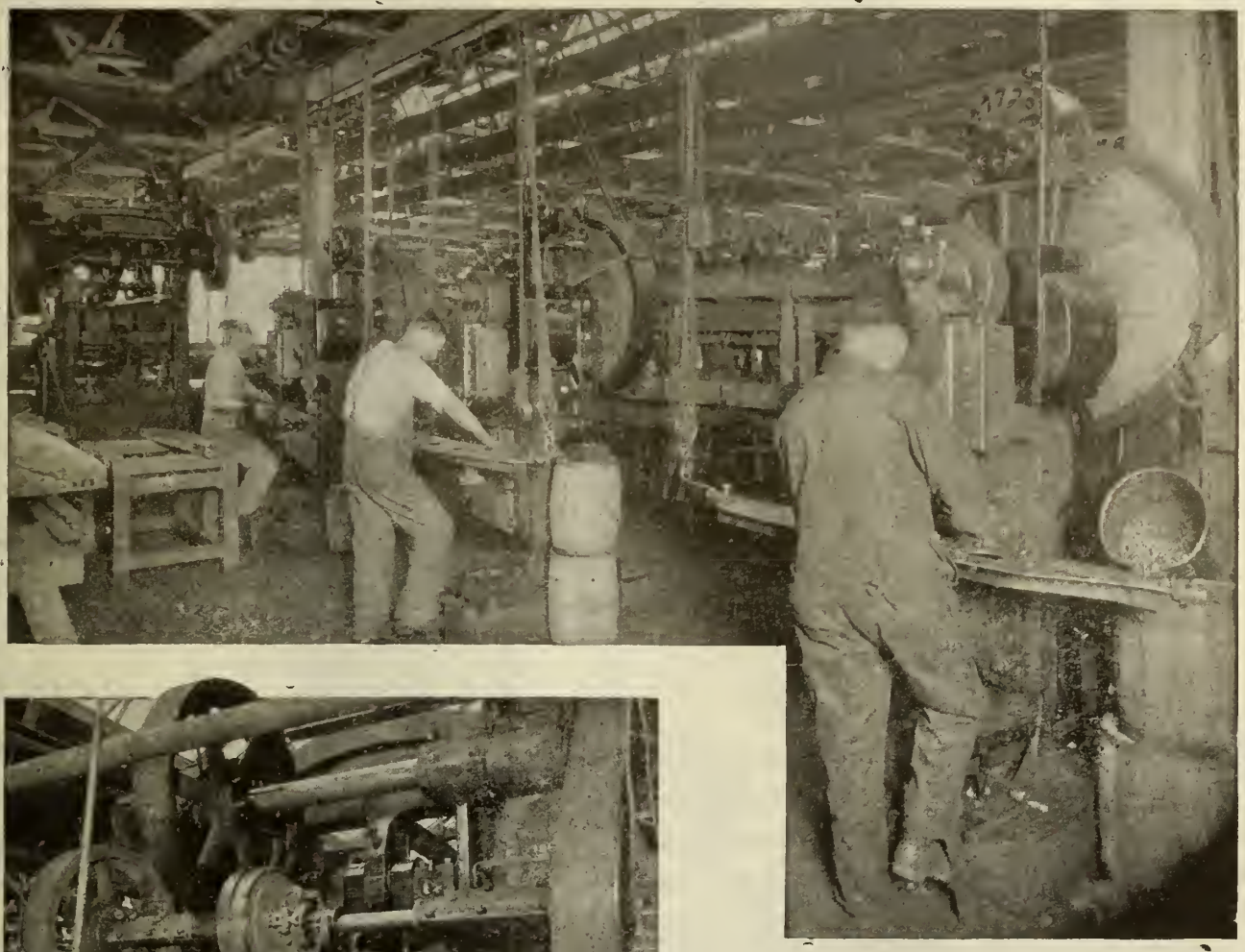
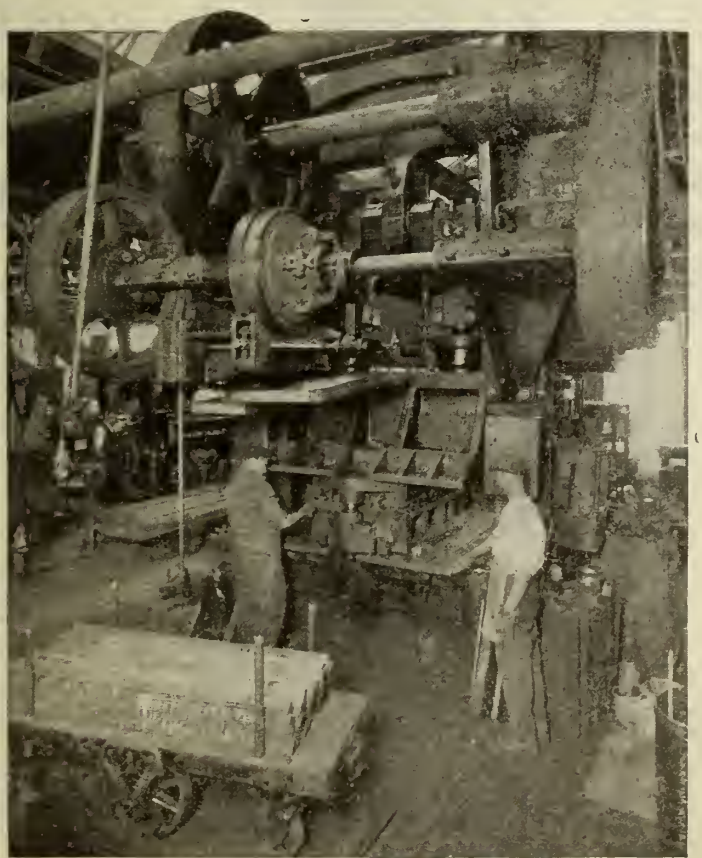
143-153 University Avenue, Toronto, Canada

Montreal Branch, Southam Building **Winnipeg Branch, Union Trust Building**





Perforating and Riveting---

"BLISS" Presses are used for perforating and riveting frame members in the plant of the Cleveland Tractor Company. The large press in the lower picture is a "BLISS" No. 12, Double-Crank. It perforates rivet-holes in two side-frame plates at each stroke.

In the upper picture is shown a battery of "BLISS" No. 103-A Presses driving and heading ⅞" rivets, cold driven, in side-frames.

BLISS 1857

E. W. Bliss Company

Main Offices: BROOKLYN, N.Y., U.S.A.
American Factories: BROOKLYN, N.Y. *and* HASTINGS, MICH.

BLISS 1920

SALES OFFICES

CHICAGO, People's Gas Bldg. DETROIT, Dime Bank Bldg. CLEVELAND, Union Bank Bldg.
CINCINNATI, Union Trust Bldg. BUFFALO, Marine Bank Bldg. St. LOUIS, Boatmen's Bank Bldg. PITTSBURGH, Keenan Bldg.

FOREIGN SALES OFFICES AND FACTORIES

LONDON, ENGLAND, Pocock Street, Blackfriars Road, S.E. PARIS, FRANCE, 100 Boulevard Victor Hugo, St. Oue

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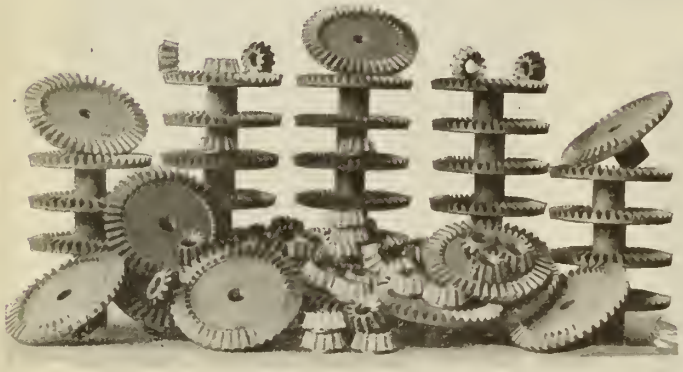
Cut Gears

in Quantity

(or singly)



Accurate Bevel Gears With Generated Teeth

Write us for all kinds of Gears

Hamilton Gear & Machine Co.

Van Horne St. TORONTO

Thor Chipping, Calking and Beading Hammer

Thor punch has helped put across many a job

Time is one of the most important items involved in every contract job.

The speed with Thor Hammers, Drills and other Tools work has pulled many a contract through on time.

Write for our Thor Catalog No. 10

Independent Pneumatic Tool Company

334 St. James St. - Montreal

Thor

TORONTO
32 Front Street W.

WINNIPEG
123 Bannatyne Ave. E.

VANCOUVER
1142 Homer Street

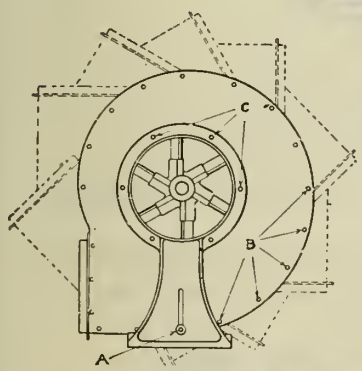
Canadian

The Canadian Standard Reversible Mill Exhauster will keep your shop clean, remove sawdust, shavings, fumes, gas or any loose materials and disagreeable odors.

Insurance rates can be reduced; floors and machines covered with sawdust, chips or shavings, increase the fire risk.

Insurance companies reduce the premiums where adequate precautions have been taken to prevent fires.

Blast Wheel — This wheel is so constructed that it will handle any kind of stringy material efficiently, such as sawdust, shavings, cotton lint. Will also handle gases, fumes, smoke, etc.

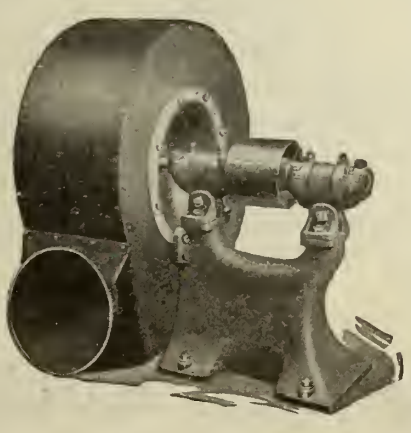


The Canadian Standard Planing Mill Exhausters have reversible housings so that the outlet can be adjusted instantly to any angle desired.

This eliminates necessity of crossed belts. Simplifies changes on alterations in piping or building.

The housing is of heavy rolled steel plate securely bolted together with angle irons. Round cast iron outlet bolted to the housing. Blast wheel mounted on heavy cast iron spider.

Every fan carefully tested by running test at speeds in excess of that required.



Write for Catalog 16

Canadian Blower & Forge Co.

Kitchener, - Ont.

THE MASTER METAL

STELLITE

Not Steel—but its Master

Stellite tools permit cutting speeds never before known in lathe history. Stellite actually increases the capacity of the shop without the necessity for more machines or floor space.

Stellite will stand heavier cuts, operate at a higher speed, and last longer between regrindings than the finest high speed steel.

Heat up to 2,000° F. but serves to increase the toughness and durability of Stellite!

You should know all about this vital factor in modern shop methods. Have us send a demonstrator to show you just what Stellite can accomplish in *your* shop.

Deloro Smelting & Refining Co., Limited

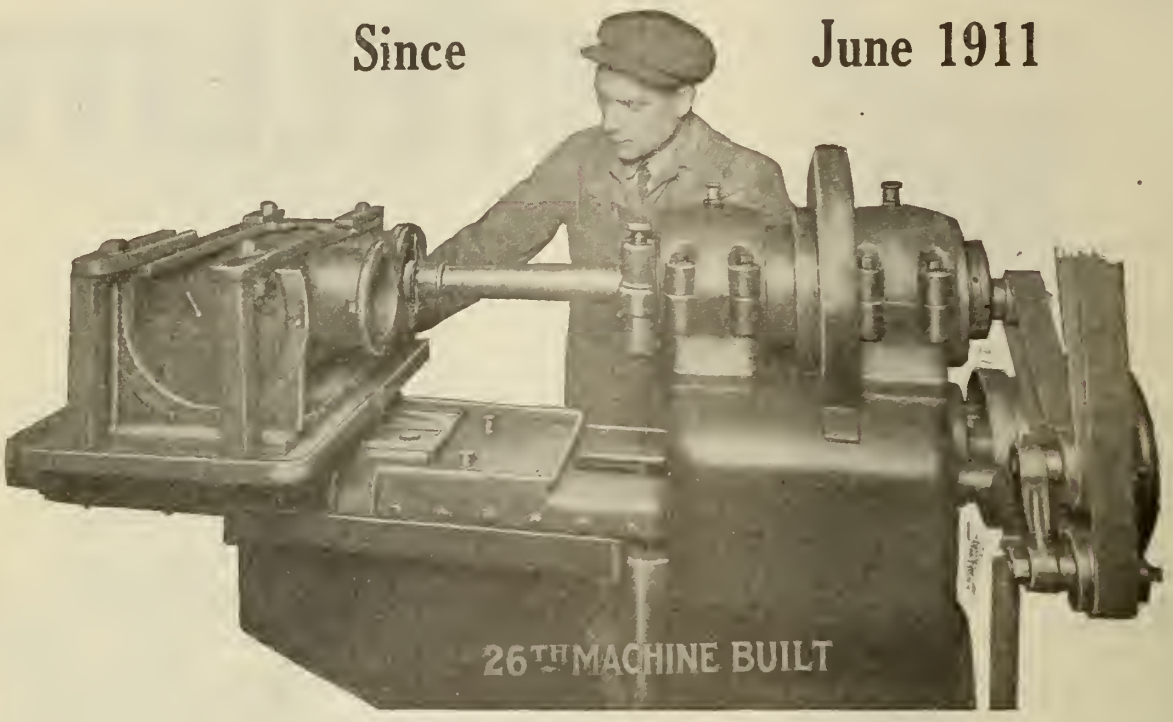
Head Office and Works :
DELORO CANADA

Branch Warehouses :
200 King St.W. Toronto, Ont., Can.
174 Corporation St. Birmingham, Eng.

THE MASTER METAL

Grinding Air Compressor Cylinders

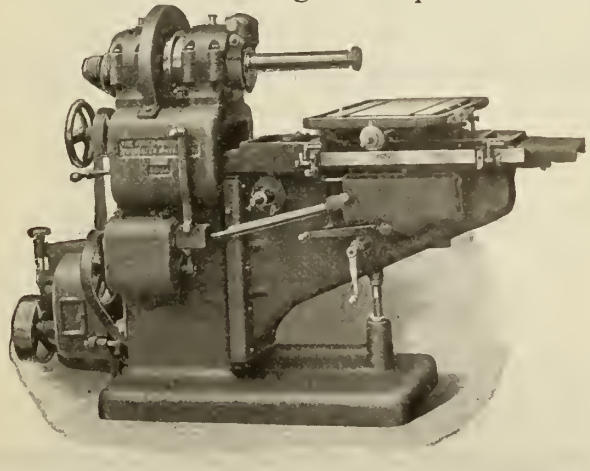
Since June 1911



This Heald No. 60 was sold the Twin City Rapid Transit Company, Minneapolis, in June 1911. It was the 26th machine built and over 2,200 have been sold since then. This photo was taken at their plant regrinding air compressor cylinders.

All classes of cylinders when being refinished should be ground on a Heald No. 60. Whether it is gas, steam or air the same rule holds true,—that no other method of machining will cut the high, hard spots and give a true round hole, from which there will be practically no leakage by the piston and rings.

This machine has been designed especially for internal grinding on a great variety of machine parts where the rapid removal of stock and the accuracy of the work are of great importance. It is particularly adapted for finishing holes in castings of such shape that it is inconvenient or impossible to rotate them according to the usual method of handling such work.



The Heald Machine Co.

Worcester, Mass., U.S.A.

Montreal: The George F. Foss Machinery & Supply Co., Ltd. New York: 839 Singer Bldg. Philadelphia: 1308 Commonwealth Bldg. Chicago: 26 South Jefferson St. Detroit: 401 Marquette Bldg. Cincinnati: 311 Provident Bank Bldg. Cleveland: 721 Engineers' Bldg.

Do You Consider Your Workmen's Temper?

It's important, because a workman out of temper cannot do good work.

Nothing puts a workman in bad temper more quickly than a dull file.

As soon as a file begins to get dull, discard it and buy a new one.

If you buy Famous Five brands, you will not have to discard files before you have full value out of them.

Made of special steel, well cut and thoroughly hardened, they give the fullest "file value."

The Famous Five brands are:

KEARNEY & FOOT
GREAT WESTERN
AMERICAN
ARCADE
GLOBE

MADE IN CANADA BY

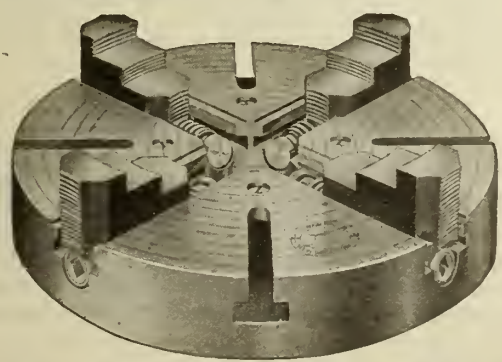
NICHOLSON FILE COMPANY

PORT HOPE - ONTARIO

ALL STEEL

INDEPENDENT CHUCKS

are not an experiment—they have come to stay. They are a necessity with the modern machinery and high-speed steel cutting tools.



THE UNION STEEL BODY CHUCKS are well designed and have all the elements of strength and durability for which they are designed. We make other types in steel also, including the Geared Scroll Chucks and the Geared Scroll Combination—all designed for heavy work and hard usage.

UNION MANUFACTURING COMPANY

New Britain, Conn.

New York Office: 26 Cortlandt Street

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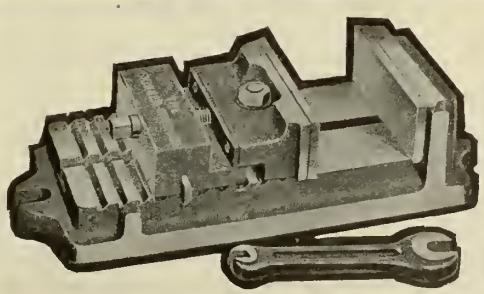

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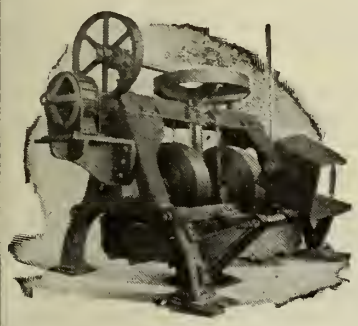

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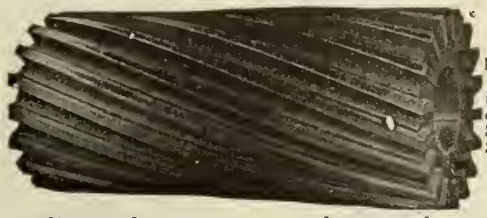

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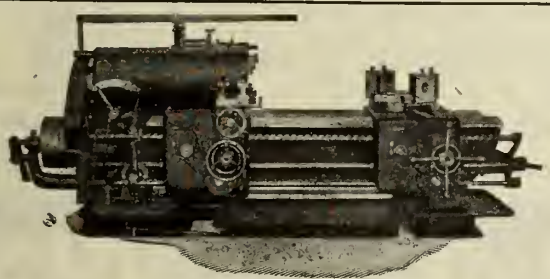

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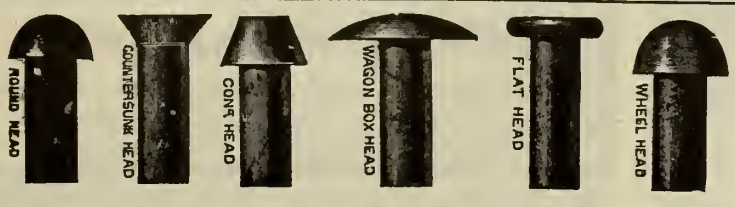

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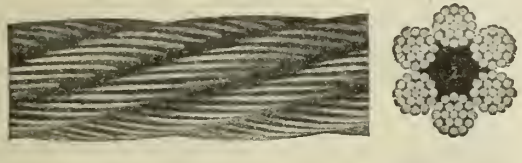

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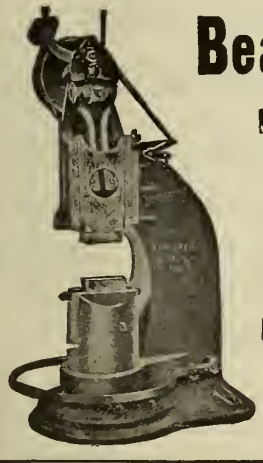

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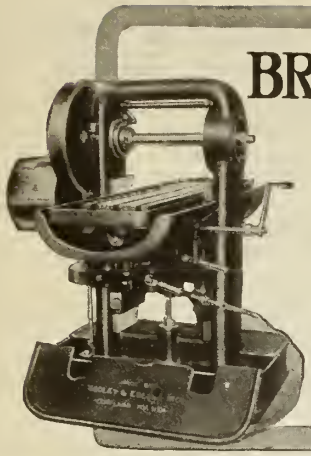

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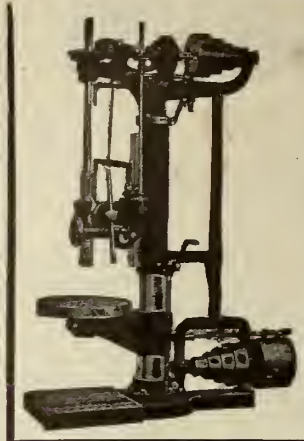

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BELTING, LEATHER
Can. Graton & Knight Mfg. Co., Montreal
Gutta Percha & Rubber, Ltd., Toronto, Canada.
Sumner & Co., New York, N. Y.
John Tullis & Son, Glasgow, Scotland.

BELTING, RUBBER
International Mchy. Spls., Ltd., Montreal.
Quaker City Rubber Co, Philadelphia, Pa.

BELTING, STITCHED COTTON DUCK
Dominion Belting Co., Hamilton, Ont.
Gutta Percha & Rubber, Ltd., Toronto.

BELTING, WOVEN
Federal Engineering Co., Ltd., Toronto
Summer & Co., New York, N.Y.

BENDING MACHINERY
Bertrams, Ltd., Edinburgh, Scotland.
Bertram & Sons Co., John, Dundas
Brown-Boggs Co., Ltd., Hamilton, Ont.
Can. Blower & Forge Co., Kitchener.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Mach. Co., Toronto.
Petrie, Ltd., H. W., Toronto.

BLAST GATES
W. S. Rockwell Co., New York, N.Y

BLASTING MACHINES, SAND
Garlock-Walker Machinery Co., Toronto
Jardine, A. B., & Co., Hespeler, Ont.
National Mach. Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co., Toledo
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont

BILLET MARKERS
Matthews & Co., Jas. H., Pittsburgh, Pa.

BILLETS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Swedish Steel & Importing Co., Ltd., Montreal.
Algoma Steel Corp., Sault Ste. Marie
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
United Alloys Steel Corp., Canton, Ohio.

BILLETS, FORGING
Dominion Foundries & Steel Ltd., Hamilton, Ont.
Kayser-Ellison & Co., Ltd., Montreal.

BINS, STEEL
Dennis Wire & Iron Works, London, Ont
Dominion Bridge Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Toronto Iron Works, Ltd., Toronto, Ont.
Wilkinson Hamilton Co., Peterboro, Ont.

BLACKSMITH WORK
The Thos. Pink Co., Ltd., Pembroke

BLOCKS, CHAIN
Oliver Engineering Co., Montreal.

BLOOMS AND SLABS
Algoma Steel Corp., Sault Ste. Marie
nited Alloys Steel Corp., Canton, Ohio.

BLOWERS
Can. Blower & Forge Co., Kitchener, Ont
Chicago Flexible Shaft Co., Chicago, Ill.
Garlock-Walker Machinery Co., Toronto
MacGovern & Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto.
Sturtevant Co., B. F., Galt, Ont.

BLOWING ENGINES
General Combustion Co., Ltd., Montreal, Que.

BLOW PIPES AND REGULATORS
Carter Welding Co., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Welding & Supplies Co., Montreal, Que.

BLUE PRINTING MACHINERY
Commercial Camera Co., Providence, R.I.

BLUE PRINT PAPER
Hughes, Owens Co., Ltd., Montreal, Que.

BOARDS, GLASS CUTTING
Lufkin Rule Co., of Can., Windsor, Ont.

BOARTZ
Joyce, Koebel & Co. Inc., New York.

BOLT CUTTERS
Greenfield Tap & Die Corp., Greenfield Mass

BOILER TUBES
Lyman Tube & Supply Co., Montreal, Que.

BOILER BREECHINGS
Que.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
St Lawrence Welding Co, Ltd., Montreal
William Hamilton Co., Peterboro, Ont.

BOLT CUTTERS
Fellows Gear Shaper Co., Springfield, Vt
Greenfield Tap & Die Corp., Greenfield Mass.
Wells Bros., of Can., Galt, Ont.
Petrie, Ltd., H. W., Toronto.

BOILERS, RANGE
Can. John Wood Mfg. Co., Ltd., Toronto, Ont.

BOILERS
Dominion Bridge Co., Montreal, Que.
MacGovern & Co., Montreal, Que.

BOILERMAKERS' TOOLS
Holden Co., Ltd., Montreal, Que.

BOLT CUTTERS AND NUT TAPERS
Aikenhead Hardware Co., Toronto, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto
Landis Machine Co., Waynesboro, Pa.
A.B. Jardine & Co., Ltd., Hespeler, Ont
Rice Lewis & Son, Toronto, Ont.
Wells Bros. Co. of Canada, Galt, Ont.
Petrie, Ltd., H. W., Toronto

BOLTS
Aikenhead Hardware Co, Toronto, Ont.
London Bolt & Hinge Wks., London, Ont.
Morrow Screw & Nut Co., John, Ingersoll.
Rice, Lewis & Son, Toronto, Ont.
Steel Co., of Canada, Ltd, Hamilton.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Co., J. H. Brooklyn, N.Y.

BOLTS, COUPLING
Galt Machine Screw Co., Ltd., Galt, Ont.

BOLTS, STAY
Morrow Screw & Nut Co., John, Ingersoll.

BOLTS, SPRING SHAKLE
Can. Winkley Co., Ltd., Windsor, Ont.
Morrow Screw & Nut Co., John, Ingersoll

BOLTS, PATCH
Morrow Screw & Nut Co., John, Ingersoll.

BOLT AND NUT MACHINERY
Barber Mchy. Co., Ltd., Toronto, Ont.
Bertram & Sons Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Gardner & Son, Robt., Montreal.
Landis Machine Co., Waynesboro, Pa.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ohio.
Universal Mach. Co., Bowling Green, O.
Williams Machinery Co., A. R., Toronto

BOLT THREADING MACHINERY
Jardine & Co., Ltd., . B., Hespeler.
Landis Machine Co., W esboro, Pa.
National Acme Co., Cleveland, Ohio.
Victor Tool Co., Waynesboro, Pa.

BONDING MACHINES (Electric Railway)
The Lincoln Electric Co., Toronto, Ont.

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Cleveland Pneumatic Tool Co., Toronto.
Canadian Fairbanks-Morse Co., Montreal
Can. Ingersoll-Rand Co., Sherbrooke Que
Garlock-Walker Mach. Co., Toronto.

BORING MACHINES, UPRIGHT AND HORIZONTAL
Barber Mchy. Co., Ltd., Toronto, Ont.
Bertram & Sons Co., John, Dundas.
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto
Gisholt Machine Co., Madison, Wis.
Holden Co., Ltd., Montreal, Que.
Hoefer Mfg., Co., Freeport, Ill.
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Oliver Mach'y Co., Grand Rapids, Mich.
Rockefson Machine & Tool Co., Toronto.
Rockford Drilling Mchs. Co, Rockford, Ill

BORING AND TURNING MILLS
Barber Mchy. Co., Ltd., Toronto, Ont.
Bertram & Sons Co., John, Dundas.
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Foss Mch. & S'ply Co., Geo. F., Montreal
Knight Metal Products, Toronto.
Oliver Mach. Co., Grand Rapids, Mich.
Niles-Rement-Pond Co., New York.
Strelinger Co., C. A., Windsor, Ont.

BOXES, CAST IRON
Brown & Sharpe Mfg. Co., Providence, R.I.

BOXES, STEEL SHOP AND TOTE
Cleveland Wire Spring Co., Cleveland.

BRAKES
Brown, Boggs & Co., Hamilton, Can.
Electric Steel & Metals, Ltd., Welland.

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Brown's Copper and Brass Rolling Mills, New Toronto.

BRASS ALLOYS
British Smelting & Refining Co., Ltd., Montreal, Que.

BRASS AND COPPER TUBING
Lyman Tube & Supply Co., Montreal, Que.

BRASS FOUNDERS
Canada Metal Co., Toronto.
St. Lawrence Welding Co., Montreal.
Tallman Brass & Metal Co., Hamilton.

BRASS GOODS
Crane, Ltd., Montreal, Que.

BRASS PIPE AND TUBE
Crane, Ltd., Montreal, Que.

BRASS WORKING MACHINERY
Barber Mchy. Co., Ltd., Toronto, Ont.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machinery Co., Toronto.
Warner & Swasey Co., Cleveland, O.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Pratt-O-Lite Co., Inc., Toronto, Ont.
Wood Turret Machine Co., Brazil, Ind.
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BRAZING EQUIPMENT
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Elk Fire Brick Co., Can., Ltd., Hamilton, Ont.

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Canadian Mead-Morrison Co., Limited, Montreal, Que.
Dominion Bridge Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.

BROACHING MACHINES
Strelinger Co., C. A., Windsor, Ont.

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Brown's Copper and Brass Rolling Mills, New Toronto.

BRONZE, NAVAL
Canada Metal Co., Toronto.
Tallman Brass and Metal Co., Hamilton.

BRONZE COPPER
Canada Metal Co., Toronto.

BRUSHES, CARBON
Lyman Tube & Supply Co., Montreal, Que.

BUFFING AND POLISHING MACHINERY
Ford-Smith Mach. Co., Hamilton.
Foss Mchy. & S'ply Co., Geo. F. Montreal
Garlock-Walker Machinery Co., Toronto.
Petrie, Ltd., H. W., Toronto.

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MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
St Lawrence Welding Co, Ltd, Montreal

BUCKETS, ELEVATOR
Can. Link-Belt Co., Toronto, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
...nce Welding Co, Ltd., Mont...

BUCKETS, CLAM SHELL, CRAB, DUMP
Brown Hoisting Machinery Co., Cleveland, Ohio.
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Ltd, Walkerville.

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Canada Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machinery Co., Toronto.
Lourie Manufacturing Co., Springfield, Ill
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

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BURRS, IRON AND COPPER
Parmenter & Bulloch Co., Gananoque,.

BUSHINGS, BRONZE
Morrow Screw & Nut Co., John, Ingersoll.
St Lawrence Welding Co, Ltd., Montreal

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Pangborn Corporation, Hagerstown, Md.

CABINETS, SAND BLAST
Pangborn Corporation, Hagerstown, Md.

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CABLES, TRANSMISSION AND TELEPHONES
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Carter Welding Co., Ltd., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.
Union Carbide Co., of Canada, Limited, Weland, nt.

CARBONIZING BOXES
Can. Driver-Harris Co., Ltd., Walkerville
Kaltie Foundry, Galt, Ont.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.
Swedish Crucible Steel Co., Windsor.

CARRIERS, PNEUMATIC TUBE
Jones & Glassco, Montreal.

CARS, INDUSTRIAL
Can. Blower & Forge Co., Kitchener, Ont
Can. Fairbanks-Morse Co., Ltd, Montreal
Elec. Steel & Metals, Welland, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

CAR MOVERS
Holden Co., Ltd., Montreal, Que.

CASES, FILING
Economy Drawing Table Co., Adrian, Mich.

CASTINGS, ALUMINUM, BRASS BRONZE, COPPER, AND GUN METAL
Algoma Steel Corp., Sault Ste. Marie.
Franklin Mfg. Co., Syracuse, N.Y.
Canada Metal Co., Ltd., Toronto, Ont.

CASTINGS, DIE CAST
Canada Metal Co., Ltd., Toronto, Ont.
Franklin Mfg. Co., Syracuse, N.Y.
Fisher Motor Co., Ltd., Orillia, Ont.
Tallman Brass & Metals Ltd., Hamilton, Ont.

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Canada Electric Castings, Ltd., Orillia, Ont.
Dominion Foundries & Steel Ltd., Hamilton, Ont.
Electric Steel & Metals Co., Welland.
Meeta Machine Co., Pittsburgh, Pa.

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Can. Elec. Castings Co. Ltd., Orillia, Ont
Dominion Foundries & Steel Ltd., Hamilton, Ont.

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John Morrow Screw & Nut Co., Ingersoll
Alexander Fleck Ltd., Ottawa.
Tallman Brass & Metal Co., Hamilton.

CASTINGS, BENCH LEG.
Brown & Sharpe Mfg. Co., Providence, R.I.

CASTINGS, BRASS AND IRON
Algoma Steel Corp., Sault Ste. Marie.
International Machinery and Supply Co., Ltd., Montreal, Que.

CASTINGS, BUILDING
Kaltie Foundry, Galt, Ont.

CASTINGS, GRAY IRON
Bernard Industrial Co., A., Fortierville, Q.
Brown & Sharpe Mfg. Co., Providence, R.I.
Brown, Boggs Co., Ltd., Hamilton.
Can. Elec. Castings Co, Ltd., Orillia, Ont
Alexander Fleck, Ltd., Ottawa.
Gardner & Son, Robt., Montreal
Hull Iron & Steel Foundries, Ltd., Hull
International Malleable Iron Co., Guelph
Kennedy & Sons, Ltd., Wm., Owen Sound.
Kaltie Foundry, Ltd., Galt, Ont.
Hamilton Co., Wm., Peterboro.
McFarlane Engineering Ltd., G. W., Paris, Ont.

CASTINGS, PLUMBERS'
Kaltie Foundry, Galt, Ont.

CASTINGS, NICHROME
Can. Driver-Harris Co., Ltd., Walkerville

CASTINGS, HARDWARE
Kaltie Foundry, Galt, Ont.

CASTINGS, STEEL CHROME AND MANGANESE STEEL
Thos. Davidson Mfg. Co., Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Hull Iron & Steel Foundries, Ltd., Hull.
Kennedy & Sons, Ltd, Owen Sound.

CASTINGS, MALLEABLE
International Malleable Iron Co., Guelph

CASTINGS, NICKEL STEEL
Hull Iron & Steel Foundries, Ltd., Hull.

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Can. Fairbanks-Morse Co., Ltd., Montreal.
Gardner, Robt., & Son, Montreal.

CEMENT HANDLING MACHINERY
Can. Link-Belt Co., Toronto, Ont.

CEMENT TOOLS
Atkins & Co., E. C., Hamilton, Ont.

CENTERING MACHINES
Victoria Foundry Co., Ottawa, Ont.

CENTRE REAMERS
Bertram & Sons Co., John, Dundas.
Butterfield & Co., Inc., Rock Island, Que.
Gardner, Robt. & Son, Montreal.
Hurlburt, Rogers Mch. Co., South Sudbury, Mass.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co., of Canada, Galt, Ont.

CHAIN, WELDED COIL
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

CHAIN BLOCKS
Aikenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Ford Chain Block & Mfg. Co., Phila., Pa.
Garlock-Walker Machy. Co., Toronto.
Lyman Tube & Supply Co., Montreal, Que.
Morris Crane & HoistCo., Herbert, Niagara Falls, Ont.
Oliver Engineering Co., Montreal.
Rice Lewis & Son, Toronto, Ont.
Jones & Glassco, Montreal, Que.

CHAINS, AGRICULTURAL
Canadian Link-Belt Co., Ltd., Toronto, Ont.
Morse Chain Co., Ithaca, New York.
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CHAINS, AUTOMOBILE ENGINE
Can. Link-Belt Co., Ltd., Toronto, Ont.
Morse Chain Co., Ithaca, New York.
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CHAINS, BICYCLE, DRIVE AND BLOCK
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
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CHAINS, FOR ELEVATORS AND CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Petrie, Ltd., H. W., Toronto.
Renold of Canada Ltd., Montreal.
Williams Mchy Co., A. R., Toronto, Ont.

CHAIN, MALLEABLE, DETACHABLE AND RIVETED
Can. Link-Belt Co., Toronto, Ont.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

CHAINS, POWER TRANSMISSION
Canadian Link-Belt Co., Ltd., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, New York.
Glasgow, N.S.
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CHAINS, SPROCKET WHEEL
Can. Link-Belt Co., Ltd., Toronto, Ont.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.

CHAIN DRIVES
Can. Link-Belt Co., Toronto, Ont.
Coventry Chain Co., Coventry, England.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold of Canada Ltd., Montreal.

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National Acme Co., Cleveland, Ohio.
Taylor, J., A. M., 315 Stair Bldg., Toronto, Ont.

CHEMISTS
Toronto Testing Lab'tory, Ltd., Toronto

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Garvin Machine Co., New York.

CHUCKS, CENTERING
Hoggson & Pettis Mfg. Co., New Haven Conn.

CHUCKS, COLLET, AIR
Elliott & Whitehall Mach. & Tool Co. Galt, Ont.
Smalley-General Co., Inc., Bay City, Mich.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

CHUCKS, DRILL, LATHE AND UNIVERSAL
Aikenhead Hardware Co., Toronto, Ont.
Bertram & Sons Co., John, Dundas.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Ltd., Brantford.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Mach'y Co., Toronto.
Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Chicago, Ill.
Jacobs Mfg. Co., Hartford, Conn.
Ker & Goodwin Machine Co., Ltd.,
Knight Metal Products, Toronto.
Modern Tool Co., Erie, Pa.
Rice Lewis & Son, Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

CHUCKS, DRILL, AUTOMATIC AND KEYLESS
Aikenhead Hardware Co., Toronto, Ont
Can. Blower & Forge Co., Kitchener.
McCrosky Tool Corp., Meadville, Pa., U. S. A.

CHUCKS, FRICTION AND TAP
Victor Tool Co., Waynesboro, Pa.

CHUCKS, MAGNETIC
Heald Machine Co., Worcester, Mass.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co, Ltd., A. R., Montreal

CHUCKS, RING WHEEL
Ford-Smith Mach. Co., Hamilton, Ont.
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CHUCKS, WHEEL, CAR
Hoggson & Pettis Mfg. Co., New Haven, Conn.

CHUCKING MACHINES
Barber Mchy. Co., Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Garvin Machine Co., New York.
Gisholt Machine Co., Madison, Wis.
National Acme Co., Windsor, Vt.
Niles-Bement-Pond Co., New York.
Rockefson Machine & Tool Co., Toronto.
Warner & Swasey Co., Cleveland, O.
Wood Turret Mach. Co., Brazil, Ind.
Williams Mchy Co., A. R., Toronto, Ont.

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Bowser Co., Ltd., S. F., Toronto, Ont.
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Wright Mfg. Co., Lisbon, Ohio.

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Bernard Industrial Co., A., Fortierville, Q.
Can. Link-Belt Co., Toronto, Ont.
Carlyle Johnson Mach. Co., Manchester, Conn.
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Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.

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MacGovern & Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
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Becker Milling Machine Co., Boston.

COMPOSITION INGOT
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Elliott & Whitehall, Galt, Ont.
Garlock-Walker Machy. Co., Toronto.
Holden Co., Ltd., Montreal, Que.
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Petrie, Ltd., H. W., Toronto.

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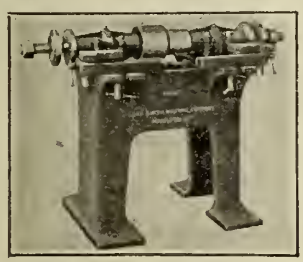
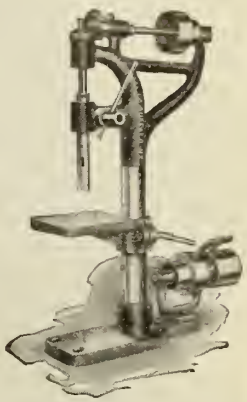
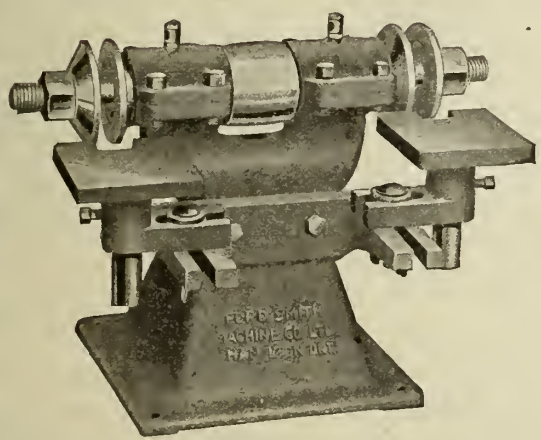


Ford-Smith Grinder



Canadian Blower and Forge Bench Drill Press



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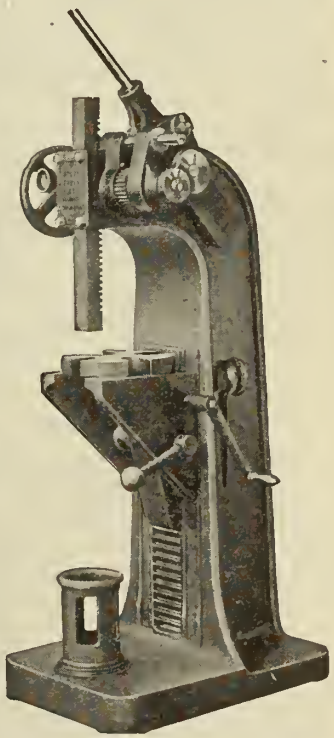

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Windsor, Ontario

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Globe Engineering Co., Hamilton, Ont.
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Volta Mfg. Co., Welland, Ont.

CONTROLLERS AND STARTERS

Williams Mach'y Co., A. R., Toronto.

CONTROLLING INSTRUMENTS

Taylor Instrument Co., Rochester, N.Y.

CONVERTERS, ROTARY

MacGovern & Co., Montreal, Que.
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal.

CONVEYORS—McCASLIN GRAVITY BUCKET

Canadian Mead-Morrison Co., Limited, Montreal, Que.

COOLERS, WITH DRINKING FOUNTAINS

Pure Sanitary Drinking Fountain Co., Haydenville, Mass.

COPING MACHINES

Bertram & Sons Co., John, Dundas, Ont
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machinery Co., Toronto.
Niles-Bement-Pond Co., New York.
Can. Blower & Forge Co., Kitchener.

COPPER, BUS BAR, SHEET, PATES, RODS

British Smelting & Refining Co., Ltd., Montreal, Que.
Brown's Copper and Brass Rolling Mills, New Toronto.
Brown's Copper and Brass Rolling Mills, New Toronto.

CORE OIL

Swan & Finch, Inc., 155 Broadway,

COUNTERBORES AND COUNTERSINKS

Aikenhead Hardware Co., Toronto, Ont.
Cleveland Twist Drill Co., Cleveland.
Eclipse Counterbore Co., Ltd., Walkerville.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
McCrosky Tool Corp., Meadville, Pa., U. S. A.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.

COUNTERSINKS, INTERCHANGEABLE

Eclipse Counterbore Co., Ltd., Walkerville, Ont.

COUNTERBORES, INVERTED, INTERCHANGEABLE

Eclipse Counterbore Co., Ltd., Walkerville, Ont.

COUNTERSHAFTS

Almond Mfg. Co., Ashburnham, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Gray Ball Bearing Co., Ltd., Toronto.
Baird Machine Co., Bridgeport, Conn.
Ford-Smith Machine Co., Hamilton, Ont.
Foster Machine Co., Elkhart, Ind.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co, Ltd., A. R., Montreal
Williams Mchy Co., A. R., Toronto, Ont.

COUPLINGS, FRICTION

Bernard Industrial Co., The A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

COUPLINGS, RAPID HOSE

Int. Machinery & Supply Co., Ltd., Montreal, Que.

COILING MACHINERY, WIRE AND SPRING

Garlock-Walker Machinery Co., Toronto.

COKE AND COAL

Hanna & Co., M. A., Cleveland, O.

COUPLINGS, PLAIN, FLEXIBLE AND CUT OFF

Cleveland Pneumatic Tool Co., of Canada, Toronto.

CRANES, OVERHEAD, HAND AND

Gardner, Robt. & Son, Montreal.
Independent Pneumatic Tool Co., Chicago

CRANES, LOCOMOTIVE

Can. Link-Belt Co., Toronto, Ont.
Northern Crane Works, Walkerville.

ELECTRIC

Volta Manufacturing Co., Welland, Ont.

CUPS, OIL

Can. Winkley Co., Ltd., Windsor, Ont.

COVERS, OIL HOLE

Can. Winkley Co., Ltd., Windsor, Ont.

CRANES, GANTRY

Brown Hoisting Machinery Co., Cleveland, Ohio.
Can. Link-Belt Co., Toronto, Ont.
Canadian Mead-Morrison Co., Limited, Montreal, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.

CRANE RUNWAYS

MacKinnon Steel Co., Sherbrooke, Que.

CRANES, JIB

Brown Hoisting Machinery Co., Cleveland, Ohio.

CRANES, LOCOMOTIVE

Brown Hoisting Machinery Co., Cleveland, Ohio.
Holden Co., Ltd., Montreal, Que.

CRANES, GOLIATH, PNEUMATIC AND PORTABLE

Brown Hoisting Machinery Co., Cleveland, Ohio.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Morris Crane and Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Petrie, Ltd., H. W., Toronto.

CRANES, PILLAR

Brown Hoisting Machinery Co., Cleveland, Ohio.

CRANES, TRAVELLING, ELECTRIC AND HAND POWER

Brown Hoisting Machinery Co., Cleveland, Ohio.
Can. Link-Belt Co., Toronto, Ont.
Curtis Pneumatic Machy. Co., St. Louis.
Dominion Bridge Co., Montreal.
Hepburn, John T., Ltd., Toronto.
Lyman Tube & Supply Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Niles-Bement-Pond Co., New York.
Northern Crane Works, Walkerville.
Oliver Engineering Co., Montreal.

CRANK SHAFTS

Canada Found's & Forgings Ltd., Welland
Williams & Co., J. H., Brooklyn, N.Y.

CRANES, PORTABLE

Aikenhead Hardware Co., Toronto, Ont.
Brown Hoisting Machinery Co., Cleveland, Ohio.
Can. Link-Belt Co., Toronto.
Lyman Tube & Supply Co., Montreal, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Rice Lewis & Son, Toronto, Ont.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

CRIMPS, LEATHER

Graton & Knight Mfg. Co., Worcester, Mass.

CRUSHERS

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Elec. Steel & Metals, Welland, Ont.

CUPOLAS

Can. Blower & Forge Co., Kitchener.
Northern Crane Works, Walkerville.

CURB PUMPS FOR OIL, GASOLINE

Bowser Co., Ltd., S. F., Toronto, Ont.

CURRENT TRANSFORMERS

Volta Manufacturing Co., Welland, Ont.

CUT-OFF COUPLINGS, FRICTION

Petrie, Ltd., H. W., Toronto.

CUTTERS, BOLT

See Bolt Cutters.

CUTTERS, GEARS

Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Fellows Gear Shaper Co., Springfield, Vt.

CUTTERS, FLUE

Cleveland Pneumatic Tool Co., Toronto.

CUTTER HEADS

Oliver Machinery Co. Grand Rapids, Mich

CUTTERS, PIPE (See Pipe Cutters)

CUTTERS, MILLING

Becker Milling Mach. Co., Boston, Mass.
Butterfield & Co., Rock Island, Que.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Cleveland Twist Drill Co., Cleveland.
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garvin Machine Co., New York.
Illinois Tool Works, Chicago, Ill.
Ingersoll Mache. Co., Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Toronto, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Whitney Mfg. Co., Hartford, Conn.
Wilt Twist Drill Co., Walkerville, Ont.

CUTTER RELIEVING MACHINES

Cleveland Milling Machine Co., Cleveland.

CUTTING-OFF MACHINES

Armstrong Bros., Tool Co., Chicago.
Atkins & Co., E. C., Hamilton, Ont.
Bertram & Sons Co., John, Dundas.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Foss Mchy & S'ply Co., Geo. F., Montreal
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hurlburt, Rogers Machy. Co., South Sudbury, Mass.
Hall & Sons, John H., Brantford, Ont.
Kennedy & Sons, Wm., Owen Sound.
Lyman Tube & Supply Co., Montreal, Que.
Niles-Bement-Pond Co., New York, N.Y.
Prest-O-Lite Co., Inc., Toronto, Ont.
Petrie, Ltd., H. W., Toronto.
Tabor Mfg. Co., Philadelphia, Pa.
Wells Bros. of Can., Galt, Ont.
Williams Mchy Co., A. R., Toronto, Ont

CUTTING COMPOUND AND CUTTING OIL

Cataract Refining Co., Ltd., Toronto.
Swan & Finch, Inc., New York.

CUTTING OIL, RECLAIMING SYSTEM

Bowser Co., Ltd., S. F., Toronto, Ont.

CUTTING AND WELDING PLANTS

Davis-Bournonville Co., Jersey City, N.J.
Prest-O-Lite Co., Inc., Toronto, Ont.
Welding & Supplies Co., Montreal, Que.

CYANIDE AND LEAD BATH POTS

Swedish Crucible Steel Co., Windsor.

CYLINDERS, AIR

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Ford-Smith Machine Co., Hamilton, Ont.
Smalley General Co., Inc., Bay City, Mich

CYLINDERS, AUTOMATIC REBORING JIGS AND REAMERS

Kelley Reamer Co., Cleveland, O.

DEHUMIDIFYING

B. F. Sturtevant Co, Galt, Ont.

DERRICKS

Aikenhead Hardware Co., Toronto, Ont.
Dominion Bridge Co., Montreal.
Hepburn Co., Ltd., J. T., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

DERRICK HOISTS

Canadian Mead-Morrison Co., Limited, Montreal, Que.

DIAMOND (BORTZ)

Furniss, Clarke & Co., Montreal, Que.

DIAMOND TOOLS

Can. Desmond-Stephan Mfg. Co., Hamilton
Ford-Smith Machine Co., Hamilton, Ont.
Furniss, Clarke & Co., Montreal, Que.
Joyce-Koebel Co., Inc., New York City.
Wheel Trueing Tool Co., Detroit.
Petrie, Ltd., H. W., Toronto.

DIAMONDS, CARBON AND BORTZ

Joyce Koebel Co., Inc., New York, N.Y.
Wheel Trueing Tool Co., Detroit.

DIAMONDS, BLACK AND ROUGH

Joyce, Koebel & Co., Inc., New York.
Wheel Trueing Tool Co., Windsor, Ont.

DIE CASTINGS

Fisher Motor Co., Ltd., Orillia, Ont.
Tallman Brass & Metals Ltd., Hamilton, Ont.

DIE HEADS, AUTOMATIC

Greenfield Tap & Die Corp., Greenfield Mass.
Wells Bros. of Can., Galt, Ont.
Petrie, Ltd., H. W., Toronto.

DIES, BRASS PRINTING, EMBOSSING AND LETTERING

Matthews, Jas. H., & Co., Pittsburgh, Pa

DIES FOR BIT BRACE USE

Butterfield & Co., Rock Island, Que.
Crescent Mche. Co., Ltd., Montreal, P.Q.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Wells Brothers Co., of Canada, Galt.

DIES AND DIE STOCKS

Ackworthie Ltd., J., Birmingham, Eng.
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Rock Island, Que.
Brown, Boggs Co., Hamilton, Ont.
Crescent Mche. Co., Ltd., Montreal, P.Q.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardner, Robt. & Son, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Jones & Lamson, Springfield, Vt.
Landis Machine Co., Waynesboro, Pa.
Marshall, Son & Bunney, Toronto.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Acme Co., Cleveland, Ohio.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Rickert-Shafer Co., Erie, Pa.
Stoll Co., Inc., D. H., Buffalo, N.Y.
Wells Brothers of Canada, Galt, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

DIES, HAMMERED

Kimber & Hillier Mfg., Co., St. Catharines, Ont.

DIES, DROP FORGE.

Kimber & Hillier Mfg., Co., St. Catharines, Ont.

DIES, METAL STAMPING

Ackworthie Ltd., J., Birmingham, Eng.
Crescent Mche. Co., Ltd., Montreal, P.Q.
Elliott & Whitehall, Galt, Ont.

DIES, PIPE THREADING

Ackworthie Ltd., J., Birmingham, Eng.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Crescent Mche. Co., Ltd., Montreal, P.Q.
Landis Machine Co., Waynesboro, Pa.

DIES, THREADING

Ackworthie Ltd., J., Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que
Crescent Machine Co., Ltd., Montreal.
Greenfield Tap & Die Corp., Greenfield Mass.
Wells Bros. of Can., Galt, Ont.

DIE SINKERS

Ackworthie Ltd., J., Birmingham, Eng.
Becker Milling Machine Co., Boston
Garvin Machine Co., New York.
Kimber & Hillier Mfg., Co., St. Catharines, Ont.
Pratt & Whitney Co., Dundas, Ont.
Walcott Lathe Co., Jackson, Mich

DIES FOR MACHINES

Ackworthie Ltd., J., Birmingham, Eng.
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Rock Island, Que.
Firth & Sons, Thos., Montreal, Que.
Landis Machine Co., Waynesboro, Pa.
Wells Brothers Co. of Canada, Galt.

DIE HEADS

Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Canada, Galt, Ont.

DIES, SELF-OPENING

Geometric Tool Co., New Haven.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Wells Brothers Co. of Can., Galt, Ont.
Petrie, Ltd., H. W., Toronto.

DIE FILING MACHINES

Oliver Mach. Co., Grand Rapids, Mich.

DIE STEEL, HOT AND COLD WORK

Armstrong-Whitworth of Can., Montreal
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall, Son & Bunney, Toronto.
Firth & Sons, Thos., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.

DIES FOR SCREW PLATES

Ackworthie Ltd., J., Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Wells Bros. Co. of Can., Galt, Ont.

DIES, SHEET METAL WORKING

Ackworthie Ltd., J., Birmingham, Eng.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada
Globe Engineering Co., Hamilton, Ont.
Stoll Co., D. H., Buffalo, N.Y.

DIES, SCREW AND THREAD

Ackworthie Ltd., J., Birmingham, Eng.
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
National-Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros., Co., of Can., Galt, Ont

DISCS, LEATHER, STEEL

Graton & Knight Mfg. Co., Worcester, Mass.
Swedish Steel & Importing Co., Montreal

DIRECT CONNECTED UNITS

MacGovern & Co., Montreal, Que.

DRAFT, MECHANICAL

Butterfield & Co., Rock Island, Que.
Can. Blower & Forge Co., Kitchener.
A. B. Jardine & Co., Hespeler, Ont.
Pratt & Whitney Co., Dundas, Ont.
Sturtevant Co., B. F., Galt, Ont.

DRAINAGE FITTINGS

Crane, Ltd., Montreal, Que.

DRAWING INSTRUMENTS

Hughes, Owens Co., Ltd., Montreal, Que.

DRAWING OFFICE SUPPLIES

Hughes, Owens Co., Ltd., Montreal, Que.

DRESSERS, GRINDING AND EMERY WHEEL

Atkins & Co., E. C., Hamilton, Ont.
Can. Desmond-Stephan Mfg. Co., Hamilton
Dominion Abrasive Co., Ltd., Mimico, Ont.
Petrie, Ltd., H. W., Toronto.
Wheel Trueing Tool Co., Windsor, Ont.

DRILL PRESSES

Aurora Tool Works, Aurora, Ind.
Barber Mchy. Co., Ltd., Toronto, Ont.
W. F. & John Barnes Co., Rockford.
Can. Blower & Forge Co., Kitchener.
Canada Machinery Corp., Galt, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machinery Co., Toronto
Garvin Machine Co., New York.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
U. S. Mach. Tool Co., Cincinnati, Ohio.
A. R. Williams Machinery Co., Toronto

DRILL RODS

Atkins & Co., Ltd., Wm., Sheffield, Eng
Kayser-Ellison & Co., Ltd., Montreal.
Lincoln Electric Co. of Canada, Ltd., Toronto, Ont.
Marshall, Son & Bunney, Toronto.
Swedish Steel & Importing Co., Ltd., Montreal.

DRILLING MACHINES, GANG

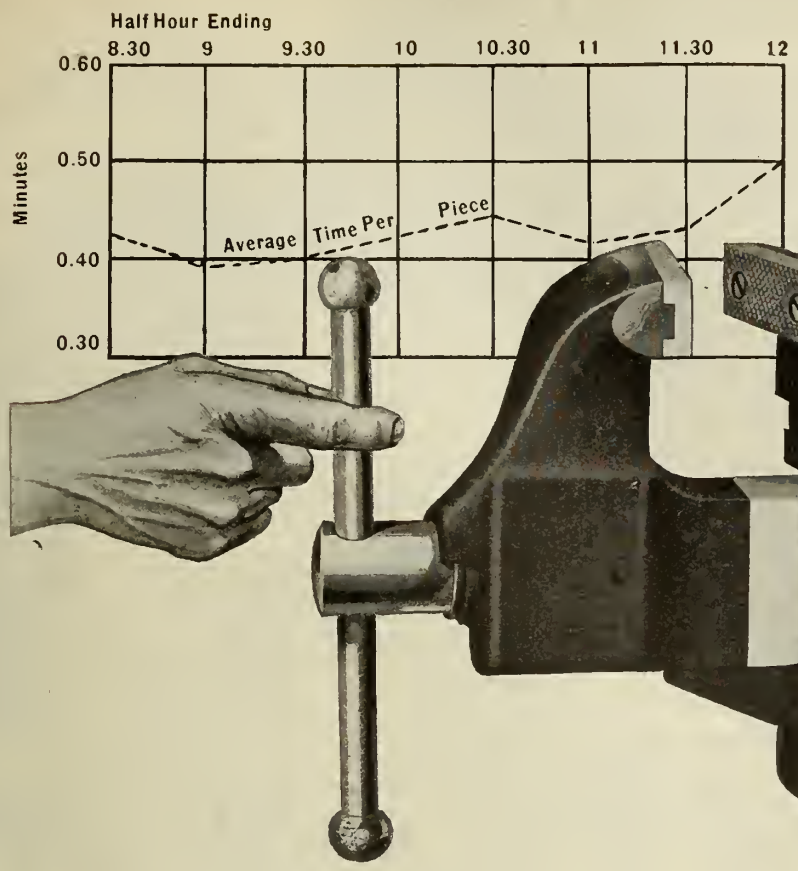
Barnes, W. F. & John, Co., Rockford, Ill.
Barber Mchy. Co., Ltd., Toronto, Ont.
Bilton Mach. Tool Co., Bridgeport, Conn
Canada Machinery Corp., Galt, Ont.
Petrie, Ltd., H. W., Toronto.
Silver Mfg. Co., Salem, Ohio.

DRILLING MACHINES, LOCOMOTIVE AND MULTIPLE SPINDLE

Barber Mchy. Co., Ltd., Toronto, Ont.
John Bertram & Sons Co., Dundas.
Bilton Mach. Tool Co., Bridgeport, Conn
Can. Blower & Forge Co., Kitchener, Ont
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Mach. Co., Toronto.
Garvin Machine Co., New York.
Hoefer Mfg., Co., Freeport, Ill.
Henry & Wright Mfg. Co., Hartford, Conn
A. B. Jardine & Co., Hespeler, Ont.
Landis Tool Co., Waynesboro, Pa.
Nat. Automatic Tool Co., Richmond, Ind.
Niles-Bement-Pond Co., New York.
Rockford Drilling Mach Co., Rockford, Ill

DRILLING MACHINES, RADIAL AND TURRET

Barber Mchy. Co., Ltd., Toronto, Ont.
John Bertram & Sons Co., Dundas.
Canadian Fairbanks-Morse Co., Montreal
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto
Henry & Wright Mfg. Co., Hartford.
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Williams Mchy Co., A. R., Toronto, Ont.



This actual chart shows the progress of fatigue and its effect on machine shop production. The average length of time taken for one operation increases as human fatigue increases. At 10.30 o'clock the workmer put forth extra effort but at 11 o'clock fatigue increased rapidly up to noon.

The Easiest Working Vise in America

FATIGUE slows down production, makes error, causes waste. Any tool that conserves the workman's energy and reduces fatigue is a good investment.

Columbian Sledge-Tested Vises are known among machinists for their easy working qualities. The cone-bearing that keeps the screw aligned, the carefully cut screw itself, and the front-jaw shield which keeps filings and chips from working into and fouling the screw, and finally the accurate machining of the beam and its large bearing surface, all help.

By the selection of swivel base and adjustable jaw types of Columbian Vises, many kinds of work can be much more conveniently done than with other vises which compel the workman to take an awkward or tiring position.

Columbian Hardware Division

of The Consolidated Iron-Steel Manufacturing Co.

World's Largest Makers of Vises and Anvils

CLEVELAND

COLUMBIAN

Sledge-Tested VISES

DRILLING MACHINES, SENSITIVE
Barber Mchy. Co., Ltd., Toronto, Ont.
Bilton Mach. Tool Co., Bridgeport, Conn.
W. F. & John Barnes Co., Rockford, Ill.
Canadian Fairbanks-Morse Co., Montreal.
Canadian Machinery Corp., Galt, Ont.
Geo. F. Foss Mch. & S'ply Co., Montreal
Garlock-Walker Mach. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
United States Mach. Tool Co., Cincinnati
Williams Mchy Co., A. R., Toronto, Ont.

DRILLING MACHINES, UPRIGHT AND HORIZONTAL
Barber Mchy. Co., Ltd., Toronto, Ont.
Aurora Tool Works, Aurora, Ind.
John Bertram & Sons Co., Dundas.
Garlock-Walker Mach. Co., Toronto, Ont
Can. Blower & Forge Co., Kitchener.
Canada Mach. Corp., Galt, Ont.
Garvin Machine Co., New York.
Ford-Smith Machine Co., Hamilton, Ont
Garlock-Walker Mach. Co., Toronto, Ont
Hoefer Mfg. Co., Freeport, Ill.
A. B. Jardine & Co., Hespeler, Ont.
Knight Metal Products, Toronto.
Landis Tool Co., Waynesboro, Pa.
R. McDougall Co., Galt.
Nat. Automatic Tool Co., Richmond, Ind
Rockford Drilling Mach. Co., Rockford, Ill
Niles-Bement-Pond Co., New York.
Silver Mfg. Co., Salem, Ohio.
A. R. Williams Machinery Co., Toronto.

DRILLING MACHINES, SPECIAL
Hoefer Mfg. Co., Freeport, Ill.

DRILLING POSTS
Aikenhead Hardware Co., Toronto, Ont.
Keystone Mfg. Co., Buffalo, N.Y.
Rice Lewis & Son, Toronto, Ont.
Silver Mfg. Co., Salem, Ohio.

DRILLS, BENCH
Aikenhead Hardware Co., Toronto.
W. F. & John Barnes Co., Rockford, Ill
Can. Blower & Forge Co., Kitchener.
Can. Fairbanks-Morse Co., Montreal.
Geo. F. Foss Mch. & S'ply Co., Montreal
Garlock-Walker Machinery Co., Toronto.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
U.S. Electrical Tool Co., Cincinnati, O.

DRILLS, BLACKSMITH AND BIT STOCK
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Inc., Rock Island, Que.
Can. Blower & Forge Co., Kitchener.
Cleveland Twist Drill Co., Cleveland.
Geo. F. Foss Mch. & S'ply Co., Montreal
A. B. Jardine & Co., Hespeler, Ont.
Morrow Screw & Nut Co., John, Ingersoll
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.
Wilkinson & Kompass, Hamilton, Ont.
Wilt Twist Drill Co. of Can., Walkerville

DRILLS, CENTRE
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
Morrow Screw & Nut Co., John, Ingersoll
Morse Twist Drill & Machine Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto.
Rice Lewis & Son, Toronto, Ont.
Wilt Twist Drill Co., of Can., Walkerville

DRILLS CORE, INTERCHANGEABLE
Eclipse Counterbore Co., Ltd., Walkerville, Ont.

DRILLS, CARBON
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Inc., Rock Island, Que
Marshall, Son & Bunney, Toronto.
John Morrow Screw & Nut Co., Ingersoll

DRILLS, ELECTRIC, CORNER
Holden Co., Ltd., Montreal, Que.

DRILLS, ELECTRIC, PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener.
Cincinnati Electrical Tool Co., Cincinnati
Geo. F. Foss Mch. & S'ply Co., Montreal
Haskins Co., R. C., Chicago, Ill.
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
Pilot Steel & Tool Co., Montreal, Que.
Prest-O-Lite Co., Inc., Toronto, Ont.
Strelinger Co., C. A., Windsor, Ont.
U. S. Electrical Tool Co., Cincinnati, O.
A. R. Williams Mach. Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

DRILLS, HAMMER
Samuel Osborne, Ltd., Montreal, P.Q.

DRILLS, EMERY
Garlock-Walker Mach. Co., Toronto, Ont.

DRILLS, HIGH SPEED TWIST
Aikenhead Hardware Co., Toronto, Ont.
Armstrong-Whitworth of Can., Montreal.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
Canadian Fairbanks-Morse Co., Montreal
R. A. Drury Co., Montreal.
Geo. F. Foss Mch. & S'ply Co. Montreal
Lyman Tube & Supply Co., Montreal, Que.
Marshall, Son & Bunney, Toronto.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
W. F. & John Barnes Co., Rockford, Ill
Osborne, Samuel, Montreal, P.Q.
Pratt & Whitney Co., Dundas, Ont.
Petrie, H. W. Toronto.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.
Taylor J. A. M., Stair Bldg., Toronto.
Wilt Twist Drill Co. of Can., Walkerville
Wilkinson & Kompass, Hamilton, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

DRILLS, OIL TUBE
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.

DRILLS, PNEUMATIC
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co., Toronto.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
Williams Mchy Co, Ltd., A. R., Montreal
Greenfield Tap & Die Corp., Greenfield, Mass.

DRILLS, PNEUMATIC CORNER
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool Co., Chicago.

DRILLS, RATCHET AND HAND
Aikenhead Hardware Co., Toronto, Ont.
Armstrong Bros. Tool Co., Chicago, Ill.
Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cincinnati Electrical Tool Co., Cincinnati.
Cleveland Twist Drill Co., Cleveland.
Garlock-Walker Mchy. Co., Toronto, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Wilt Twist Drill Co. of Can., Walkerville.

DRILLS, ROCK
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co., Toronto.
The Foss Mchy. & Supply Co. Montreal.
Holden Co., Ltd., Montreal, Que.
Samuel Osborne Ltd., Montreal, P.Q.
A. R. Williams Machy. Co., Toronto.

DRILLS, SQUARE & HEXAGON
Globe Engineering Co.

DRILLS, TRACK
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
The Foss Mchy. & Supply Co., Montreal.
Holden Co., Ltd., Montreal, Que.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Wilt Twist Drill Co. of Can., Walkerville.

DRINKING FOUNTAINS, SANITARY
Crane, Ltd., Montreal, Que.
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

DRIVES, CHAIN
See Belting, Chain.

DRIVING TOOLS
The Thos. Pink Co., Ltd., Pembroke, Ont.

DRY CLEANING SYSTEM
Bowser Co., Ltd., S. F., Toronto, Ont.

DRYERS, SAND
Lyman Tube & Supply Co., Montreal, Que.
Pangborn Corporation, Hagerstown, Md.

DRYING APPLIANCES
Baird Machine Co., Bridgeport, Conn.
Sturtevant Co., B. F., Galt, Ont.
W. S. Rockwell Co., New York, N.Y.

DRUM CONTROLS
Volta Manufacturing Co., Welland, Ont.

DUMP CARS
Canadian Fairbanks-Morse Co., Montreal.
MacKinnon Steel Co., Sherbrooke, Que.

DUST EXHAUSTER. ARRESTER SYSTEM
Pangborn Corporation, Hagerstown, Md.

DUST HANDLING EQUIPMENT
Pangborn Corporation, Hagerstown, Md.
Sturtevant Co., B. F., Galt, Ont.

DUST SEPARATORS
Can. Blower & Forge Co. Kitchener, Ont.
Sturtevant Co., B. F., Galt, Ont.

DYNAMOS AND ELECTRICAL SUPPLIES
Canadian Fairbanks-Morse Co., Montreal.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
MacGovern & Co., Montreal, Que.
A. R. Williams Machy. Co., Toronto.

ELECTRICAL SUPPLIES
Can. General Electric Co., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Northern Electric Co., Ltd., Montreal Que

ELECTRIC FURNACES
Electric Furnace Construction Co., Philadelphia, Pa.
Hamilton & Hassell, Inc., New York City
Volta Manufacturing Co. Welland, Ont.

ELECTRIC FURNACE REGULATORS. WINCHES, ROOF COOLERS AND ELECTRODE HOLDERS
Volta Manufacturing Co. Welland, Ont.

ELECTRICAL RESISTANCE MATERIALS. NICHROME, KROMORE. CHROMAX. CLIMAX, NICKEL. SILVER. ADVANCE.
Can. Driver-Harris Co., Walkerville, Ont.

ELECTRIC HOISTS, STATIONARY AND MONO RAIL
Canadian Link-Belt Co., Ltd., Toronto.
Canadian Mead-Morrison Co., Limited, Montreal, Que.
Volta Manufacturing Co., Welland, Ont.

ELECTRIC MOTORS
Lincoln Electric Co. of Canada, Ltd., Toronto, Ont.
Sturtevant Co., B. F., Galt, Ont.
Volta Manufacturing Co., Welland, Ont.

ELECTRIC TRUCKS
Cowan Truck Co., Holyoke, Mass.
Goad Engineering Co., Toronto, Ont.

ELEVATOR, ENCLOSURES
Volta Mfg. Co., Welland, Ont.
Canada Wire & Iron Goods Co., Hamilton

ELEVATOR WEIGHTS
Kaie Foundry, Galt, Ont.

ELEVATORS AND BUCKETS
Can. Link-Belt Co., Toronto, Ont.
Curtis Pneumatic Machy. Co., St. Louis.

ELEVATING AND CONVEYING MACHINERY
Can. Link-Belt Co., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Petrie, Ltd., H. W., Toronto.

EMBOSSING PRESSES
Dom. Steel Products Co., Ltd., Brantford.
Oliver Machinery Co., Grand Rapids, Mich

EMERY GRINDERS (PNEUMATIC)
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Cleveland Pneumatic Tool Co., Toronto.
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.

EMERY CLOTH
Atkins & Co., E. C., Hamilton, Ont.

EMERY PAPER
Atkins & Co., E. C., Hamilton, Ont.

EMERY AND EMERY WHEELS
Atkins & Co., E. C., Hamilton, Ont.
Brantford Emery Wheel Co., Brantford, Canada.
The Foss Mchy. & Supply Co., Montreal.
Garvin Machine Co., New York.
Canadian Fairbanks-Morse Co., Montreal.
Canada Emery Wheels Co., Hamilton.
Dominion Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Mach. Co., Hamilton, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.
Wilkinson & Kompass, Hamilton, Ont.
Dominion Abrasive Wheel Co., Ltd., Mimico, Ont.

EMERY WHEEL DRESSINGS
Dominion Abrasive Co., Ltd., Mimico, Ont
Wheel Trueing Tool Co., Windsor Ont.

ENAMELWARE
Crane, Ltd., Montreal, Que.

END MILLS
John Morrow Screw & Nut Co., Ingersoll

ENGINEERS—INDUSTRIAL CLEANING (Free Consultation)
Oakley Chemical Co., New York. N.Y.

ENGINEERS
Samuel Osborne (Canada) Ltd., Montreal.

ENGINES—HOISTING, PILE DRIVING, BRIDGE ERECTING, MINING
Canadian Mead-Morrison Co., Limited, Montreal, Que.

ENGINES, STEAM, GAS, GASOLINE
Furniss, Clarke & Co., Montreal, Que
Canadian Fairbanks-Morse Co., Montreal.
Holden Co., Ltd., Montreal, Que.
Johnson Mach. Co., Carlyle, Manchester, Conn.
MacGovern & Co., Montreal, Que.
Sturtevant Co., B. F., Galt, Ont.

ENGINES, HORIZONTAL AND VERTICAL
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Johnson Mach. Co., Carlyle, Manchester, Conn.
Petrie, Ltd., H. W., Toronto.
A. R. Williams Machy. Co., Toronto.

ENGINES, OIL
Holden Co., Ltd., Montreal, Que.
Ker & Goodwin Machine Co., Ltd., Brantford, Ont.

ENGINES, HEAVY OIL, DIESEL TYPE
Dom. Steel Products Co., Ltd., Brantford
Holden Co., Ltd., Montreal, Que.

ENGINES, MARINE
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Sturtevant Co., B. F., Galt, Ont.

ENGINES, STATIONARY, FUEL, OIL, GAS OR GASOLINE
Holden Co., Ltd., Montreal, Que.

ESCUTCHEON PINS
Parmenter & Bulloch, Gananoque, Ont.

EXHAUST HEADS AND HOODS
Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal
Sturtevant Co., B. F., Galt, Ont.

EXHAUSTERS
Can. Blower & Forge Co., Kitchener, Ont.
Pangborn Corporation, Hagerstown, Md.
Petrie, Ltd., H. W., Toronto.
Sturtevant Co., B. F., Galt, Ont.

EXTRACTORS, TAP
Walton Co., The, Hartford, Conn.

EYE BOLTS AND NUTS
Can. Foundries & Forgings, Ltd., Welland, Ont.

EYE PROTECTORS
Standard Optical Co., Geneva, N.Y.

FACTORY GATES
Page Steel & Wire Co., Adrian, Mich.

FACTORY LOCATIONS
City of St. Johns, Quebec.

FACTORY SITES
City of St. Johns, Quebec.

FANS
Baird Machine Co., Bridgeport, Conn.
Can. Blower & Forge Co., Kitchener, Ont.
Sturtevant Co., B. F., Galt, Ont.

FENCING, WIRE
Page Steel & Wire Co., New York, N.Y.

FENCE, IRON AND FACTORY
Can. Wire & Iron Goods, Hamilton, Ont.
Page Steel & Wire Co., Adrian, Mich.

FERRO-TUNGSTEN
Vanadium-Alloys Steel Co., Pittsburgh, Pa

FIBRE, RODS AND SHEETS
Diamond State Fibre Co., Bridgeport, Pa.

FILES
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Wm., Sheffield, Eng.
Ingersoll File Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Marshall, Son & Bunney, Toronto, Ont.
Nicholson File Co., Port Hope, Ont.
Rice Lewis & Son, Toronto, Ont.
Simonds Mfg. Co., Fitchburg, Mass.
Whitman & Barnes Mfg. Co., Akron, O.
Wilkinson & Kompass, Hamilton, Ont.

FILES, COMMUTATOR SLOTTING
Lyman Tube & Supply Co., Montreal, Que.

FILING MACHINES, BENCH AND MOTOR DRIVEN
Barry Mfg. Co., Chicago, Ill.

FILTERING AND CIRCULATING SYSTEMS FOR LUBRICATING OIL
Bowser Co., Ltd., S. F., Toronto, Ont.
Can. Wire & Iron Goods, Hamilton, Ont.

FIRE BRICK
Elk Fire Brick Co., Hamilton, Ont.
General Combustion Co., Ltd., Montreal, Que.

FIRE CLAY
Elk Fire Brick Co., Can., Ltd., Hamil-
General Combustion Co., Ltd., Montreal, Que.

FINISHING MACHINES
Brown & Sharpe Mfg. Co., Providence, R.I.

FIRE EXTINGUISHERS
Strong, Kennard & Nutt Co., Cleveland, O.

FITTINGS, CAST IRON, SCREWED, FLANGED
Crane, Ltd., Montreal, Que.

FIXTURES
Brown Engineering Corp., Toronto, Ont.
Crescent Mche. Co., Ltd., Montreal, Que.
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.
Toronto Tool Co., Toronto, Ont.

FLAT SPRINGS
The Dunbar Brothers Co., Bristol, Conn

FLEXIBLE SHAFT EQUIPMENT
Chicago Flexible Shaft Co., Chicago, Ill.
R. C. Haskins Co., Chicago, Ill.

FLOODLIGHTS, ELECTRIC
Holden Co., Ltd., Montreal, Que.
Northern Electric Co., Ltd., Montreal Que

FLOTATION MACHINERY
Elec. Steel & Metals, Welland, Ont.

FLUMES
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
William Hamilton Co., Peterboro, Ont.

FORGES, HAND PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener.
A. R. Jardine & Co., Ltd., Hespeler, Ont.
Rice Lewis & Son, Toronto, Ont.
Sturtevant Co., B. F., Galt, Ont.

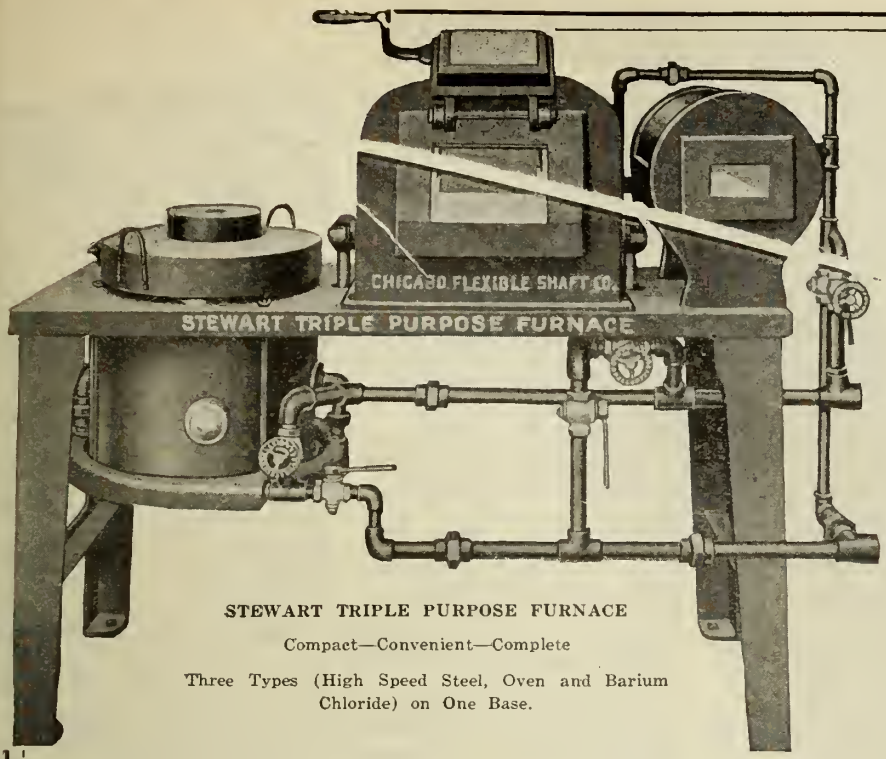
FORGE TOOLS
Kimber & Hillier Mfg., Co., St. Catharines, Ont.

FORGES, OIL
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.

FORGINGS
Meets Machine Co., Pittsburgh, Pa
Can. Found. & Forgings, Ltd., Welland.
Nova Scotia Steel & Coal Co., New Glasgow, N.S.

FORGINGS, DROP, AUTOMOBILE AND LOCOMOTIVE FORGING AND WELDING
Dominion Bridge Co., Montreal, Que.
Dom. Forge & Stamp'g Co., Walkerville
Steel Co. of Canada, Ltd., St. Catharines.
Victoria Foundry Co., Ottawa.
Williams & Co., J. H., Brooklyn, N.Y.

FORGING MACHINERY
John Bertram & Sons Co., Dundas, Ont.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.
National Machy. Co., Tiffin, Ohio.
Petrie, Ltd., H. W., Toronto.
Chicago Flexible Shaft Co., Chicago, Ill.



STEWART TRIPLE PURPOSE FURNACE

Compact—Convenient—Complete

Three Types (High Speed Steel, Oven and Barium Chloride) on One Base.

What is included in the Stewart Triple Purpose Furnace

This is an assembly of three of our standard Stewart Furnaces, and covers a wide range of heat treatment.

Right section is our No. 3 High Speed Steel Furnace, cylindrical chamber, in which an intense direct heat is evenly delivered at every point. Excellent for tool dressing, bending, forging, etc.

Center section is our No. 28 Oven Furnace, indirect heat type, suited for hardening dies, tools, cutters, reamers, knife or shear blades, etc. A temperature of 2,250°F. has been reached in 25 minutes and held as long as necessary. For high speed or carbon steel.

Left section is our No. 12 Barium Chloride Furnace, crucible type, for lead or cyanide hardening or oil tempering. Pieces should be pre-heated in oven section before placing in barium bath.

Units may be operated singly, or any two at a time. Each capable of high temperatures necessary for high speed steel hardening.

Furnaces of Proven Ability

Stewart Furnaces of 1920 are backed by the record of years of thorough, satisfactory performance for manufacturers and tool makers all over North America.

Stewarts have come up against many extremely difficult heat treating requirements, and have satisfied in every instance. They produce results because they are scientifically constructed and are thoroughly in line with modern shop practice.

Manufacturers using Stewarts do not deal with uncertainties—they **know** that Stewart Furnaces guarantee high quality tools, dies, gears, machine parts, etc. They also know that these high quality results are obtained at a considerable saving in time, fuel and material.

The satisfactory, economical experience of users in practically every line of industry can be duplicated in **your** works.

There's a Stewart Furnace for every heat treating requirement.

Chicago Flexible Shaft Company

1148 S. Central Ave., Chicago, Ill.

350 Broadway, N.Y **Railway Exch. Bldg., St. Louis**

Distributors in Canada:

The General Supply Co. of Canada, Ottawa, Montreal, Toronto, Winnipeg, Vancouver.
A. R. Williams Machinery Co., Winnipeg, St. John, N.B.
J. Bertram & Sons Co., Dundas, Ont.
Keystone Products Ltd., Toronto.
Garlock-Walker Machinery Co.,Toronto
Gregg Mfg. Co., Ltd., Winnipeg.
E. J. Woodison Co., Toronto.
Geo. F. Foss Machinery & Supply Co., Ltd., Montreal.

Stewart No. 25 Oven Furnace

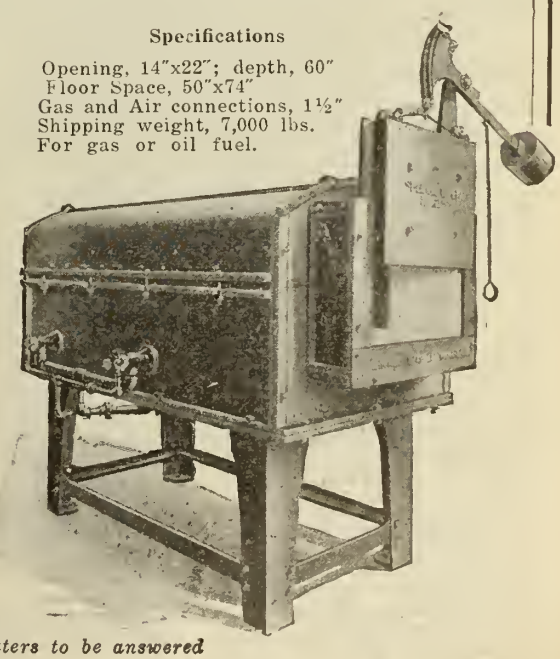
Indirect Heat Type, with flat bottom slab.

For carbonizing, heat treating and annealing.

A large capacity furnace, adapted to large and long work, or for holding medium and large annealing and carbonizing boxes.

Specifications

Opening, 14"x22"; depth, 60"
Floor Space, 50"x74"
Gas and Air connections, 1½"
Shipping weight, 7,000 lbs.
For gas or oil fuel.



If interested tear out this page and place with letters to be answered

FORGINGS, SPECIAL
Armstrong-Whitworth of Can., Montreal.
Can. Found. & Forgings, Ltd., Welland.
Williams & Co., J. H., Brooklyn, N.Y.

FORMING
Brown & Sharpe Mfg. Co., Providence, R.I.

FRICTION LEATHERS
Graton & Knight Mfg. Co., Montreal.

FRICTION SURFACE BELTING
Can. Consolidated Rubber Co., Montreal.

FUEL OIL SYSTEMS
Bowser Co., Ltd., S. F., Toronto, Ont.

FURNACES, ANNEALING, CASE HARDENING AND TEMPERING
Bellevue Furnace Co., Detroit, Mich.
Brown & Sharpe Mfg. Co., Providence, R.I.
Chicago Flexible Shaft Co., Chicago, Ill.
Gen. Combustion Co, Can., Ltd, Montreal
Mechanical Eng'r'g Co., Three Rivers, Q.
W. S. Rockwell Co., New York, N.Y.
Petrie, Ltd., H. W., Toronto.

FURNACES, BLAST
Bellevue Industrial Furnace Co., Detroit.
Chicago Flexible Shaft Co., Chicago, Ill.
W. S. Rockwell Co., New York, N.Y.
Toronto Iron Works, Ltd., Toronto.

FURNACES — BRASS MELTING
General Combustion Co., Ltd., Montreal.

FURNACES — CRUCIBLE
Chicago Flexible Shaft Co., Chicago, Ill

FURNACES, CYANIDE AND LEAD HARDENING
Chicago Flexible Shaft Co., Chicago, Ill.

FURNACES, ELECTRIC
Electric Furnace Construction Co., Philadelpria, Pa.
Hamilton & Hansell, Inc., New York City

FURNACES, FORGING
Chicago Flexible Shaft Co., Chicago, Ill.
Gen. Combustion Co. of Can., Ltd., Montreal.
W. S. Rockwell Co., New York, N.Y.

FURNACES — HIGH-SPEED STEEL
Chicago Flexible Shaft Co., Chicago, Ill.

FUSE BOXES, STEEL
Dom. Forge & Stamp. Co., Walkerville.

FUSE PLUGS AND FUSES
Northern Electric Co., Ltd., Montreal Que

GALVANIZING FLUX
British Smelting & Refining Co., Ltd. Montreal, Que.

GANG PLANER TOOLS
Armstrong Bros. Tool Co., Chicago.

GAS AND STEAM ENGINES
Mesta Machine Co., Pittsburgh, Pa.

GASKETS, LEATHER, ETC.
Graton & Knight Mfg. Co., Montreal.
Holden Co., Ltd., Montreal, Que.

GASOLINE METERS
Bowser Co., Ltd., S. F., Toronto, Ont.

GASOLINE TANKS
Bowser Co., Ltd., S. F., Toronto, Ont.

GASOLINE PUMPS, SELF-MEASURING
Bowser Co., Ltd., S. F., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.

GAUGES
Crescent Mach. Co., Ltd., Montreal, P.Q.
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.

GAUGERS, CALIPERS
Williams & Co., J. H., Brooklyn, N.Y.

GAUGES, MERCURY COLUMN, DRAFT
Taylor Instrument Co., Rochester, N.Y.

GAUGES, HYDRAULIC
Taylor Instrument Co., Rochester, N.Y.

GAUGES, MANUFACTURERS, LIMIT, THREAD
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Can., Galt, Ont.

GAUGES, SNAP, THREAD AND CYLINDRICAL
C. E. Johanson, Inc., Toronto, Ont.

GAUGES, VACUUM AND PRESSURE
Bristol Co., Waterbury, Conn.
Taylor Instrument Co., Rochester, N.Y.

GAUGES, STANDARD
Brown Engineering Corp., Toronto, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Crescent Mche. Co., Ltd., Montreal, Que.
Garvin Machine Co., New York.
C. E. Johanson, Inc., Toronto, Ont.
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Hartford, Conn.
Taylor, J. A. M., 318 Bloor Bldg., Toronto
Toronto Tool Works, Toronto, Ont.
Wells Brothers Co. of Canada, Galt, Ont.

GEAR BLANKS
Can. Steel Foundries, Ltd., Montreal.
Can. Found. & Steel, Hamilton, Ont.
Kaysor-Ellison & Co., Ltd., Montreal.
Williams & Co., J. H., Brooklyn, N.Y.

GEAR BLANKS, CAST
Katie Foundry, Galt, Ont.

GEAR BLANKS, RAWHIDE
Lyman Tube & Supply Co., Montreal, Que.

GEAR BOXES, REDUCTION
Can. Link-Belt Co., Ltd., Toronto, Ont.

GEAR SHAPERS AND CUTTERS
Fellows Gear & Shaper Co., Springfield, V.

GEAR-CUTTING MACHINERY
Bilton Mach. Tool Co., Bridgeport, Conn.
Fellows Gear & Shaper Co., Springfield, V.
Garlock-Walker Mchy. Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto.
A. R. Williams Machy. Co., Toronto.

GEAR-TESTING MACHINE
Gisholt Machine Co., Madison, Wis.

GEARS, CHAIN
Can. Link-Belt Co., Ltd., Toronto, Ont.
Morse Chain Co., Ithaca, New York.
Renold of Canada Ltd., Montreal.

GEARS, COMPENSATING
Morse Chain Co., Ithaca, New York.
Can. Link-Belt Co., Ltd., Toronto, Ont.

GEARS, CUT, MORTISE, ANGLE, WORM
Can. Link-Belt Co., Toronto, Ont.
Diamond State Fibre Co., Bridgeport, Pa.
Dom. Steel Products Co., Ltd., Brantford.
Dominion Bridge Co., Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Elliott & Whitehall, Galt, Ont.
Gardner, Robt., & Son, Montreal.
Hamilton Gear & Machine Co., Toronto.
Hull Iron & Steel Found., Ltd., Hull, Q.
Jones & Glassco, Montreal.
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Philadelphia Gear Works, Philadelphia.
Victoria Foundry Co., Ottawa.

GEARS, RAWHIDE
Gardner, Robt., & Son, Montreal.
Grant Gear Works, Boston, Mass.
Hamilton Gear & Machine Co., Toronto.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Jones & Glassco, Montreal.
Lyman Tube & Supply Co., Montreal, Que.
Philadelphia Gear Works, Philadelphia.
A. R. Williams Machy. Co., Toronto.

GENERATORS, GEAR
Fellows Gear & Shaper Co., Springfield, V

GEARS, SILENT CHAIN
Can. Link-Belt Co., Ltd., Toronto, Ont.

GEARS, SPRING
Morse Chain Co., Ithaca, New York.

GEARS, SPUN, BENCH, SPIRAL
Brown & Sharpe Mfg. Co., Providence, R.I.

GENERAL MACHINE WORK
Elliott & Whitehall, Galt, Ont.

GENERATORS AND CONVERTORS
Northern Elec. Co., Ltd., Montreal, P.Q.

GENERATORS, MOTOR
MacGovern & Co., Montreal.
Northern Elec. Co., Ltd., Montreal, P.Q.
Sturtevant Co., B. F., Galt, Ont.

GENERATORS, STEAM TURBO
Can. Link-Belt Co., Ltd., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

GILDING
Brown's Copper and Brass Rolling Mills New Toronto.

GLOVES, ASBESTOS, ACID PROOF, WATERPROOF, ETC.
Strong, Kennard & Nutt Co., Cleveland.

GLUE HEATERS
Oliver Machinery Co., Grand Rapids, Mich

GLASSES, SAFETY
Strong, Kennard & Nutt Co., Cleveland.
Willson & Co., Inc., T. A., Reading, Pa.

GRAPHITE
Athenhead Hardware, Ltd., Toronto.
Rice Lewis & Son, Toronto.

GOGGLES
Consolidated Optical Co., Toronto.
Standard Optical Co., Geneva, N.Y.

GRAB BUCKETS—CLAMSHELL and ORANGE PEEL
Canadian Link-Belt Co., Ltd., Toronto, Ont.
Canadian Mead-Morrison Co., Limited, Montreal, Que.

GRAVITY CARRIERS
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal.
Morris Crane & Hoist Co., Ltd., Herbert Niagara Falls, Ont.

GREASE CUPS, PRESSED STEEL, BRASS
Can. Winkley Co., Ltd., Windsor, Ont.

GREASES (See Lubricants)

GRINDERS, AUTOMATIC KNIFE
Canada Machinery Corp., Galt, Ont.
Foss Mchry. & S'ply Co., G. F., Montreal
Garlock-Walker Machinery Co., Toronto.

GRINDERS, BENCH
Superior Machinery Co., London, Ont.

GRINDERS, CENTRE COLUMN, PEDESTAL AND BENCH
Can. Machinery Corp., Galt, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Haskins & Co., R. C., Chicago, Ill.
Wisconsin Electric Co., Inc., Racine, Wis
Cleveland Pneumatic Tool Co., Toronto.
Ford-Smith Mach. Co., Hamilton, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machinery Co., Toronto.
Holden Co., Ltd., Montreal, Que.
Katie Foundry, Galt, Ont.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford.
Niles-Bement-Pond Co., New York, N.Y.
Perfect Machine Co., Galt, Ont.
United States Elec. Tool Co., Cincinnati.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

GRINDERS, CUTTER
Brown & Sharpe Mfg. Co., Providence, R.I
Cincinnati Milling Mach. Co., Cincinnati.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garvin Machine Co., New York.
Globe Engineering Co., Hamilton, Ont.
Greenfield Machine Co., Greenfield, Mass.
Greenfield Tap & Die Corp., Greenfield, M.
Heald Machine Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.
Manhattan Machine & Tool Co., Grand Rapids, Mich.
Norton Co., Worcester, Mass.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. of Can., Galt, Ont.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

GRINDERS, DIE AND CHASER
Haskins & Co., R. C., Chicago, Ill.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
National-Acme Co., Cleveland, Ohio.

GRINDERS, DISK
Armstrong Bros. Tool Co., Chicago, Ill.
Atkins & Co., E. C., Hamilton, Ont.
Ford-Smith Mach. Co., Hamilton.
Gardner Machine Co., Beloit, Wis.
Heald Machine Co., Worcester, Mass.

GRINDERS, FLEXIBLE CASTING
Manhattan Machine & Tool Co., Grand Rapids, Mich.

GRINDERS, DRILL
Aikenhead Hardware Co., Toronto.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield.
Petrie, Ltd., H. W., Toronto.
United States Elec. Tool Co., Cincinnati.
Wells Bros. of Canada, Galt, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

GRINDERS, CYLINDER, INTERNAL
Barber Mchy. Co., Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I
Foss Mchy. & S'ply Co., G. F., Montreal.
Greenfield Machine Co., Greenfield, Mass.
Heald Machine Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Norton Co., Worcester, Mass.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

GRINDERS, PORTABLE, ELECTRIC HAND, TOOL POST, FLOOR AND BENCH
Baird Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Ford-Smith Mach. Co., Hamilton, Ont.
Haskins & Co., R. C., Chicago, Ill.
Grant Mfg. & Mach. Co., Bridgeport, Conn
Garlock-Walker Machinery Co., Toronto.
Greenfield Machine Co., Greenfield, Mass.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool Co., Chicago
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
United States Elec. Tool Co., Cincinnati
Wisconsin Electric Co., Inc., Racine, Wis.
Williams Mchy Co., A. R., Toronto, Ont.
Wilkinson & Kompass, Hamilton, Ont.

GRINDERS, MANUFACTURING
Barber Mchy. Co., Ltd., Toronto, Ont.
Universal Grinding Mach. Co., Fitchburg, Mass.

GRINDERS, HOLE, HOLE AND AND DEEP HOLE
Barber Mchy. Co., Ltd., Toronto, Ont.
Bryant Chucking Grinder Co., Springfield, Vermont.
Heald Machine Co., Worcester, Mass.

GRINDERS, PLAIN CYLINDRICAL
Barber Mchy. Co., Ltd., Toronto, Ont.
Fitchburg Grinding Mach. Co., Fitchburg, Mass.

GRINDERS, PNEUMATIC
Can. Ingersoll-Rand Co., Montreal.
Cleveland Pneumatic Tool Co., Toronto.
Garlock-Walker Machinery Co., Toronto.
Heald Machine Co., Worcester, Mass.
Independent Pneumatic Tool Co., Chicago
MacGovern & Co., Montreal, Que.

GRINDERS, PROFILE
Cleveland Milling Machine Co., Cleveland.

GRINDERS, ROTARY SURFACE
Brown & Sharpe Mfg. Co., Providence, R.I
Bristol Machine Tool Co., Bristol, Conn.
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Kayser-Ellison & Co., Ltd., Montreal.
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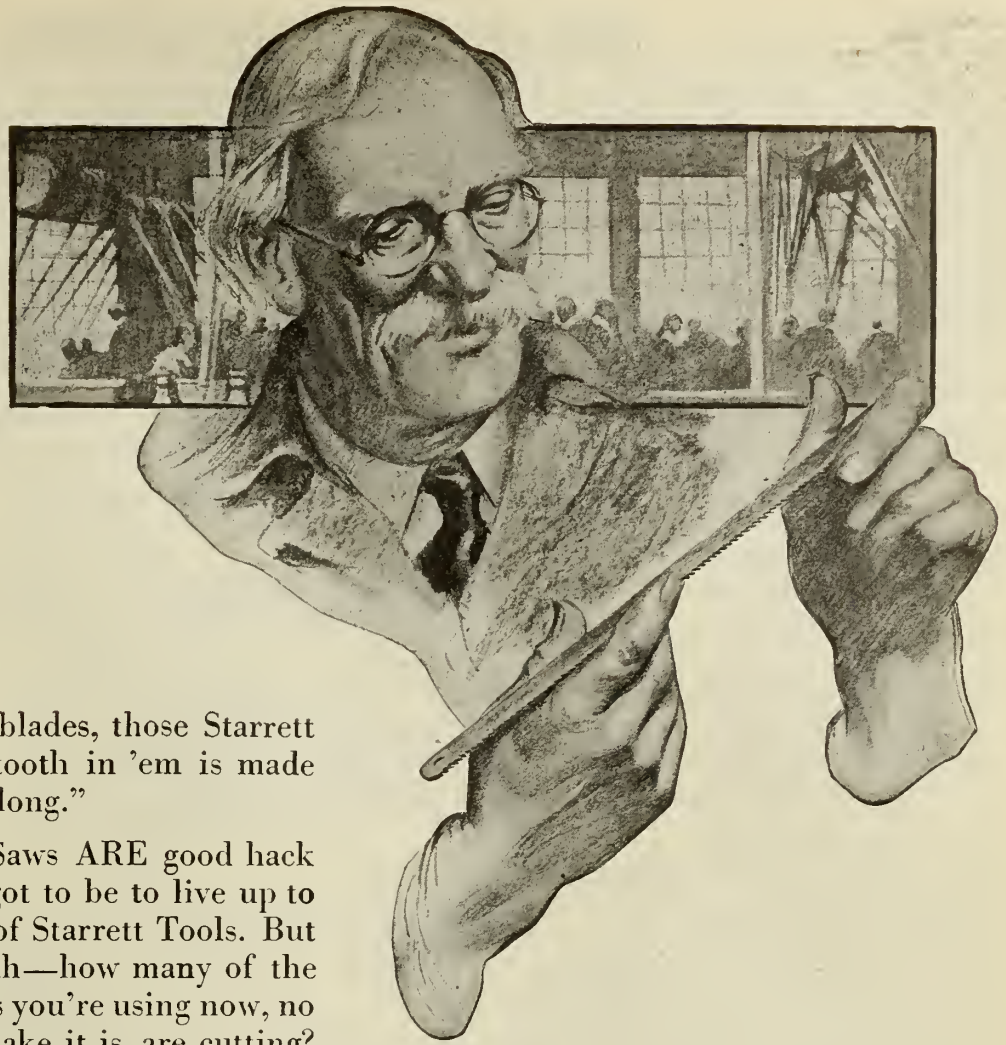

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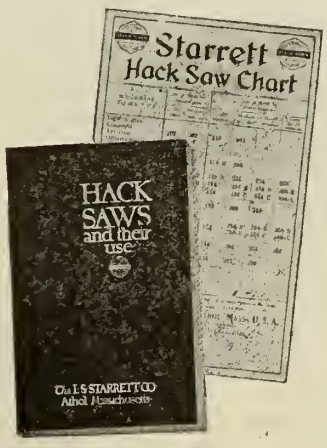

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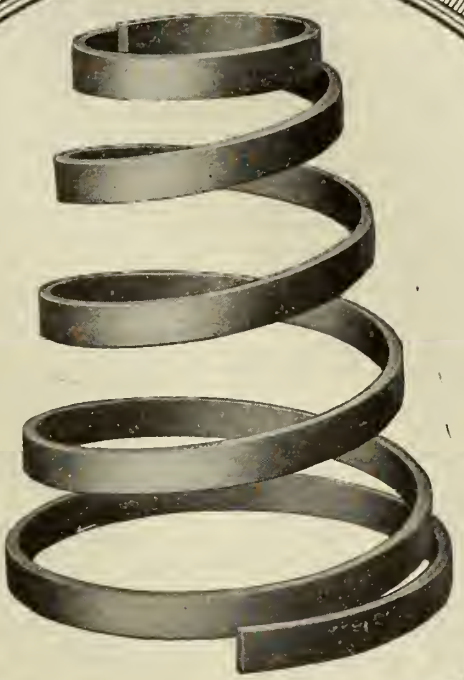

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Volta Mfg. Co., Welland, Ont.

MANDRELS
Butterfield & Co., Inc., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Jardine & Co., A. B., Hespeler, Ont.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
McCrosky Tool Corp., Meadville, Pa., U. S. A.
Pratt & Whitney Co., Dundas, Ont.

MARKING DEVICES
Matthews & Co., Jas. H., Pittsburgh, Pa

MARKING MACHINERY
Brown, Boggs Co., Hamilton, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal
Perrin, Wm. R., Toronto.
Petrie, Ltd., H. W., Toronto.

MATERIALS, HANDLING PLANTS
Canadian Mead-Morrison Co., Limited, Montreal, Que.

MATS, RUBBER MATTING
Quaker City Rubber Co., Philadelphia, Pa
International Mchy. Sply., Ltd., Montreal

MEASURING MACHINES
Pratt & Whitney Co., Dundas, Ont.

MEASURES, REGISTERING
Bowser Co., Ltd., S. F., Toronto, Ont.

MEASURING TAPES AND RULES
Chesterman & Co., Jas., Sheffield, Eng.

MERCHANTS, IRON AND STEEL
Samuel Osborne (Can.), Ltd., Montreal.

METALLURGISTS
See Chemists.

METAL CLEANERS
Oakley Chemical Co., New York, N.Y.

METAL CUTTING MACHINES
Atkins & Co., E. C., Hamilton, Ont.
Lyman Tube & Supply Co., Montreal, Que.

METAL SAWS
See Saws.

METAL, ANTI-FRICTION
Thos. Moore & Son, Montreal.

METAL SAWS, POWER
E. C. Atkins & Co., Inc., Indianapolis.
Hoefer Mfg. Co., Freeport, Ill.
Lyman Tube & Supply Co., Montreal, Que.

METALS
British Smelting & Refining Co., Ltd., Montreal, Que.
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.
Canada Metal Co., Toronto, Ont.
Deloro Smelting & Refining Co., Ltd, Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.

METAL, STAMPINGS, SMALL
Can. Winkley Co., Ltd., Windsor, Ont.

METERS, OIL, GASOLINE, KEROSENE, ETC.
Bowser Co., Ltd., S. F., Toronto, Ont.
General Combustion Co., Ltd., Montreal, Que.

MICROMETERS
Taylor, J. A. M., 31f Stair Bldg., Toronto.
Petrie, Ltd., H. W., Toronto.

MILLS, BRACE AND TUBE
Elec. Steel & Metals, Welland, Ont.

MILL SPECIALTIES
Atkins & Co., E. C., Hamilton, Ont.

MILLS, SAND
Frost Mfg. Co., Chicago, Ill.

MILL MACHINERY
Alexander Fleck, Ltd., Ottawa.
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

MILLING ARBORS
Ackworthie Ltd., J., Birmingham, Eng.
Barber Mchy. Co., Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Kearney & Trecker Co., Milwaukee Wis.

MILLING ATTACHMENTS
Ackworthie Ltd., J., Birmingham, Eng.
Barber Mchy. Co., Ltd., Toronto, Ont.
Becker Milling Machine Co., Boston, Mass.
Bertram & Sons Co., John, Dundas, Ont.
Brown & Sharpe Mfg. Co., Providence
Canada Machinery Corp., Galt, Ont.
Cincinnati Milling Machine Co., Cincinnati
Ford-Smith Mach. Co., Hamilton, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal
Garlock-Walker Machy. Co., Toronto, Ont.
Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Standard Equipment & Tool Wks., Montreal, P.Q.
Williams Mchy Co., A. R., Toronto, Ont.

MILLING CUTTERS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Milling Machine Co., Cleveland.
Deloro Smelting & Refining Co., Ltd, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Marshall, Son & Bunney, Toronto.
Petrie, Ltd., H. W., Toronto.
Wilt Twist Drill Co., Walkerville, Ont.

MILLING MACHINES, HAND
Bristol Machine Tool Co., Bristol, Conn.

MILLING MACHINES, THREAD
Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Inc., Chicago, Ill.
Gray Ball Bearing Co., Ltd., Toronto.
United States Mach. Tool Co., Cincinnati
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Smalley Gen. Co., Inc., Bay City, U.S.A.
Standard Equipment & Tool Wks., Montreal, P.Q.

MILLING MACHINES, HORIZONTAL AND VERTICAL
Barber Mchy. Co., Ltd., Toronto, Ont.
Becker Milling Machine Co., Boston, Mass
Bristol Machine Tool Co., Bristol, Conn.
Brown & Sharpe Mfg. Co., Providence.
Bertram & Sons Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Ford-Smith Mach. Co., Hamilton, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Knight Metal Products, Toronto.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Rockford Milling Mach. Co., Rockford, Ill
United States Mach. Tool Co., Cincinnati.
Whitney Mfg. Co., Hartford, Conn.
Williams Machy. Co., A. R., Toronto.

MILLING MACHINES, PLAIN, BENCH AND UNIVERSAL
Barber Mchy. Co., Ltd., Toronto, Ont.
Becker Milling Machine Co, Boston, Mass.
Bilton Mach. Tool Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence.
Canada Machinery Corp., Galt, Ont.
Cleveland Milling Machine Co., Cleveland.
Cincinnati Milling Machine Co., Cincinnati
Ford-Smith Mach. Co., Hamilton, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Garvin Machine Co., New York.
National Machy. Co., Tiffin, Ohio.
Gooley & Eklund, Inc., Cortland, N.Y.
Hardinge Bros., Inc., Chicago, Ill.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Knight Metal Products, Toronto.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Standard Equipment & Tool Wks., Montreal, P.Q.

MILLING MACHINES, PROFILE
Barber Mchy. Co., Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

MILLING TOOLS
Aikenhead Hardware Co., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence.
Ford-Smith Mach. Co., Hamilton, Ont.
Geometric Tool Co., New Haven, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
Rice Lewis & Son, Toronto, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

MINE CARS
Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Dominion Bridge Co., Montreal, Que.
Elec. Steel & Metals, Welland, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.

MINING MACHINERY
Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Elec. Steel & Metals, Welland, Ont.
Holden Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto.
Williams Machy. Co., A. R., Toronto.
Williams Mchy Co., A. R., Toronto, Ont

MIXERS, SAND
Frost Mfg. Co., Chicago, Ill.

MORTISING CHAINS
Renold of Canada Ltd., Montreal.

MORTISING MACHINES
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.
Gray Ball Bearing Co., Ltd., Toronto.

MOTORS, ELECTRIC
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
Lincoln Electric Co. of Canada, Ltd., Toronto, Ont.
MacGovern & Co., Montreal, Que.
Northern Elec. Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto.
Sturtevant Co., B. F., Galt, Ont.
U. S. Ordnance, Toronto, Ont.
Volta Mfg. Co., Welland, Ont.
Williams Mach'y Co., A. R., Toronto.

MOTOR SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

MOTORCYCLE FRAME AND FORK
The Dunbar Brothers Co., Bristol, Conn.

MOTORS, PNEUMATIC
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto.
Holden Co., Ltd., Montreal, Que.

MOULDS, RUBBER
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

MULTIPLE INDEX CENTRES
Garvin Machine Co., New York.
Graton & Knight Mfg. Co., Worcester, M.

MULTI-DRILLING, MULTI-BORING, MULTI-TAPPING MACHINERY,
Nat. Automatic Tool Co., Richmond, Ind.

MUNICIPALITIES
City of St. John, Quebec.

NAIL SETS
Morrow Screw & Nut Co., J., Ingersoll, Ont

NAME PLATES, BRONZE, ETCHED AND STAMPED
Matthews & Co., Jas. H., Pittsburgh, Pa
Turner Brass Works, Sycamore, Ill.

NICHROME CASTINGS
Can. Driver-Harris Co., Ltd., Walkerville

NICKEL
Pilot Steel & Tool Co., Montreal, Que.

NICKEL STEEL
See Steel.

NICKEL SILVER—SHEETS, ROLLS, PLATES and RODS
Brown's Copper and Brass Rolling Mills, New Toronto.

NIPPLE THREADING MACHINES
Hall & Sons, Ltd., John H., Brantford.
Landis Machine Co., Waynesboro, Pa.

NITROGEN
Carter Welding Co., Toronto, Ont.

NUTS, STEEL, CASTELLATED AND COLD PRESSED
Galt Machine Screw Co., Ltd., Galt, Ont.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Williams & Co., J. H., Brooklyn, N.Y.

NUTS, SEMI-FINISH AND FINISHED
Galt Machine Screw Co., Galt, Ont
National-Acme Co., Cleveland, Ohio.
Wilkinson & Kompass, Hamilton.

NUT LOCKS
Edw. W. Robinson Co., Ltd., Montreal.

NUT BURRING AND NUT MACHINES (HOT)
National Machy. Co., Tiffin, Ohio.

NUT FACING AND BOLT SHAVING MACHINES
Garvin Machine Co., New York.
National Machinery Co., Tiffin, Ohio.
Petrie, Ltd., H. W., Toronto.
Victor Tool Co., Waynesboro, Pa.

NUT TAPPERS
Bertram & Sons Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
Hall & Son, J. H., Brantford, Ont.
Jardine & Co., A. B., Hespeler.
Landis Machine Co., Waynesboro, Pa.
National Machinery Co. Tiffin, Ohio.
Petrie, Ltd., H. W., Toronto.

OILERS
All-Way Oiler Mfg. Co., Toronto, Ont.

OIL SEPARATORS
Can. Fairbanks-Morse Co., Montreal.

OIL STONES
Aikenhead Hardware Co., Toronto, Ont.
Carborundum Co., Niagara Falls, N.Y.
Norton Co., Worcester, Mass.
Rice Lewis & Son, Toronto, Ont.

OIL STONE GRINDERS
Oliver Machy. Co., Grand Rapids, Mich.

OIL STORAGE SYSTEMS
Bowser Co., Ltd., S. F., Toronto, Ont.
St. Lawrence Welding Co., Ltd., Montreal.

OPENING DIE HEADS
Greenfield Tap & Die Corp, Greenfield.
Wells Bros. of Canada, Galt, Ont.

OPTICAL SUPPLIES
Consolidated Optical Co., Toronto Ont.

ORE HANDLING EQUIPMENT
Brown Hoisting Machinery Co., Cleveland, Ohio.
Canadian Link-Belt Co., Ltd., Toronto, Ont.
Canadian Mead-Morrison Co., Limited, Montreal, Que.

OSCILLATING VALVE GRINDERS (PNEUMATIC)
Cleveland Pneumatic Tool Co. of Canada, Toronto

OVENS FOR BAKING, BLUING, DRYING, ENAMELING, JAPANNING AND LACQUERING
Brantford Oven & Rack Co., Brantford.

OVEN TRUCKS, STEEL
Brantford Oven & Rack Co., Brantford.
MacKinnon Steel Co., Sherbrooke, Que.

OVENS FOR DRYING, TEMPER AND OXYGEN, ELECTROLYTIC CELLS UNDER TRUCKS
Welding & Supplies Co., Montreal, Que.
Brantford Oven & Rack Co., Brantford.

OXY-ACETYLENE WELDING AND CUTTING AND OUTFITS
Carter Welding Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
L'Air Liquide Society, Toronto, Ont.
Prest-o-Lite Co., Inc. Toronto, Ont.
Davis-Bournonville Co., Toronto, Ont.

OXYGEN
Carter Welding Co., Ltd., Toronto, Ont.
Dominion Oxygen Co., Ltd., Toronto, Ont.
Nat. Electro Products Ltd., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.

OXYGEN PLANTS (ELECTROLYTIC)
Davis-Bournonville Co., Toronto, Ont.

PACKINGS, ASBESTOS
Cleveland Wire Spring Co., Cleveland.

PACKING, ROD AND SHEET
Dunlop Tire & Rubber Goods Co., Ltd. Toronto.
Goodyear Tire & Rubber Co., Can., Ltd. Toronto
Gutta Percha & Rubber, Ltd., Toronto.
International Mach. Spls., Ltd., Montreal
Petrie, Ltd., H. W., Toronto.
Quaker City Rubber Co., Philadelphia, Pa

PANS, WET AND DRY
Frost Mfg. Co., Chicago, Ill.

PAPER MILL CONVEYORS AND DRIVES
Bertrams, Ltd., Edinburgh, Scotland.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Gutta Percha & Rubber, Ltd., Toronto.
MacKinnon Steel Co., Sherbrooke, Que.

PARTITIONS, WIRE
See Guards

PAPER MILL MACHINERY
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Machinery Co., Toronto.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

PATTERN SHOP EQUIPMENT
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Oliver Machy. Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto.

PATTERN MAKERS' LATHES
See Lathes.

PATENT SOLICITORS
Budden, Hanbury A., Montreal.
Fetherstonhaugh & Co., Ottawa.
Marion & Marion, Montreal.
Ridout & Maybee, Toronto.

PECK CARRIERS FOR POWER PLANTS
Can. Link-Belt Co., Toronto, Ont.

PENSTOCKS
William Hamilton Co., Peterboro, Ont.

PERFORATED METALS AND ORNAMENTAL IRON GOODS
Canada Wire & Iron Goods Co., Hamilton

PHOSPHOR TIN, COPPER AND BRONZE
British Smelting & Refining Co., Ltd., Montreal, Que.

PHOTOSTATS
Commercial Camera Co., Providence, R.I.

PIG IRON
Hanna & Co., M. A., Cleveland, O.
Steel Co. of Canada, Ltd., Hamilton, Ont.

PINS, TAPER
Morrow Screw & Nut Co., J., Ingersoll, Ont

PINS, BELT-LACING
Clipper Belt Lacer Co., Grand Rapids.

PIPE, BLACK & GALVANIZED
Crane, Ltd., Montreal, Que.

PIPE FITTINGS, MALLEABLE AND CAST IRON
International Malleable Iron Co., Guelph.

PIPE CUTTING AND THREADING MACHINES
Barber Mchy. Co., Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Curtis & Curtis Co., Bridgeport, Conn.
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield.
Hall & Sons, John H., Brantford.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
McDougall Co., R., Galt.
Petrie, Ltd., H. W., Toronto.
Wells Bros. Co. of Canada, Galt, Ont.
Williams Tool Co., Erie, Pa.
Williams Machy. Co., A. R., Toronto.

PIPE, JOINT COMPOUNDS
Crane, Ltd., Montreal, Que.

PIPE RIVETED STEEL
Toronto Iron Works, Ltd., Toronto.
William Hamilton Co., Peterboro, Ont.

PIERCING
Oliver Machy. Co., Grand Rapids, Mich.

PIPE CUTTERS, ROLLING
Curtis & Curtis Co., Bridgeport, Conn.
Greenfield Tap & Die Corp., Greenfield.
Hall & Sons, Ltd., John H., Brantford.
Wells Bros. Co. of Canada, Galt, Ont.

The Mecca of Manufacturers

ST. JOHNS QUEBEC

A Beautiful City An Industrial Centre

ST. JOHNS is at once a beautiful residential city and an ideal industrial location. Its picturesque and commanding geographical location, its miles of beautifully shaded and paved streets, its unequalled transportation facilities and cheap labour market make St. Johns unsurpassed as an industrial centre and an ideal home for you and your employees.

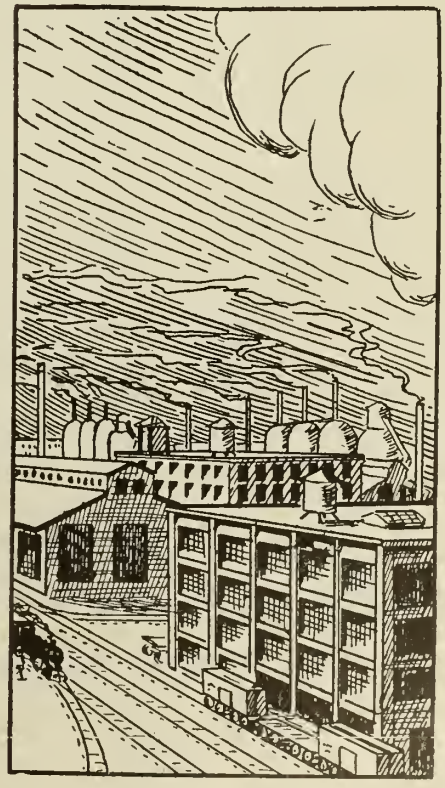
The city has a population of 12,000 and enjoys every modern convenience in the way of waterworks, sewers, driveways, concrete walks, electric lights, public parks and buildings, etc. Seven railroads including the C.P.R. and G.T.R. pass through St. Johns, ensuring low freight rates and dispatch in the handling of merchandise.

St. Johns has an abundant supply of skilled and unskilled labor and is recognized as the cheapest labor market in Canada. Low rents and taxes and the general low cost of living are responsible for this. Labor troubles are quite unknown.

Electric Power is cheap and plentiful and the excellent railway connections assure a satisfactory coal supply.

To encourage new industries, the following incentives are offered by the city:

Exemption of taxes for fifteen years' period, subject to extension; all public improvements required, such as street extensions, sidewalks, waterworks and sewage; five per cent. bonus on your payroll for five years. If you wish it, this bonus will be advanced to you to be applied to the construction of a suitable building.



For more specific information write

The Secretary of the City Council
ST. JOHNS, QUE.

If interested tear out this page and place with letters to be answered.

PIPE TOOLS AND DIES
Ackworthie Ltd., J., Birmingham, Eng.
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PIPE CUTTERS AND REAMERS
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PIPE STOCKS AND THREADERS
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PIPE TAPS AND VISES
Ackworthie Ltd., J., Birmingham, Eng.
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PIPE WRENCHES
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PISTON AND PISTON RING MACHINES
National Acme Co., Windsor, Vt.

PLANER BOLTS
Atkins & Co., E. C., Hamilton, Ont.
Morrow Screw & Nut Co., J., Ingersoll, Ont

PLANER JACKS
Armstrong Bros. Tool Co., Chicago.

PLANERS, STANDARD AND ROTARY
Betts Machine Co., Rochester, N.Y.
Barber Mchy. Co., Ltd., Toronto, Ont.
Bertram & Sons Co., John, Dundas.
Oliver Machy. Co., Grand Rapids, Mich.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal
Gardner & Son, Robt., Montreal.
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Morton Mfg. Co., Muskegon Heights, Mich
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
Standard Equipment & Tool Wks., Montreal.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.

PLANING AND SHAPING MACHINERY
Barber Mchy. Co., Ltd., Toronto, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Niles-Bement-Pond Co., New York.
Ohio Mach. Tool Co., Kenton, Ohio.
Perrin, Ltd., William, Toronto.
Williams Mchy Co. Ltd., A. R., Montreal

PLANER-SHAPER, COMBINED OPEN SIDE
Lund-Farquhar Co., Boston.
Petrie, Ltd., H. W., Toronto.

POWER HAMMERS
Quickwork Co., St. Marys, Ohio.

PLANING MILL EXHAUSTERS
Can. Blower & Forge Co., Kitchener, Ont.
MacGovern & Co., Montreal, Que.
Niles-Bement-Pond Co., New York.
Sturtevant Co., B. F., Galt, Ont.

PLATES, Q.M., SHEARED AND CHEQUERED
Peckovers, Ltd., Toronto, Ont.

PLATING, PLANTS & SUPPLIES
Can. Hanson Van Winkle Co., Ltd., Toronto, Ont.

PLIERS
Aikenhead Hardware Co., Toronto.
Can. Billings & Spencer, Ltd., Welland.
Elec. Lewis & Son, Toronto, Ont.

PNEUMATIC CYLINDERS
Holden Co., Ltd., Montreal, Que.

PNEUMATIC EQUIPMENT
Strelinger Co., C. A., Windsor, Ont.

PNEUMATIC TOOLS
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland P'matic Tool Co., Can., Toronto.
Curtis Pneumatic Machy. Co., St. Louis.
Garlock-Walker Machy. Co., Toronto.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool Co., Chicago.
Int. Mach. & Supply Co., Ltd., Montreal.

POWER CRANES, HAND
MacKinnon Steel Co., Sherbrooke, Que.

POLISHING MACHINES
Ackworthie Ltd., J., Birmingham, Eng.
Brown & Sharpe Mfg. Co., Providence, R.I.
Ford-Smith Machine Co., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto.

POLISHING PLATES
Greenfield Tap & Die Corp., Greenfield.
Petrie, Ltd., H. W., Toronto.
Wells Bros. of Canada, Galt, Ont.

POLISHING PAPER
H. H. Barton & Son Co., Philadelphia.

POTS AND KETTLES, CAST STEEL
Elec. Steel & Metals, Welland, Ont.

POWER HOUSE CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

PORTABLE MACHINERY
Hoskins & Co., R. C., Chicago, Ill.

POWER TRANSMISSION MCHY.
Canadian Link-Belt Co., Ltd., Toronto,
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Petrie, Ltd., H. W., Toronto.

PRESSED STEEL PARTS
Ackworthie Ltd., J., Birmingham, Eng.
Gray Ball Bearing Co., Ltd., Toronto.

PRESSERS, ARBOR
Atlas Press Co., Kalamazoo, Mich.
Metalwood Mfg. Co., Detroit, Mich.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
Lourie Manufacturing Co., Springfield, Ill.

PRESSES, BROACHING, FORGING AND FLANGING
Atlas Press Co., Kalamazoo, Mich.
Bliss Co., E. W., Brooklyn, N.Y.
Dom. Steel Products Co., Ltd., Brantford.
Eastern Production Co., Detroit, Mich.
Metalwood Mfg. Co., Detroit, Mich
Petrie, Ltd., H. W., Toronto.
Toledo Machine & Tool Co., Toledo.
Stoll Co., D. H., Buffalo, N.Y.
Williams Mchy Co., Ltd., A. R., Montreal

PRESSES, CAM, TOGGLE, EYELET
Baird Machine Co., Bridgeport, Conn.
Bliss Co., E. W., Brooklyn N.Y.
Toledo Machine & Tool Co., Toledo.
Stoll Co., D. H., Buffalo, N.Y.

PRESSES, FILTER
Perrin, Ltd., William R., Toronto.
Smalley-General Co., Inc., Bay City, Mich.

PRESSES, PNEUMATIC
Dom. Steel Products Co., Ltd., Brantford.
Eastern Production Co., Detroit, Mich.
Metalwood Mfg. Co., Detroit, Mich.
Toledo Machine & Tool Co., Toledo.

PRESSES, DROP AND FORGING
Barber Mchy. Co., Ltd., Toronto, Ont.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs Co, Ltd., Hamilton.
Can. Fairbanks-Morse Co., Montreal.
Niles-Bement-Pond Co., New York.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co, Toledo.

PRESSES, HYDRAULIC
Barber Mchy. Co., Ltd., Toronto, Ont.
Bertram & Sons Co., John, Dundas.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Dom. Steel Products Co., Ltd., Brantford.
Eastern Production Co., Detroit, Mich.
Lourie Manufacturing Co., Springfield, Ill.
Metalwood Mfg. Co., Detroit, Mich.
Niles-Bement-Pond Co., New York.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.
Toledo Machine & Tool Co., Toledo.
Stoll Co., Inc., D. H., Buffalo, N.Y.
Williams Machy. Co., A. R., Toronto.

PRESSES, HYDRAULIC, HORIZONTAL
Eastern Production Co., Detroit, Mich.

PRESSES, HYDRAULIC, VERTICAL
Eastern Production Co., Detroit, Mich.

PRESSES, HYDRO-PNEUMATIC
Eastern Production Co., Detroit, Mich.

PRESSES, BALING
Perrin, Ltd., William R., Toronto.

PRESSES, POWER
Baird Machine Co., Bridgeport, Conn.
Barber Mchy. Co., Ltd., Toronto, Ont.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machinery Co., Toronto.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo.
Williams Machy. Co., A. R., Toronto.

PRESSES, SPRING FOOT
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Ont.
Toledo Machine & Tool Co., Toledo.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., Ltd., A. R., Montreal

PRESSES, SCREW
Barnes & Co., W. F. & Jno., Rockford, Ill
Bliss Co., E. W., Brooklyn, N.Y.
Manhattan Machine & Tool Co., Grand Rapids, Mich.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.

PRESSES, TIRE
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,

PRESSES, TRIMMING
Bliss Co., E. W., Brooklyn, N.Y.
Canada Machinery Corp., Galt, Ont.
Petrie, Ltd., H. W., Toronto.
Stoll Co., D. H., Buffalo, N.Y.

PROJECTORS, FLOOD LIGHTING
Holden Co., Ltd., Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que

PROPELLERS
Kennedy & Sons, Wm., Owen Sound.

PROTECTIVE COATINGS
H. H. Robertson, Ltd., Sarnia, Ont.

PSYCROMETERS, SLING
Taylor Instrument Co., Rochester, N.Y.

PULLEYS
Algoma Steel Corp., Sault Ste. Marie, Ont
American Pulley Co., Philadelphia.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., Fortierville, Que.
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Diamond State Fibre Co., Bridgeport, Pa.
Ford-Smith Machine Co., Hamilton, Ont.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Kennedy & Sons, Ltd., W., Owen Sound.
Positive Clutch & Pulley Works Ltd., Toronto.
Petrie, Ltd., H. W., Toronto.

PULLEYS, STEEL SASH, STEEL BELT
American Pulley Co., Philadelphia, Pa.

PULLEYS, FRICTION, CLUTCH
American Pulley Co., Philadelphia, Pa.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., A., Fortierville, Q.
Can. Link-Belt Co., Toronto, Ont.
Carlyle Johnson Mch. Co., Manchester, Ct.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Jones & Glassco, Montreal.
Positive Clutch & Pulley Works, Toronto.
Petrie, Ltd., H. W., Toronto.

PULP MILL MACHINERY
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Hamilton Co., Ltd., Wm., Peterborough, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

PUMPS, AIR LIFT
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Holden Co., Ltd., Montreal, Que.

PUMPS, BOILER FEED
Can. Ingersoll-Rand Co., Ltd. Sherbrooke,

PUMPS, CENTRIFUGAL
Bowser Co., Ltd., S. F., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Ingersoll-Rand Co., Montreal, Que.
Darling Bros., Ltd., Montreal, Que.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

PUMPS, FUEL OIL
Bowser Co., Ltd., S. F., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Darling Bros., Ltd., Montreal, Que.
Trabern Pump Co., Rockford, Ill.

PUMPS, GEARED
Darling Bros., Ltd., Montreal, Que.
Globe Engineering Co., Hamilton, Ont.

PUMPS, HIGH PRESSURE
Perrin, Ltd., William R., Toronto.

PUMPS, HYDRAULIC
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Clarke & Co., Furniss, Montreal, Que.
Garlock-Walker Machinery Co., Toronto.
Darling Bros., Ltd., Montreal, Que.
Elec. Steel & Metals, Welland, Ont.
Metalwood Mfg. Co., Detroit, Mich.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

PUMPS, LUBRICATING, OIL STORAGE
Bowser Co., Ltd., S. F., Toronto, Ont.

PUMPS, RETURN AIR
Can. Ingersoll-Rand Co. Ltd., Sherbrooke,

PUMPS, SPECIAL
Elec. Steel & Metals, Welland, Ont.

PUMPS, RUBBER CEMENT
Bowser Co., Ltd., S. F., Toronto, Ont.

PUMPS, KEROSENE, OIL, SELF-MEASURING
Bowser Co., Ltd., S. F., Toronto, Ont.

PUMPS, LUBRICANT, OIL, WATER
Darling Bros., Ltd., Montreal, Que.
Trabern Pump Co., Rockford, Ill.

PUMPS — ROTARY
General Combustion Co., Ltd., Montreal, Que.

PUMP LEATHERS
Graton & Knight Mfg. Co., Worcester.

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Atkins & Co., Ltd., Wm., Sheffield, Eng.
E. W. Bliss Co, Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Can.
Can. Blower & Forge Co., Kitchener, Ont.
Crescent Mach. Co., Ltd., Montreal, P.Q.
Can. Fairbanks-Morse Co., Montreal.
Elliott & Whitehall Machine and Tool Co., Galt, Ont.
Gardner & Son, Robert, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Marshall, Son & Blunney, Toronto.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, O.
Williams Mchy Co., A. R., Toronto, Ont.

PUNCHES, POWER
John Bertram & Sons Co., Dundas, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd, Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd. Brantford.
Garlock-Walker Machinery Co., Toronto.
A. B. Jardine & Co., Hespeler, Ont.
Long & Allstatter, Hamilton, Ohio.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
D. H. Stoll Co., Buffalo, N.Y.
Williams Mchy Co., A. R., Toronto, Ont.

PUNCHING MACHINES, HORIZONTAL
Bertrams, Ltd., Edinburgh, Scotland.
Bertrams & Sons, John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co. Ltd., Hamilton, Ont.
Garlock-Walker Mach'y. Co., Toronto.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

PUNCHES, HAND
Niles-Bement-Pond Co., New York.

PYROMETERS
Bristol Co., Waterbury, Conn.
Shore Instrument & Mfg. Co., New York
Taylor Instrument Co., Rochester, N.Y.

QUARTERING MACHINES
Bertram & Sons, John, Dundas, Ont.
Canadian Mead-Morrison Co., Limited, Montreal, Que.
Niles-Bement-Pond Co., New York.

QUARRY HOISTS
Canadian Mead-Morrison Co., Limited, Montreal, Que.

RAIL BENDERS
Algoma Steel Corp., Sault Ste. Marie, Ont.

RAILROAD TOOLS
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machinery Co., Toronto.
Holden Co., Ltd., Montreal, Que.
Niles-Bement-Pond Co., New York.
Petrie Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

RASPS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall, Son & Bunney, Toronto.

RAWHIDE PINIONS (See Gears)

REAMERS
Butterfield & Co., Inc., Rock Island, Que.

REAMERS, ADJUSTABLE
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Elliott & Whitehall Machine and Tool Co., Galt, Ont.
Greenfield Tap & Die Corp., Greenfield.
Ingersoll Machy. Co., Ingersoll, Ont.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
McCrosky Tool Corp., Meadville, Pa., U. S. A.
Plewes, Ltd., Winnipeg, Man.
Pratt & Whitney Co., Dundas, Ont.
The Kelly Reamer Co., Cleveland, O.
J. A. M. Taylor, 118 Stair Bldg., Toronto.
Wells Bros. of Can., Galt, Ont

REAMERS, BRIDGE, EXPANDING AND HIGH SPEED
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Aikenhead Hardware Co., Toronto.
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Elliott & Whitehall Machine and Tool Co., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Lyman Tube & Supply Co., Montreal, Que
Marshall, Son & Bunney, Toronto.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Morse Twist Drill & Mch. Co., New Bedford, Mass.
McCrosky Tool Corp., Meadville, Pa., U. S. A.
Samuel Osborne, Ltd., Montreal, P.Q.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

REAMERS, STEEL TAPER AND SELF-FEEDING
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

REAMERS, CHUCKING
Ackworthie Ltd., J., Birmingham, Eng.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Elliott & Whitehall Machine and Tool Co., Galt, Ont.
Greenfield Tap & Die Corp., Greenfield.
Ingersoll Machy. Co., Ingersoll, Ont.
Marshall, Son & Bunney, Toronto.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wells Bros. of Canada, Galt, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

REAMERS, HAND
Ackworthie Ltd., J., Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Elliott & Whitehall, Galt, Ont.
Greenfield Tap & Die Corp., Greenfield
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wells Bros. of Can., Galt, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

REAMERS, PIN
Ackworthie Ltd., J., Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield.
Morrow Screw & Nut Co., John, Ingersoll.
Wells Bros. of Can., Galt, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

REAMER FLUTING MACHINES
Garvin Machine Co., New York.

REAMING MACHINES, PNEUMATIC
Cleveland Pneumatic Co. of Can., Toronto
Garlock-Walker Machinery Co. Toronto.
Holden Co., Ltd., Montreal, Que.

RECORDING INTRUMENTS
Bristol Co., Waterbury, Conn.
Gisholt Machine Co., Madison, Wis.
Taylor Instrument Co., Rochester, N.Y.

REELS, WIRE AND TEXTILE MFG.
American Pulley Co., Philadelphia, Pa.

REGULATORS, AUTOMATIC
Electric Steels & Metals, Ltd., Welland.

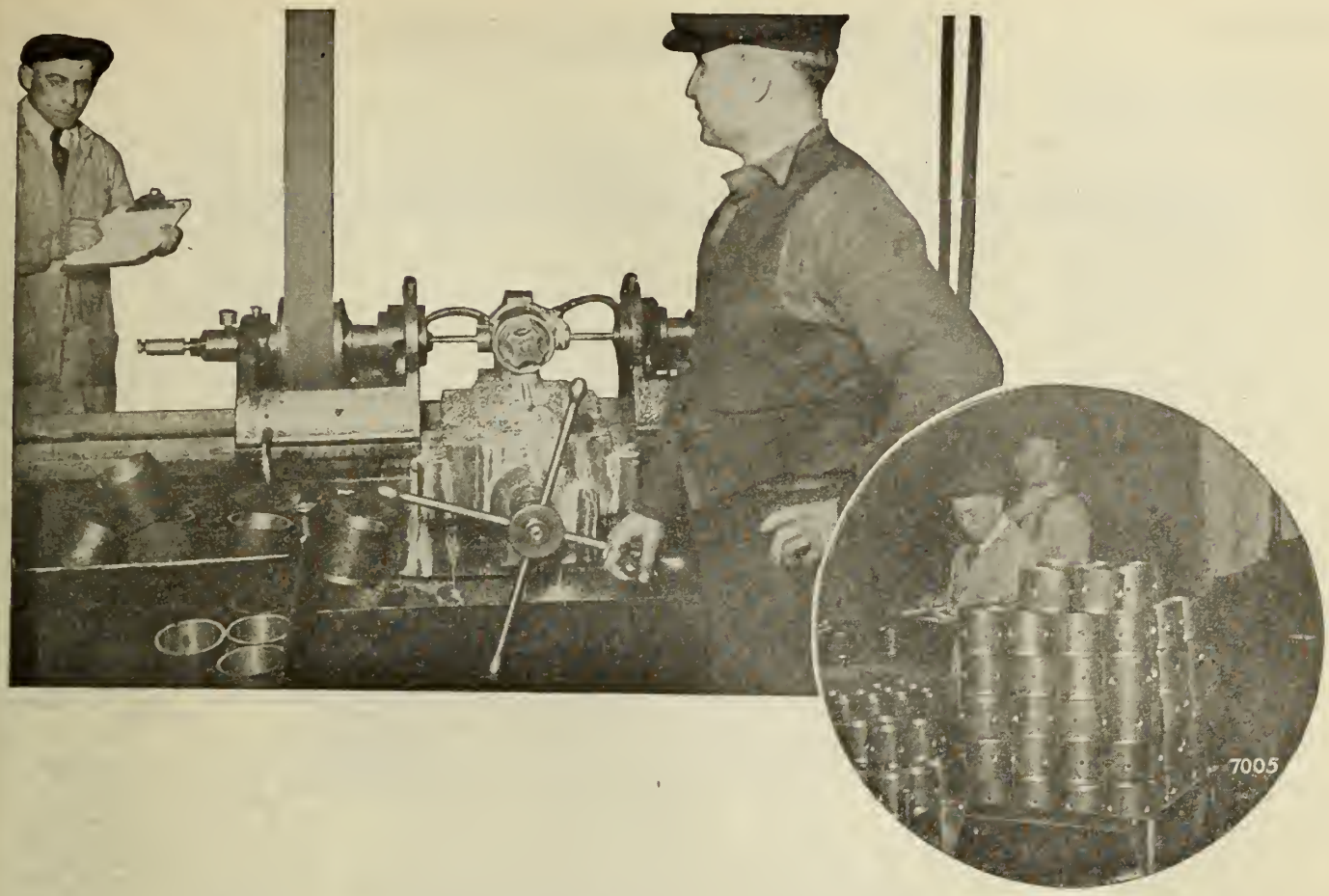
REGULATORS, PRESSURE, TEMPERATURE
Can. Fairbanks-Morse Co., Montreal.
Taylor Instrument Co., Rochester, N.Y.

REPAIR WORK — SAWS
Atkins & Co., E. C., Hamilton, Ont.

REPAIR WORK, ALL KINDS
Elec. Steel & Metals, Welland, Ont.

RIVETS,
Aikenhead Hardware Co., Toronto, Ont.
Parmenter & Bulloch Co., Gananoque.
Rice, Lewis & Son, Toronto.
Steel Co. of Canada, Ltd., Hamilton.

RIVET HEATERS
Chicago Flexible Shaft Co., Chicago, Ill.



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The quickest and surest method of drilling two holes in line is to put the work on a Garvin Duplex Horizontal Drill.

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GARVIN

BUILDER OF BETTER MACHINE TOOLS

If interested tear out this page and place with letters to be answered

BUYERS' DIRECTORY

RIVETERS, PNEUMATIC, HYDRAULIC, HAMMER, COMPRESSION
Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Montreal.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.

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Grant Mfg. & Machine Co., Bridgeport.
High-Speed Hammer Co., Rochester.
Petrie, Ltd., H. W., Toronto.
P. B. Shuster Co., New Haven, Conn.
Strelinger Co., C. A., Windsor, Ont.

ROAD BUILDING EQUIPMENT
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Holden Co., Ltd., Montreal, Que.

ROAD-MAKING MACHINERY
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Page Steel & Wire Co., Adrian, Mich.

RODS, PURE NICKEL, MONEL METAL, NICHROME
Can. Driver-Harris Co., Ltd., Walkerville.

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Can. Link-Belt Co., Toronto.
Jones & Glasco, Montreal.
Lyman Tube & Supply Co., Montreal, Que.

ROLLS, BENDING, STRAIGHTENING
John Bertram & Sons Co., Dundas.
Brown, Boggs Co., Ltd., Hamilton.
Can. Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machinery Co., Toronto.
Niles-Bement-Pond Co., New York.
Petrie Ltd., H. W., Toronto.
Toledo Machine & Tool Co., Toledo, O.

ROLLS CRUSHING
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

ROLLS AND TABLES
Dominion Foundries & Steel Ltd., Hamilton, Ont.
Elec. Steel & Metals, Welland, Ont.

ROOFING
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ROPE, GALX, MONEL METAL, BRONZE, TILLER AND SASH CORD
Can. Driver-Harris Co., Ltd., Walkerville.

ROTARY SHEARS
The Quickwork Co., St. Mary's, Ohio.

ROLLER CHAINS
Renold of Canada Ltd., Montreal.

ROLLING MACHINES, SHEET METAL
Manhattan Machine & Tool Co., Grand Rapids, Mich.

ROLLING MILL MACHINERY
Dom. Steel Products Co., Ltd., Brantford.
Mesta Machine Co., Pittsburgh, Pa.

ROLL LATHES
Mesta Machine Co., Pittsburgh, Pa.

ROLLS, BENDING, STRAIGHTENING
Manhattan Machine & Tool Co., Grand Rapids, Mich.

ROLLS, CRUSHING
Can. Link-Belt Co., Toronto.

ROOF COOLERS
Electric Steels & Metals, Ltd., Welland

RUBBER MOULDS AND CORES
Elliott & Whitehall, Galt, Ont.

RUBBER MILL DRIVES
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Dom. Steel Products Co., Ltd., Brantford
Can. Link-Belt Co., Toronto.

RUBBER MILL MACHINERY
Bertrams Ltd., Edinburgh, Scotland
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Dom. Steel Products Co., Ltd., Brantford

RUBBER MOULDS & CORES
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

RUBBER PRODUCTS, MECHANICAL
Dunlop Tire & Rubber Goods Co., Ltd., Montreal.

RUBBING BRICKS
Dominion Abrasive Co., Mimico, Ont.

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Brown & Sharpe Mfg. Co., Providence.
James Chesterman & Co., Ltd., Sheffield.
Rice, Lewis & Son, Toronto.
L. S. Starrett Co., Athol, Mass.

RULES, STEEL, STRAIGHT, AND FOLDING
Lufkin Rule Co. of Can., Windsor.

RULES, BOXWOOD, FOLDING
Lufkin Rule Co. of Can., Windsor.

RULES, BOARD AND LONG
Lufkin Rule Co. of Can., Windsor.

RUST PREVENTATIVES
Oakley Chemical Co., New York, N.Y.

SAW MILL CONVEYORS
Can. Link-Belt Co., Toronto.
Petrie, Ltd., H. W., Toronto.

SAND MILLS
Frost Mfg. Co., Chicago, Ill.

SAND-BLAST EQUIPMENT
SAND BLAST SUPPLIES AND ACCESSORIES
Pangborn Corporation, Hagerstown, Md

SAND BLAST ABRASIVES
Pangborn Corporation, Hagerstown, Md.

SAND MIXING MACHINERY
Frost Mfg. Co., Chicago, Ill.

SANITARY DRINKING FOUNTAINS
Pure Sanitary Drinking Fountain Co. Haydenville.

SANDING MACHINES
Canada Machinery Corp., Galt.

SAW MILL MACHINERY
Can. Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt.
Robert Gardner & Son, Montreal.
Curtis Pneumatic Machy. Co., St. Louis
Hamilton Co., Ltd., Wm., Peterborough, Ont.
A. R. Williams Machy. Co., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

SASH SPRINGS
The Dunbar Brothers Co., Bristol, Conn

SAWS FOR EVERY USE
Atkins & Co., E. C., Hamilton, Ont.

SAWS, CIRCULAR METAL
Atkins & Co., E. C., Hamilton, Ont.
Wm. Atkins & Co., Ltd., Sheffield, Eng.
Marshal, Son & Bunney, Toronto.
Plewes Ltd., Winnipeg, Man.
Simonds Mfg. Co., Fitchburgh, Mass.
Tabor Mfg. Co., Philadelphia, Pa.

SAWS, HACK (See Hack Saws)

SAW GUARDS
Ackworthie Ltd., J., Birmingham, Eng.
Atkins & Co., E. C., Hamilton, Ont.

SAWS, METAL, HACK AND BAND
Atkins & Co., E. C., Hamilton, Ont.

SAWS, SILVER STEEL
E. C. Atkins & Co., Inc., Indianapolis.

SAW SHARPENERS
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Can., Galt, Ont.

SAWS, SLITTING
J. A. M. Taylor, Stair Bldg., Toronto.
Atkins & Co., E. C., Hamilton, Ont.
Elliott & Whitehall Machine and Tool Co., Galt, Ont.

SAWS — HIGH-SPEED FRICTION
Atkins & Co., E. C., Hamilton, Ont.

SAWS — PATTERN SHOP
Atkins & Co., E. C., Hamilton, Ont.

SAWS — SWING
Atkins & Co., E. C., Hamilton, Ont.

SCALES
Can. Kron Scale Co., Montreal, P.Q.

SCALES, MECHANICS'
Lufkin Rule Co. of Can., Windsor.

SCLEROSCOPES
Shore Instrument & Mfg. Co., New York.

SCREENING MACHINERY
Can. Link-Belt Co., Toronto.

SCREW EXTRACTORS
Cleveland Twist Drill Co., Cleveland.

SCREW MACHINES, HAND, AUTOMATIC
Barber Mchy. Co., Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Ltd., Toronto
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield.
A. B. Jardine & Co., Hespeler.
National Acme Co. Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto.
Pratt & Whitney Co., Dundas, Ont.
Warner & Swasey Co., Cleveland, O.
Wells Bros. of Can., Galt, Ont.
Wood Turret Mach. Co., Brazil, Ind.

SCREWS, MACHINE, SET, CAP AND SPECIAL
Galt Machine Screw Co., Galt.
John Morrow Screw & Nut Co., Ingersoll.
National Acme Co. Montreal.
Rice Lewis & Son, Toronto.
Steel Co. of Canada, Ltd., Hamilton.
Wilkinson & Kompass, Hamilton.

SCREW COLLARS
Galt Machine Screw Co., Ltd., Galt, Ont.
John Morrow Screw & Nut Co., Ingersoll.

SCREW MACHINES, PLAIN WIRE FEED
Barber Mchy. Co., Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.

SCREW PLATES
Ackworthie Ltd., J., Birmingham, Eng.
Butterfield & Co., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield.
A. B. Jardine & Co., Hespeler.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto.
J. A. M. Taylor, Stair Bldg., Toronto.
Wells Bros. of Can., Galt.
Wilkinson & Kompass, Hamilton.

SCREWS, SAFETY SET
Galt Machine Screw Co., Ltd., Galt, Ont.

SCREW SLOTTERS
Butterfield & Co., Inc., Rock Island, Que.
Garvin Machine Co., New York.
National Acme Co., Cleveland, O.
Pratt & Whitney Co., Dundas, Ont.

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SELF-OPENING DIES
See Dies.

SEPARATORS, SAND
Pangborn Corporation, Hagerstown, Md.

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Aikenhead Hardware Co., Toronto.
Bristol Co., Waterbury, Conn.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wilkinson & Kompass, Hamilton.

SHANKS, STRAIGHT AND TAPER
Seneca Mfg. Co., Hartford, Conn.

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Barber Mchy. Co., Ltd., Toronto, Ont.
John Bertram & Sons Co., Dundas.
Can. Fairbanks-Morse Co., Montreal.
Canadian Machinery Corp., Galt.
Geo. F. Foss Mchy. & Sply. Co., Montreal
Robt. Gardner & Son, Montreal.
Garlock-Walker Mach'y. Co., Toronto.
Hendey Machine Co., Torrington, Conn.
Milwaukee Shaper Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto.
Rae Mach. Tool Co., Hamilton.
Strelinger Co., C. A., Windsor, Ont.
Standard Equipment & Tool Wks., Montreal.
Walcott Lathe Co., Jackson, Mich.
Williams Mchy Co., A. R., Toronto, Ont.

SHAPERS, GEAR
Fellows Gear & Shaper Co., Springfield, V.
Knigh Metal Products, Toronto.

SHAFTING
Algoma Steel Corp., Sault Ste. Marie, O.
Can. Fairbanks-Morse Co., Montreal.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machy. Co., Ltd., Toronto
Jones & Glasco, Montreal.
Niles-Bement-Pond Co., New York.
Can. Drawn Steel Co., Hamilton.
Peckovers, Ltd., Toronto, Ont.
Petrie, Ltd., H. W., Toronto.
Pratt & Whitney Co., Dundas.
Rice, Lewis & Son, Toronto.
A. R. Williams Machy. Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

SHARPENING STONES
Norton Co, Worcester, Mass.
Rice, Lewis & Son, Toronto.

SHEARING MACHINES, ANGLE IRON, BAR AND GATE
John Bertram & Sons Co., Dundas.
Bertrams Ltd., Edinburgh, Scotland.
Canada Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machy. Co., Ltd., Toronto
A. B. Jardine & Co., Hespeler, Ont.
Long & Allstatter Co., Hamilton, Ohio.
Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co., Toledo, O.

SHEARS, POWER
John Bertram & Sons Co., Dundas.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co, Ltd., Hamilton.
Can Blower & Forge Co, Kitchener.
Canada Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machy. Co., Ltd., Toronto
Long & Allstatter, Hamilton, Ohio.
A. B. Jardine & Co., Hespeler, Ont.
National Machy. Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
H. D. Stoll Co., Inc., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, O.
Williams, White & Co., Moline, Ill.
Williams Mchy Co., A. R., Toronto, Ont.

SHEARS, ROTARY
The Quickwork Co., St. Mary's, Ohio.

SHEARS, PNEUMATIC
Toledo Machine & Tool Co., Toledo, Ohio

SHEARS, PLATE CUTTING, SLITTING
Dom. Steel Products Co., Ltd., Brantford.
Quickwork Co., St. Mary's, Ohio.

SHEARS, SPLITTING
Dom. Steel Products Co., Ltd., Brantford.

SHEARS, IRREGULAR AND CIRCLE CUTTING
The Quickwork Co., St. Mary's, Ohio.
D. H. Stoll Co., Inc., Buffalo, N.Y.

SHEARS, SERPENTINE
The Quickwork Co., St. Mary's, Ohio.

SHEARS, SQUARING
Brown, Boggs & Co., Hamilton, Ont.
D. H. Stoll Co., Inc., Buffalo, N.Y.

SHEET METAL WORKING MACHINERY
D. H. Stoll Co., Inc., Buffalo, N.Y.

SHEET METAL WORKING TOOLS
Baird Machine Co., Bridgeport, Conn.
Barber Mchy. Co., Ltd., Toronto, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton.
Peck, Stow & Wilcox Co., Southington, C.
Petrie, Ltd., H. W., Toronto.
D. H. Stoll Co., Inc., Buffalo, N.Y.

SHEETS, CRUCIBLE, CAST
British Smelting & Refining Co., Ltd., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.

SHEETS, BLACK AUTO AND GALVANIZED
Peckovers, Ltd., Toronto, Ont.

SHEETS, NICKEL, RESIST. ALLOY
Can. Driver-Harris Co., Ltd., Walkerville.

SHELVING, STEEL
Dennis Wire & Iron Works, London.

SHIPYARD MACHINERY, SHOP FURNITURE
Dennis Wire & Iron Works, London.

SIDE TOOLS
Armstrong Bros. Tool Co., Chicago.
J. H. Williams & Co., Brooklyn, N.Y.

SILENT CHAINS
Can. Link-Belt Co., Toronto, Ont.
Jones & Glasco, Montreal.
Renold of Canada Ltd., Montreal.

SLEDGES
Aikenhead Hardware Co., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.
Wilkinson & Kompass, Hamilton, Ont.

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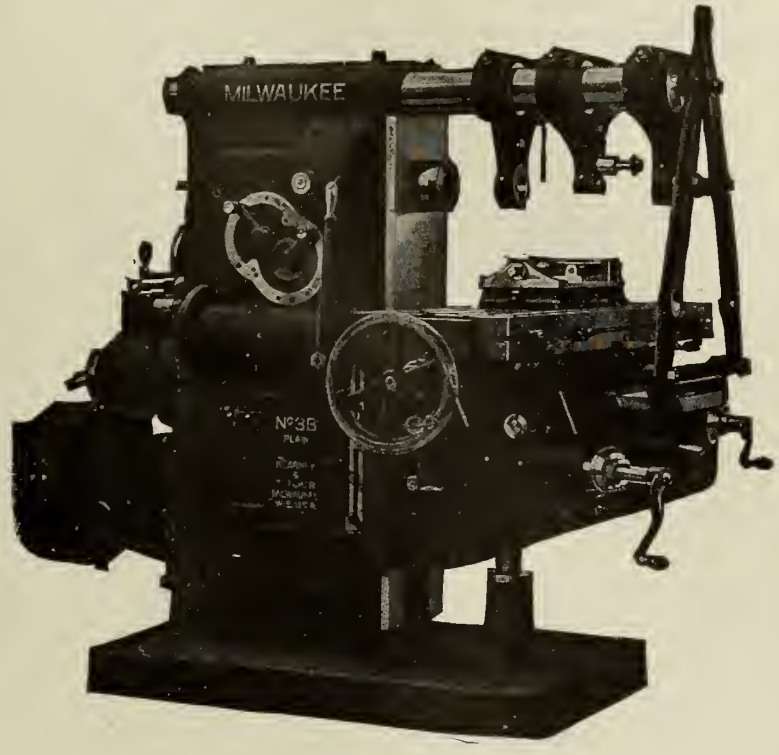

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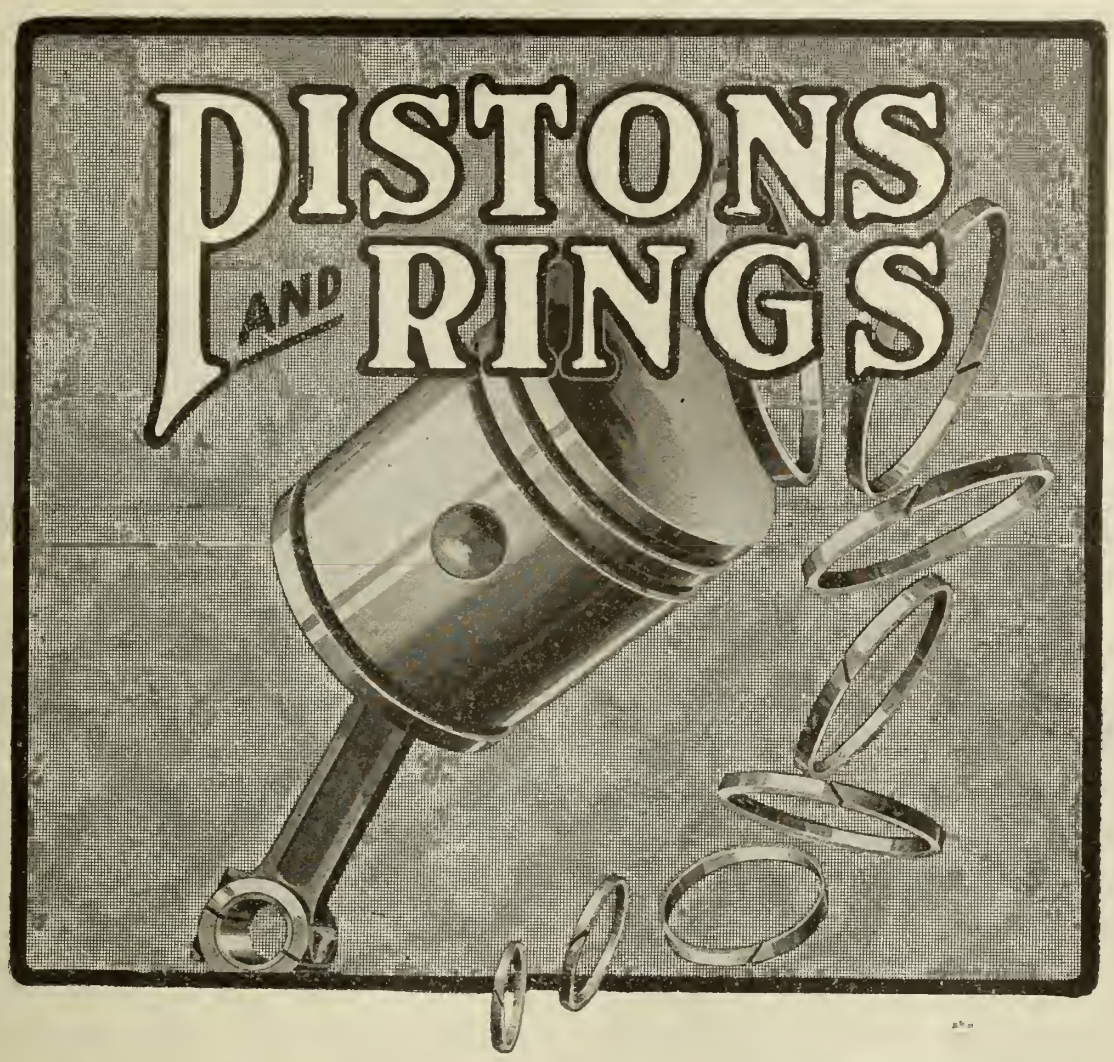

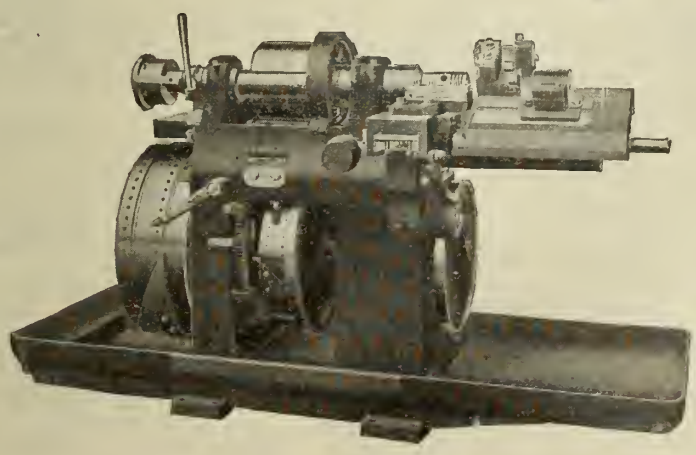

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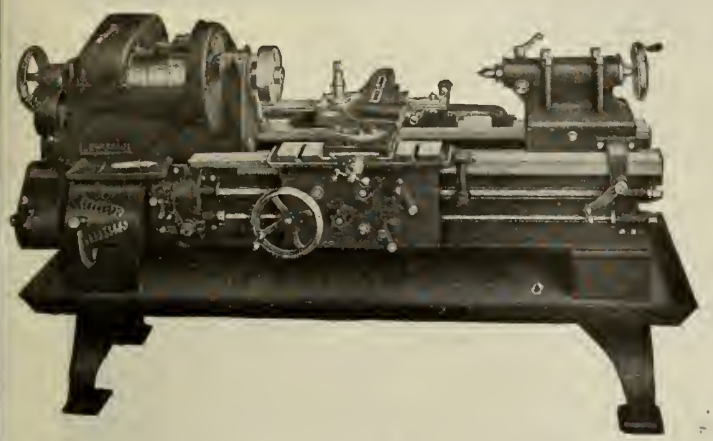

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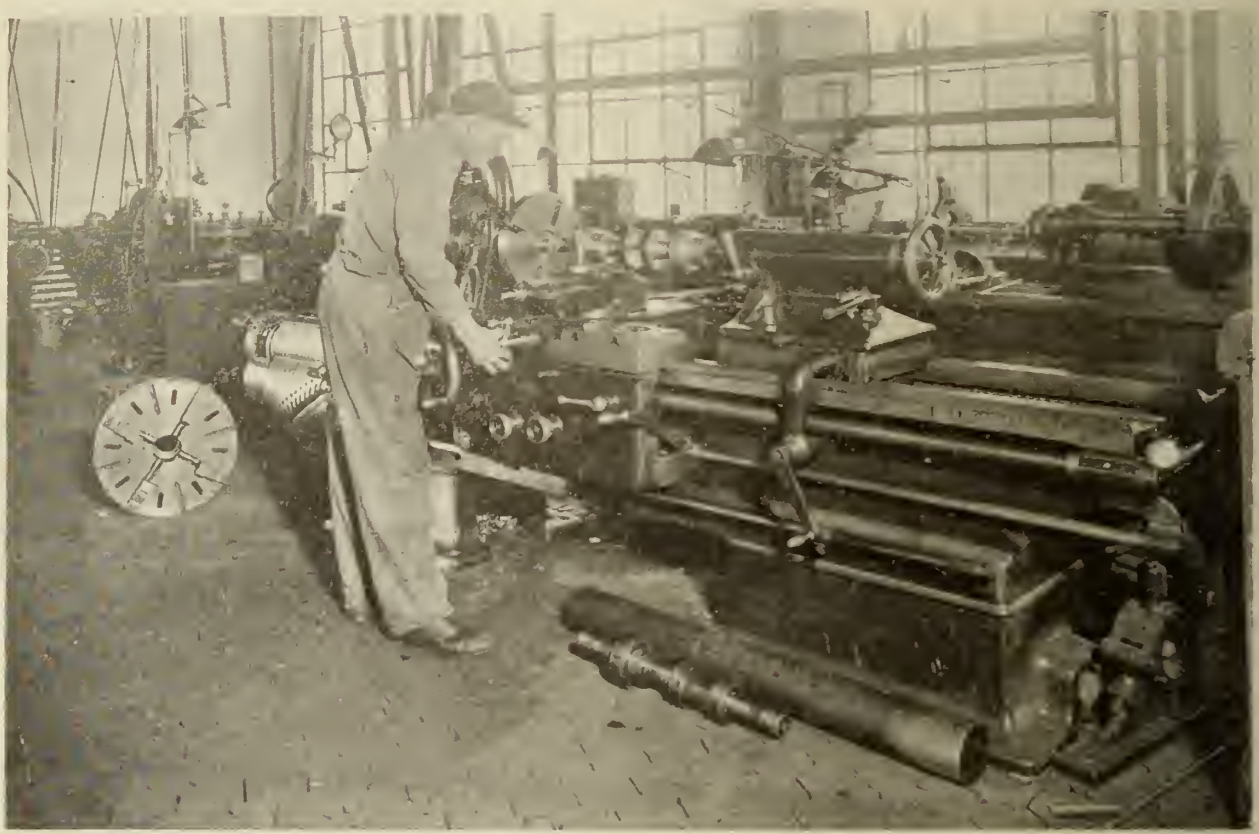

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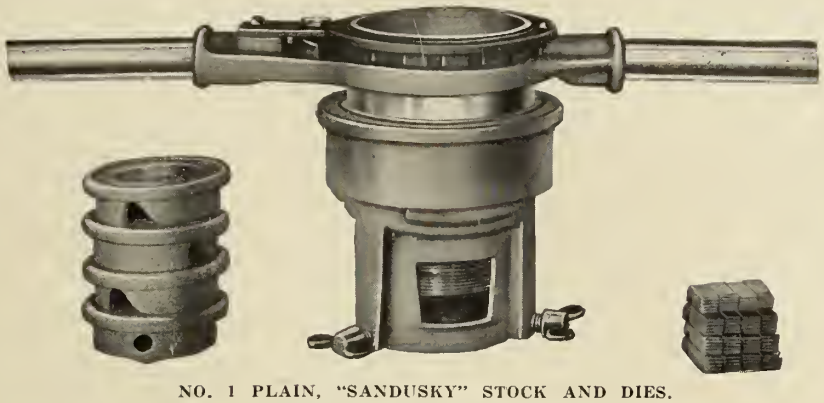

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36″ vertical drill, sliding head.
20″ drill, square base, wheel and lever feed.

These machines are offered subject to prior sale and as C.M.C. machines are moving readily intending purchasers should order promptly.

CANADA MACHINERY CORPORATION
LIMITED

GALT ONTARIO

Toronto Office and Warerooms, Brock Avenue Subway.

CANADIAN MACHINERY AND MANUFACTURING NEWS

Vol. XXIV., No. 4 | Published by the MacLean Publishing Company, Limited, Toronto | July 22, 1920 | $4.00 a Year Subscription Price

READ AND PASS TO	check	See Page	READ AND PASS TO	check	See Page	READ AND PASS TO	check	See Page
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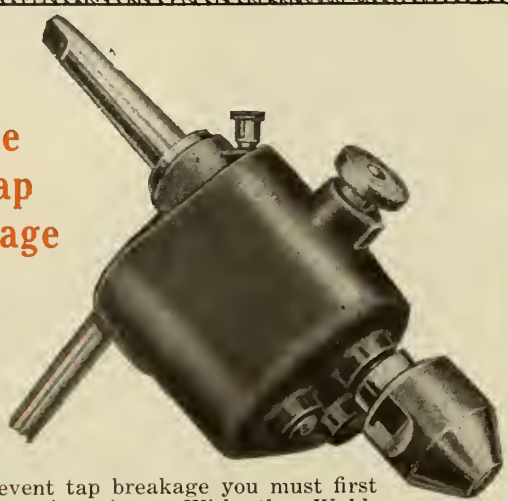
WAHLSTROM'S TAPPING ATTACHMENT

A Cure For Tap Breakage



TO prevent tap breakage you must first prevent jamming. With the Wahlstrom tapping attachment the tap doesn't jam because the chips are freed by its oscillating motion which is a close reproduction of the simple to-and-fro motion of hand tapping, though ten times faster. This feature reduces tap breakage to a minimum and speeds up production.

The Wahlstrom fits any drill press; is powerful, durable, and has nothing to get out of order. It's oscillating motion is changeable to a continuous revolution for tapping in soft materials. Also the tap reverse when the spindle is raised. All these features are absolutely indispensable in economical tapping by power.

It is made in two sizes. No. 1 takes taps of all sizes from 5.40 to ½ inch standard. No. 2 takes taps from ¼ inch to ¾ inch.

Aikenhead's

May we send one for 10 days' trial. Return if not satisfactory.

There is an Aikenhead tool for every requirement. Try them. You'll find the quality, service and price right.

Aikenhead Hardware Limited

17 Temperance St., Toronto, Ont.

SMALL TOOLS

Pratt & Whitney Adjustable Blade Reamers

These reamers have eccentric relief and can be set to size without regrinding. They are unexcelled for design and simplicity and ease of adjustment.

The eccentrically relieved blades are stronger than others, do not chatter, and produce a smoother hole. The hand, shell and fluted chucking reamers have interchangeable nuts, screws and wrenches. The bottom of a hole can readily be faced.

By a simple adjustment of the blades the reamer can easily be set to size, without regrinding.

Prompt service is assured at our nearest store, where P. & W. Small Tools are carried in stock for immediate delivery. Place your order there to-day.

PRATT & WHITNEY CO.
OF CANADA, LIMITED
Works: Dundas, Ontario
MONTREAL — 723 Drummond Bldg
TORONTO — 1002 C.P.R. Bldg.
WINNIPEG — 1205 McArthur Bldg.
WINDSOR — Davis Building
VANCOUVER — B.C. Equipment Co.
HALIFAX — Roy Building

PRATT AND WHITNEY

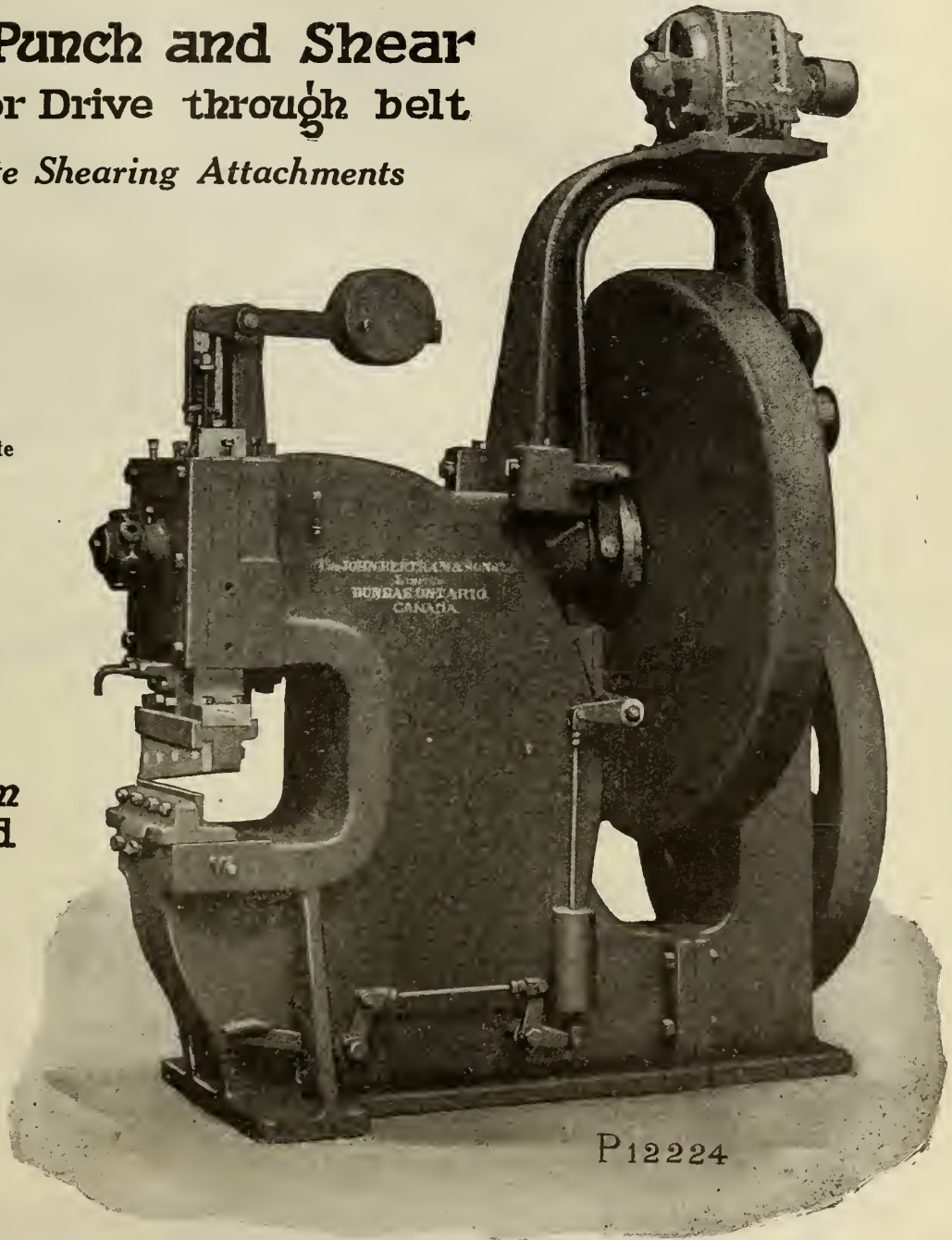
The BERTRAM Page

MACHINE TOOLS

No.4 Single Punch and Shear

12" Throat Motor Drive through belt

Fitted with Plate Shearing Attachments



Capacity

To punch 1" hole through 1" Plate
To shear 1" Plates
To " 6"x1" Flat Bars
To " 1¾" Round Bars
To " 4x4x⅜" Angles

The John Bertram & Sons Co., Limited
DUNDAS. ONTARIO.

MONTREAL
723 Drummond Bldg.

TORONTO
1002 C.P.R. Bldg.

VANCOUVER
609 Bank of Ottawa Bldg.

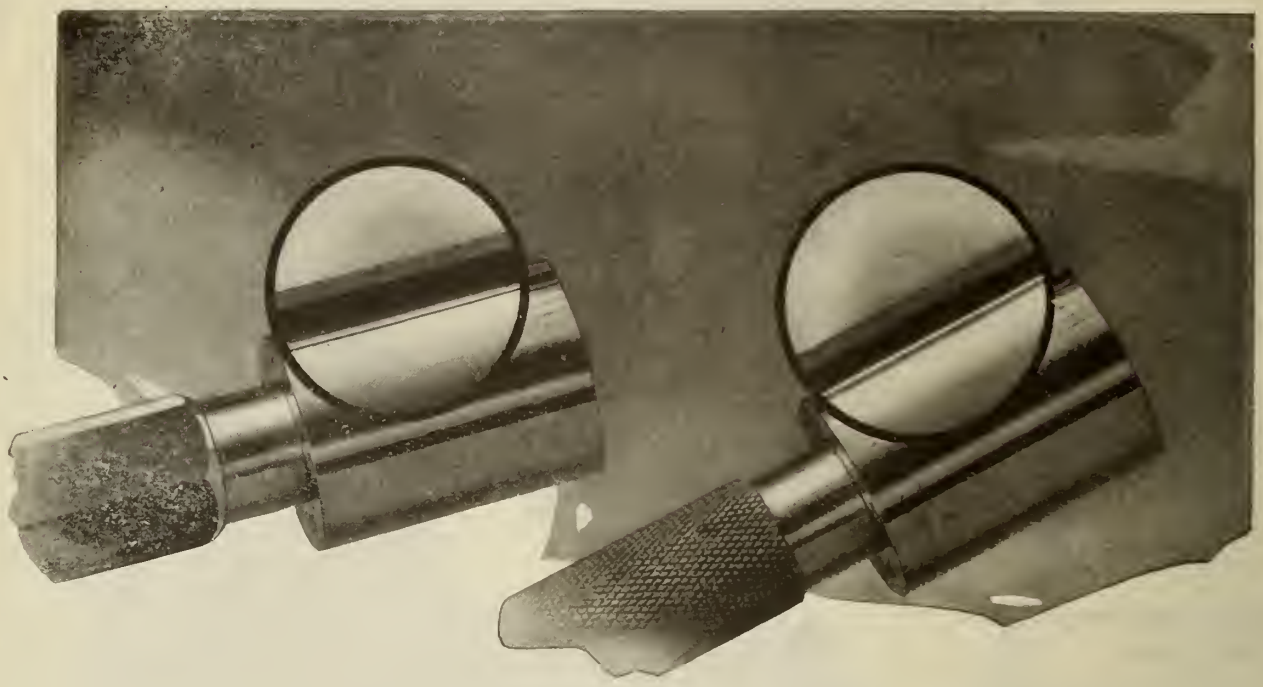
WINDSOR
Davis Building

WINNIPEG
1205 McArthur Bldg.

HALIFAX
Roy Building

Canadian Machinery and Manufacturing News, July 22nd, 1920. Vol. 24, No. 4. Published weekly at 143-153 University Avenue, Toronto, Canada. Subscription price in Canada, $4; United States, $4.50. Entered as second-class matter at the Post Office Department, Ottawa, Canada. Entered as second-class matter July 1, 1912, at the Post Office Department at Buffalo, under the Act of March 3rd, 1879.

Why Your Shop Should Use Johansson Standard Plug Gages



Illustrating the Smooth, Highly Finished Surface of Johansson Plug Gages

The present trend towards standardization is constantly increasing the demand for Standard Plug Gages of an assured accuracy. Many shops have found innumerable occasions when a Standard Plug Gage has paid for itself on one particular job. A final authority on standard size holes is often as important as it is in linear measurement.

Each gaging member of a Johansson Standard Plug Gage is made of high-grade Swedish Crucible Steel hardened all the way through and seasoned by the Johansson process to insure its remaining constant in size. They are lapped to a mirror-like finish as shown above, by methods similar to those used in lapping Standard Gage Blocks. This smooth finish, free from microscopic defects, will permit the gage to wear longer without loss of accuracy.

The gage surfaces are guaranteed to be round, parallel and made to a progressive accuracy of .00004" per inch. All sizes above 47/64" have the reversible feature which doubles the life of the gage. Immediate delivery can be made on Johansson Standard Plug Gages through the following Canadian dealers.

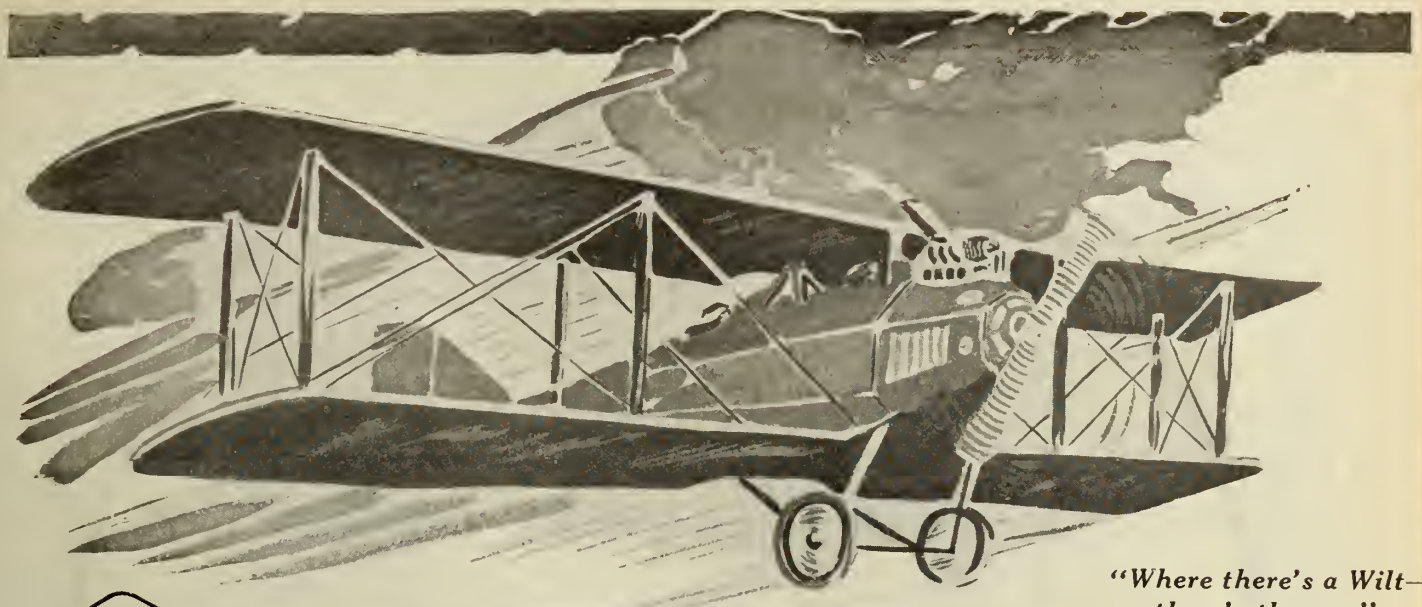
Johansson
ACCURACY

Aikenhead Hardware, Limited
TORONTO

Chas. A. Strelinger, Limited
WINDSOR

Williams & Wilson, Limited
MONTREAL

C. E. JOHANSSON, Inc. Poughkeepsie, N.Y.



"Where there's a Wilt—there's the way"

TRADE WILT MARK

Achievement through Quality

WILT

DRILLS

REAMERS

The aeroplane is representative of **highest quality** in mechanical construction. Every bolt, nut and screw—every part—is typical of **quality**. Hundreds of drilled holes are contained in every flying machine. These holes must be accurately drilled—**quality drills for quality work!** That's why WILT Drills are numbered among the tools selected for the best class of work both in Canada and Great Britain.

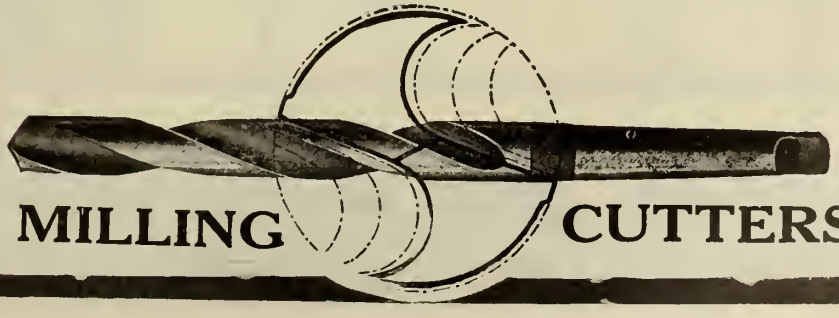
Whether it be High Speed or Carbon Twist Drills, Milling Cutter or Reamer, you can depend upon **Wilt for Quality.**

WILT TWIST DRILL COMPANY

OF CANADA, LIMITED

WALKERVILLE - - - - ONTARIO

"Made in Canada"



MILLING CUTTERS

ANNOUNCEMENT

THE ALGOMA STEEL CORPORATION, LIMITED, take pleasure in announcing to their customers and the Canadian trade that in accordance with the wide-spread desire throughout the Dominion that there should be obtained in Canada with Canadian labor, a much larger proportion of the requirements of this country in STEEL SECTIONS for STRUCTURAL PURPOSES, CAR CONSTRUCTION, SHIPBUILDERS' REQUIREMENTS, etc., they are just completing extensive alterations and additions to their rolling mills, and will soon be ready to produce and ship American Standard Sections of BEAMS and CHANNELS up to and including 15", all standard sections of ANGLES from 6" x 6" down to 1¼", ZEE BARS for car builders and general purposes, small and large ROUNDS and SQUARES, and FLAT BARS up to 14" wide. The quality of the product is already well known to the trade, and is exclusively steel made by the Open Hearth process, and can be furnished in all grades from the softest rivet stock to high carbon special spring material.

The following are the sections which will be rolled:

ANGLES—Equal Leg—
6 x 6"—5 x 5"—4 x 4"
3½ x 3½"—3 x 3"
2½ x 2½"—2¼ x 2¼"
2 x 2"—1¾ x 1¾"
1½ x 1½"—1¼ x 1¼"

ANGLES—Unequal Leg—
6 x 4"—6 x 3½"—5 x 4"
5 x 3½"—5 x 3"—4½ x 3"
4 x 3½"—4 x 3"—3½ x 3"
3½ x 2½"—3 x 2½"—3 x 2"
2½ x 2"

BEAMS—
15, 12, 10, 8, 6, 5, 4, 3"

CHANNELS—
15, 13, 12, 10, 8, 6, 5, 4, 3"

ZEES—
3¼ x 5 x 3¼ x 5 16"
3 5/16 x 5 1 16 x 3 5/16 x ⅜"
3⅜ x 5⅛ x 3⅜ x 7 16"
3 1/16 x 4 x 3 1/16 x ¼"
3¼ x 4 1 16 x 3⅛" x 5/16"
3 3 16 x 4⅛ x 3 3/16 x ⅜"
2 11 16 x 3 x 2 11/16 x ¼"
2¾ x 3 1/16 x 2¾ x 5/16"

ROUNDS—
All sizes from ½" up to and including 4".

SQUARES—
All sizes from ½" up to and including 3".

FLATS—
All sizes from 1 to 1¼" up to and including 14" wide.

MINE RAILS—
All sections from 12 lbs. up to and including 45 lbs. per yard.

PIG IRON—
Machine cast FOUNDRY MALLEABLE and BASIC.

SULPHATE OF AMMONIA
NITRE CAKE

For the better convenience of customers who may find it necessary to secure rush shipments of particular items, they contemplate keeping a large stock of all the various standard sections constantly on hand, and to this end extensive warehouse facilities are being prepared.

Your enquiries and business will be appreciated.

Algoma Steel Corporation

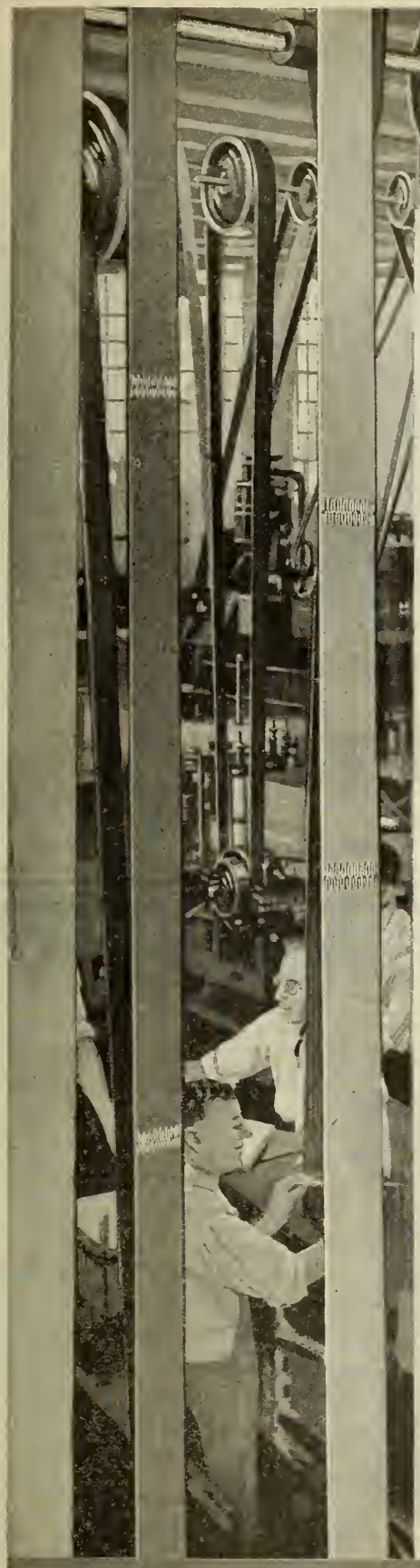
Limited

SAULT STE. MARIE, ONT.

Sales Offices:

Montreal: 605 McGill Building

Toronto: Bank of Hamilton Building



Speed Up— The World Waits

World readjustment waits upon the production of manufactured goods. Supply **must** equal demand. The high cost of raw materials, the mounting cost of labor and shrinking work hours make the saving of time more than ever imperative. "Clipper" Belt Lacing, developed to the highest point of efficiency, is an important element in time-saving that is recognized by power plant engineers throughout the world of industry.

Industrial Canada has, like the British Empire and its sister continent of America, adopted the "Clipper."

The Clipper Belt Lacer
Laces a Belt in Three Minutes

Factory hands do not stand idle while belts are joined by the "Clipper." The saving of time alone in a single season pays for a "Clipper" Belt Lacing outfit. It requires no experts. Any factory workman can lace a belt with the "Clipper" and do the job quickly and right. It makes a joint that has a perfect hinge action. There is no strain on the belt ends. Tension is equal on both edges and in the middle of belts joined the "Clipper" way. The joint is smooth and flush on both sides, hugs the pulley, runs true, and is durable. The "Clipper" is perpetually guaranteed and, on request, goes to responsible manufacturers for free trial.

Most mill supply houses sell the "Clipper." Dealers not stocking it, write for particulars.

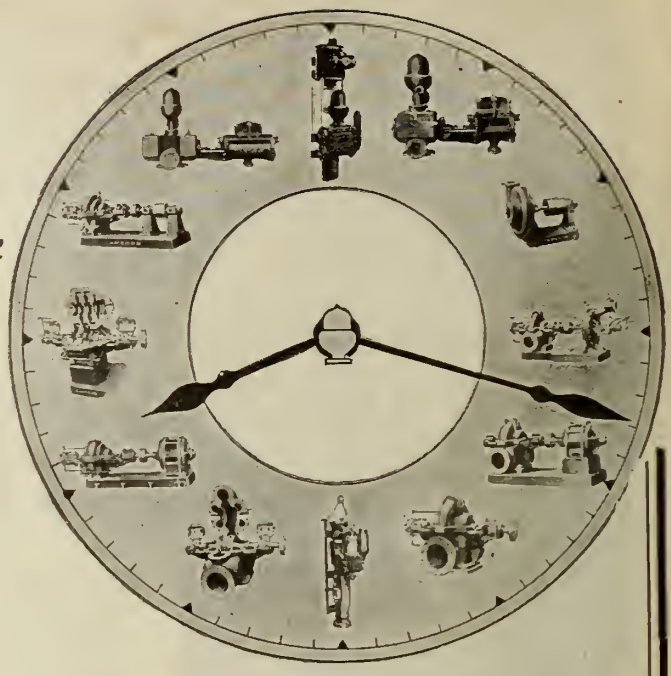
"The Connecting Link Between Power and Production."

Clipper Belt Lacer Company
GRAND RAPIDS, MICHIGAN, U.S.A.

If interested tear out this page and place with letters to be answered.

NO TIME LOST

For Shutdowns When You Use "CAMERONS"



Hospital St. Boniface,
St. Boniface, Man.,
March 4th, 1919.

Dear Sirs:—Regarding two Cameron Class DV volute type pumps furnished by your people to the hospital, I am glad to say that they are giving good satisfaction. *They have been pumping 250 G. P. M. against a head of 160' for as long as 11 months without a shut down.* They are still running without noise or repairs of any kind. No. 1 is direct connected to steam turbine and runs 2500 R. P. M. No. 2 is a duplicate of number one but is motor driven. *I can recommend the Cameron pump to any firm wishing a real pump to do real work, as we forget to notice our pump unless someone wishes to see them running.*

Yours sincerely,
GEO. K. BEERS,
Chief Engineer.

The Cameron line includes pumps for all classes of service and all types of drive. Ask for a set of the Cameron bulletins.

Canadian Ingersoll-Rand Company Limited

Sydney Sherbrooke Montreal Toronto Cobalt Winnipeg Nelson Vancouver

The

NAZEL AIR HAMMER

NOTED FOR ITS BLOW AND CONTROL

A self-contained unit, HAMMER AND COMPRESSOR COMBINED, built in three types, six sizes arranged for BELT OR DIRECT MOTOR DRIVE, with capacities up to 7 inches square, for all manner of jobbing, manufacturing and certain classes of drop forgings.

Nazel Engineering & Machine Works
Dept. F., Philadelphia, Pa.

ACCURACY

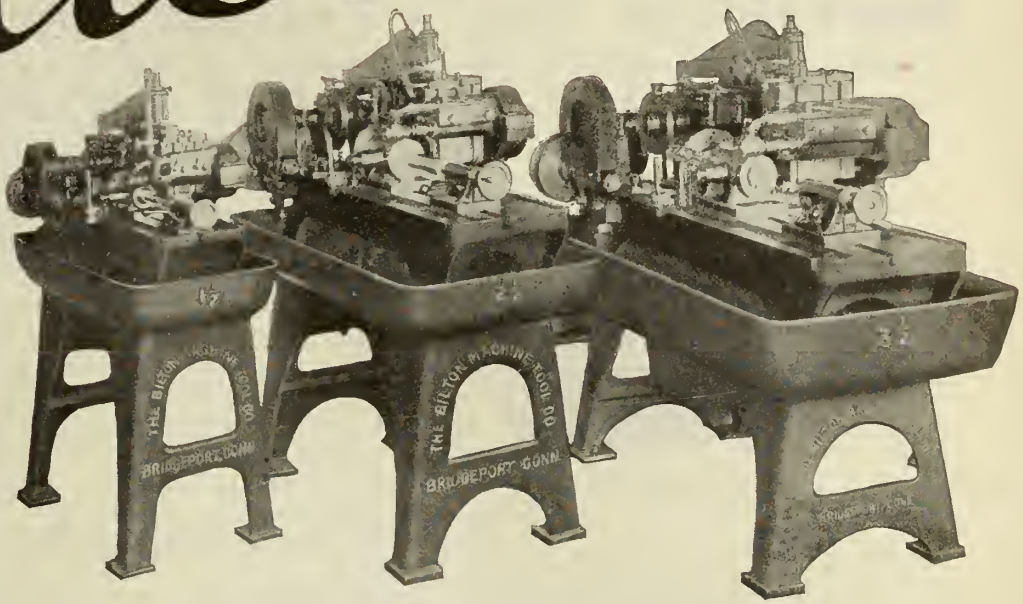
Prompt shipments of all Standard Sizes in
Cap Screws, V or U.S.S.
Cap Screws, S.A.E.
Set Screws, V or U.S.S.
S.F. Hexagon Nuts, V or U.S.S.
S.A.E. Hexagon Nuts, Plain.
S.A.E. Hexagon Nuts, Castellated.
Turned Paper Pins.

Send us your rush orders.

THE GALT MACHINE SCREW CO., LIMITED
GALT, ONTARIO

Eastern Representatives: The Canadian B. K. Merton Company Limited, 49 Common St., Montreal, Que.

Bilton GEAR MILLERS



Fully Automatic

Their adaptability is almost unlimited on small work—such as cutting spur, bevel, miter, angle gears, saws, ratchets, sprockets, cutters, knurls, taps, cylinders, form cutting, manufacturing, milling, etc.

A big time saver, as indexing takes place during return stroke of cutter — which is removing metal 90% of the time.

Write us for Catalog 30-6

Over 500 leading manufacturers now use the Bilton for high production on accurate work

Bilton Machine Tool Co. Housatonic Avenue **Bridgeport, Conn., U.S.A.**

Foreign Agents: Alfred Herbert, Ltd. Chas. Churchill & Co., Ltd.

SHIPS' ANCHORS

WE are sole makers in Canada of Baldt Anchors, which are supplied to Lloyd's requirements and tested in a testing machine of 200,000 lbs. capacity. This machine is also approved by Lloyd's for testing anchors of other than British-owned ships.

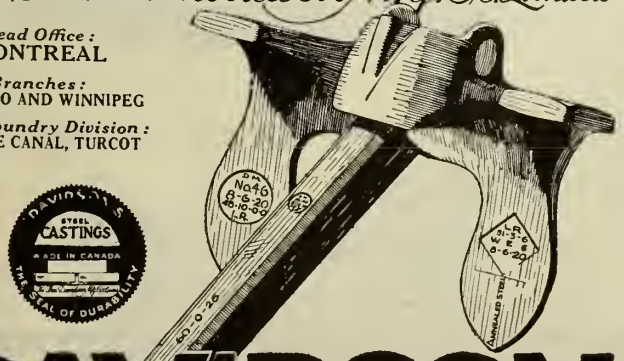
Write to Davidson's for all types of Anchors for any ships building in Canada. Fishermen's anchors also a specialty.

We shall be glad to supply in addition to our General Catalogue, literature on

Steel Castings
Galvanizing
Wire Goods
Stoves
Lithographed
Ware
Enamelled
Signs

The Thos. Davidson Mfg. Co. Limited

Head Office: MONTREAL
Branches: TORONTO AND WINNIPEG
Steel Foundry Division: LACHINE CANAL, TURCOT



DAVIDSON

STEEL CASTINGS

QUICK DELIVERIES

High Carbon Steel
Manganese Steel
Chrome Steel
Mild Steel

QUALITY GUARANTEED

Sizes—½ lb. to 5,000 lbs. each

THE WILLIAM KENNEDY & SONS, *LIMITED*
OWEN SOUND, ONTARIO
ESTABLISHED 1860

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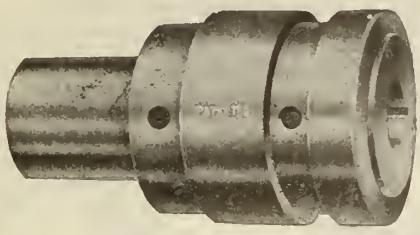
THE JOHNSON FRICTION CLUTCH

Don't Decide That A Friction Clutch Won't Do, Until You Have Tried The Johnson



Single Clutch Exterior

Many of our best customers have been secured after they had lost all faith in friction clutches. They had failed to find a clutch that compared in quality with the rest of their equipment, and were skeptical that such a thing existed.

You will never realize how thoroughly dependable a friction clutch can be until you have tried the Johnson. And the best of it all is, that we can develop the Johnson principle in any form necessary to meet your requirements.

Compact clutches for use with standard pulleys on overhead transmission, and special clutches for incorporating in machinery. Get our Booklet. "Clutches as Applied to Machinery," and our yellow catalog.

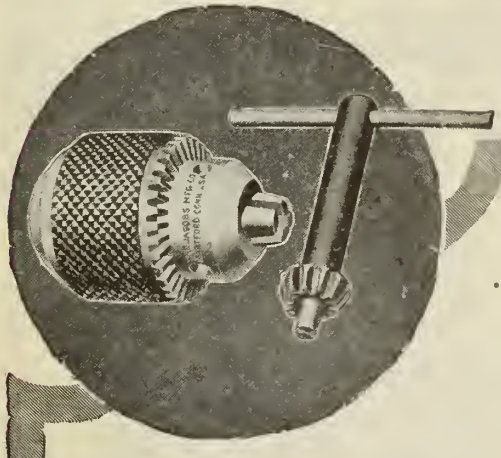
CANADIAN AGENTS:

WILLIAMS & WILSON, Limited, 84 Inspector St., Montreal

CANADIAN FAIRBANKS-MORSE CO., LIMITED, Montreal, Toronto, Winnipeg

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN

JACOBS CHUCKS



Defective chucks cause broken drills and loss of time and money. The wise manufacturer uses Jacobs Chucks exclusively because he is sure of their reliability.

You can buy Jacobs Chucks from dealers everywhere.

Address Dept. C.M.

THE JACOBS MFG. CO. HARTFORD, CONNECTICUT, U.S.A.

TRACKWORK

FOR STEAM AND ELECTRIC RAILWAYS

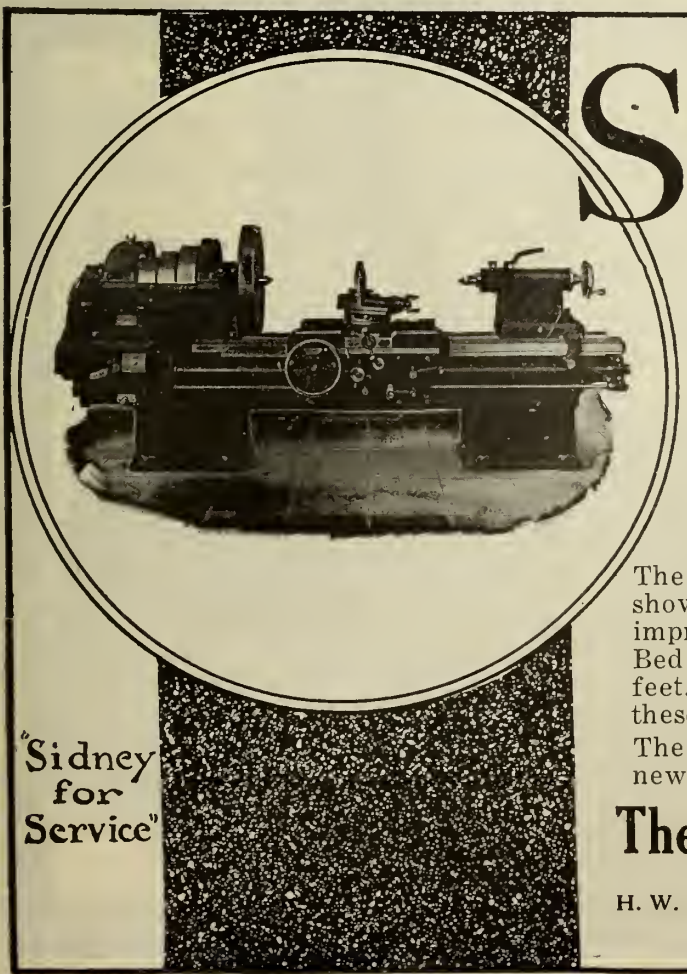
Manufacturers of Balkwill Articulated Manganese Steel Crossings

Complete layouts of built-up, rail-bound hard-centre or solid manganese steel construction.

TRACKWORK ACCESSORIES

CANADIAN STEEL FOUNDRIES LIMITED

Transportation Building, Montreal



"Sidney for Service"

SIDNEY

Heavy Duty Engine Lathes

Noted for Their Power and Rigidity

One of the outstanding features of the Sidney is the manner in which it takes deep cuts through tough metals. Clean cuts without chatter, without pause. The Sidney is so designed that rigidity is maintained under severe conditions, and, in normal service.

The 25-inch Heavy Duty Quick Change Sidney here shown is the last word in lathe construction. Every improvement will be found in this, the latest model. Bed lengths available are: 10, 12, 14, 16, 18 and 20 feet. 27-inch swing design can also be supplied in these lengths.

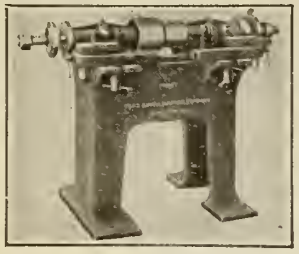
The specific details of the Sidney are given in our new Bulletin. Write for your copy to-day.

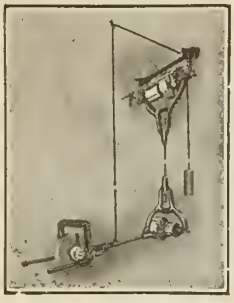
The Sidney Tool Co., Sidney, Ohio

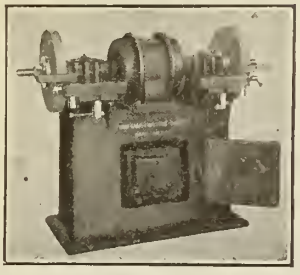
Canadian Agents:

H. W. Petrie, Limited
TORONTO

Yates Machinery & Supply Co.
MONTREAL, QUEBEC







FORD-SMITH

Grinders of Quality

Quality which will give long, uninterrupted service has always been the standard of Ford-Smith Grinders. We do not pretend that we can continue to maintain this standard and sell our products at the "lowest price on the market." Instead, we manufacture machines of the highest quality and sell at prices as low as possible. This is why **Ford-Smith Grinders give the greatest service for your money.**

The Ford-Smith line includes grinders for all ordinary purposes and many special ones. If we cannot fill your requirements from stock we will gladly build special machines.

Complete catalog upon request.

The Ford-Smith Machine Co., Ltd., Hamilton, Canada

FOREIGN AGENTS:

W. E. Storey, London, England — Gollin & Co., Melbourne, Australia

British & Canadian Hydraulic Tube Co., Johannesburg, S.A.

STEEL *for*

Every Commercial Purpose

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

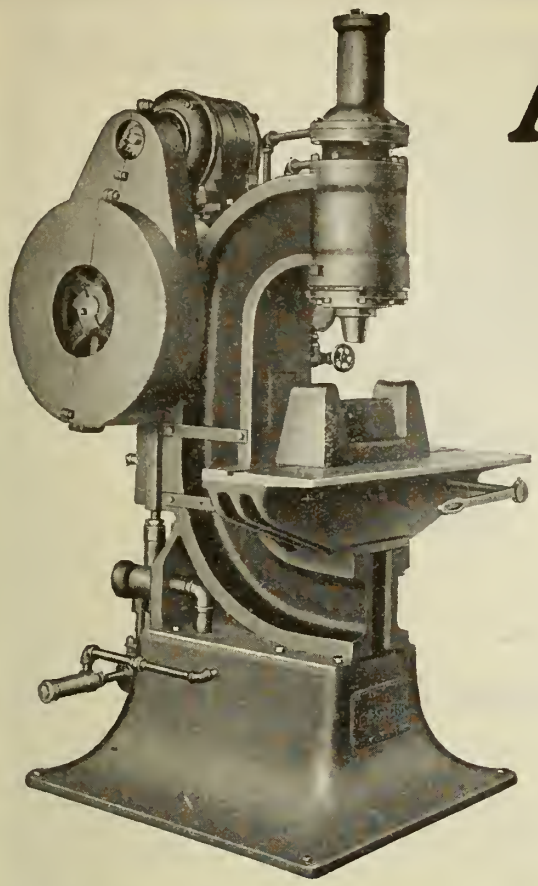
We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.

Nova Scotia Steel and Coal Co., Limited

Head Offices:
New Glasgow, N.S.

Sales Offices:
Western Room 14 Windsor Hote
MONTREAL

Steel Ingots
by the
HARMET
Liquid Process



A SELF-CONTAINED HYDRAULIC UNIT

EASTERN UNIVERSAL HYDRAULIC PRESS. Supplied in 20-35 and 50 ton capacities, full hydraulic depending on no springs or weight for return of ram delivering pressure instantly at a speed of 1½" per second, return of ram 3" per second.

Length of Ram Travel	**6 in.**
Depth of Throat	**10 in.**
Length of Table	**8 ft.**
Width of Table	**10 in.**
Table to Ram	**10 to 14 in.**

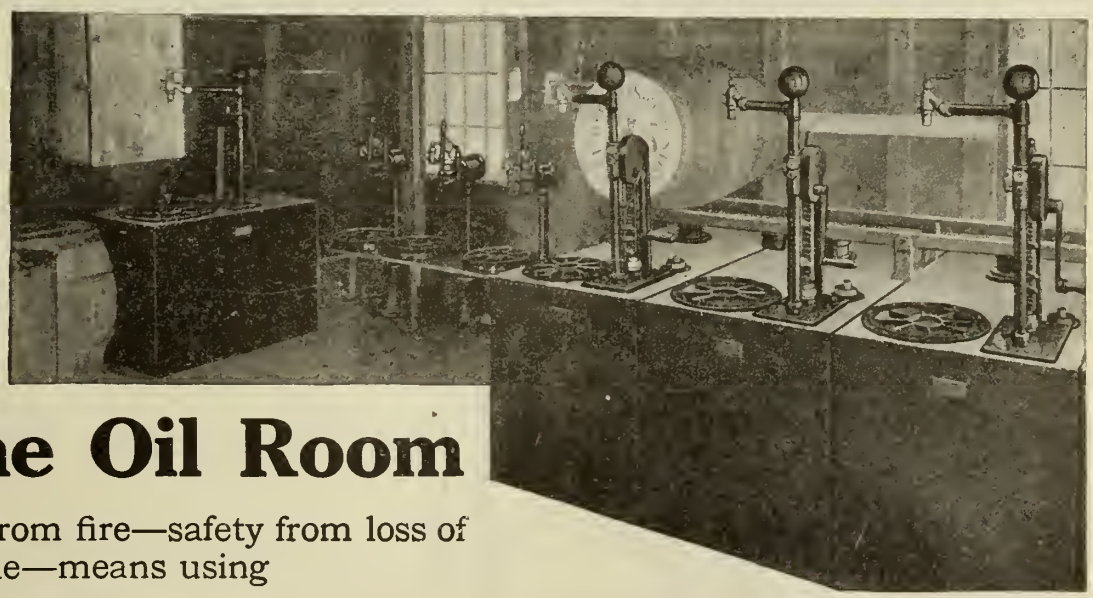
EASTERN UNIVERSAL PRESSES are tested before leaving our plant at 33 1/3% overload. They are furnished with rolling centers and are unexcelled for straightening of motor crankshafts, heavy wheel shafts, broaching splines in drive plate, differential gears, and others. Straightening front axles and spindles.

Write for details.

EASTERN PRODUCTION CO.
137 LIEB STREET -- DETROIT, MICH.

Eastern Representative: Swind Machinery Company, Widener Building, Philadelphia, Pa.
Canadian Representative: F. F. Bar Machinery Co., Limited, Foy Building, Toronto.

Safety First



In the Oil Room

Safety from fire—safety from loss of oil and time—means using

BOWSER Oil Storage Equipment

Bowser Equipment is practically fire-proof. Handling of oils is done mechanically, with a wonderful saving of floor space, time and oils. It keeps all the oils clean and fit for use. Enables keeping of accurate records. *We have some interesting literature. It's yours for the asking, Write for it today.*

LONDON
32 Victoria St., S. W. 1
HAVANA
Lonja del Comercio 427

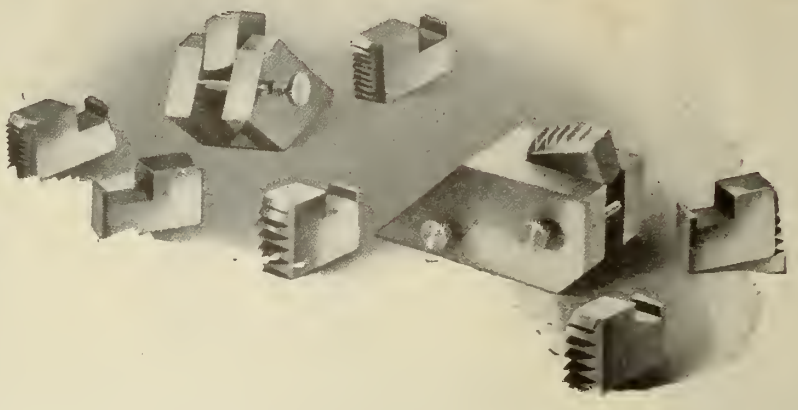
S. F. BOWSER COMPANY, Limited
66-68 FRASER AVE., TORONTO, CANADA
Offices in Principal Cities of the World

PARIS
5 Rue Denis-Poisson
SYDNEY
6 Castlereagh Street

If interested, tear out this page and keep with letters to be answered.

Chasers for HARTNESS Dies are easily ground

These Jigs



And any small Grinder will grind Hartness Chasers quickly and correctly.

These Jigs are sent **Gratis** with new dies, and are sold separately at modest prices. Full instructions for Grinding Chasers are sent with chasers.
A special Grinder for this purpose **is not required.**

Jones & Lamson Machine Company

(DIE DIVISION)
SPRINGFIELD, VERMONT

American Agents for Dies and Chasers:

Boyer, Campbell Company, Detroit.
E. L. Essley Machy. Co., Chicago, Milwaukee and Moline.
Robinson, Cary & Sands Co., St. Paul and Duluth.

Foreign Agents:

France, Spain, Belgium—F. Auberty & Company, 91 Rue de Maubeuge, Paris, France.
Holland—Spliethoff, Beewukes & Company, Rotterdam, Holland.
Australia—McPherson's Pty., Ltd., Melbourne, Australia.
Japan, Manchuria, Korea, Formosa—Mitsui Bussan Kaisha, Ltd., Tokyo, Japan.

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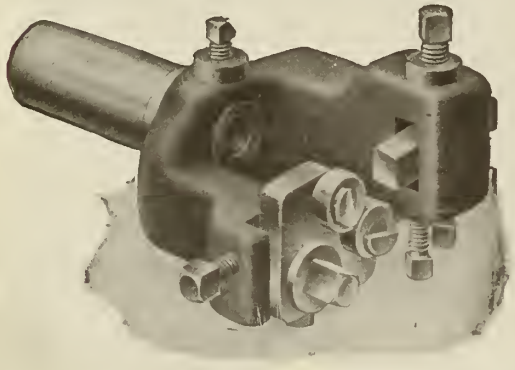

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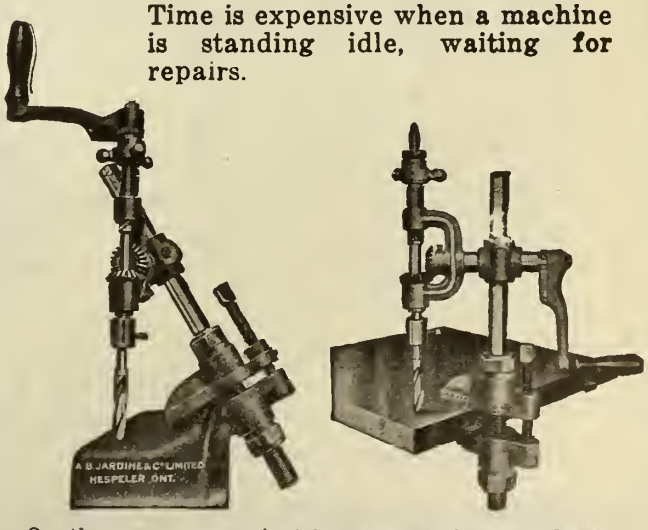

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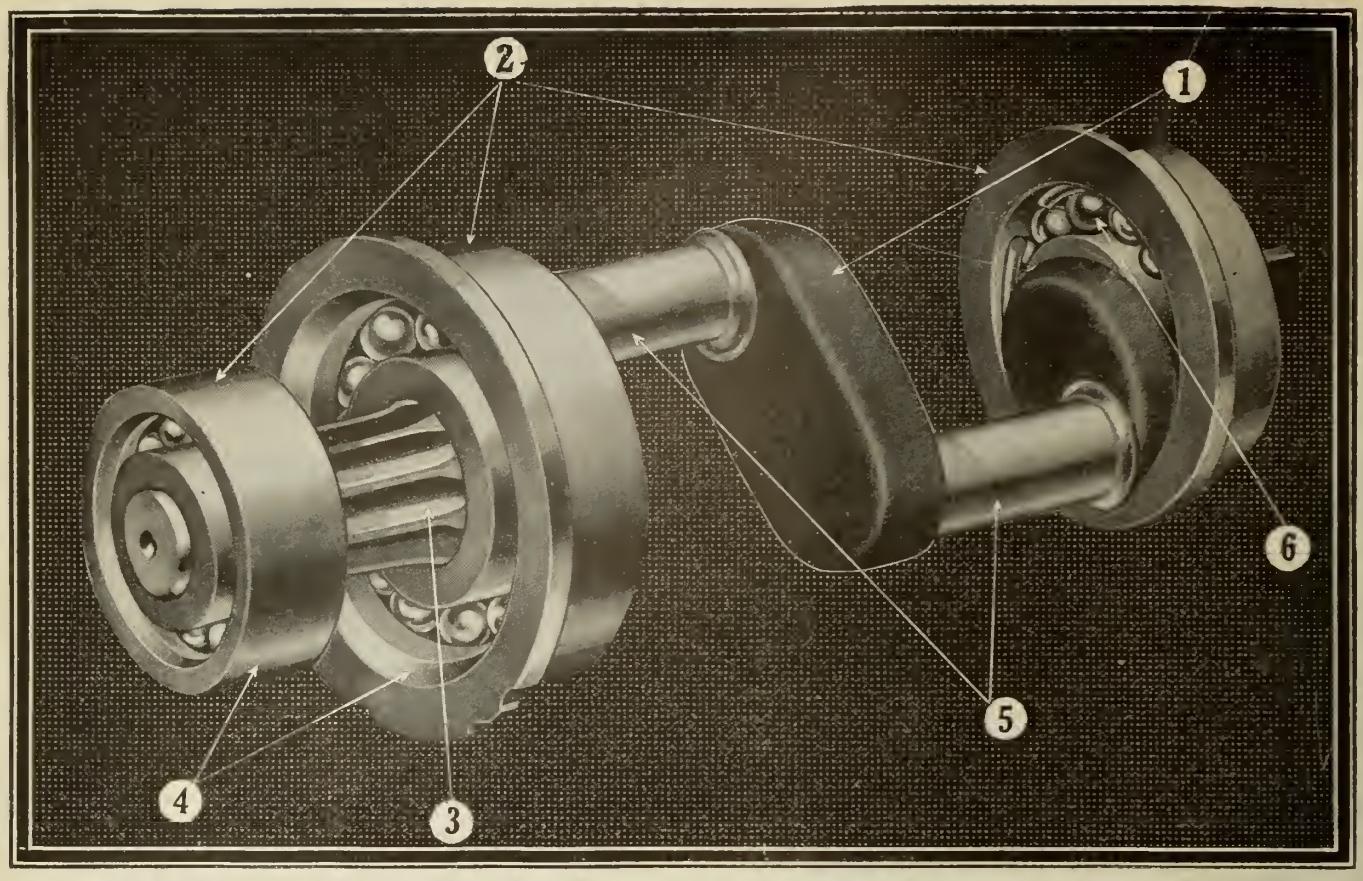

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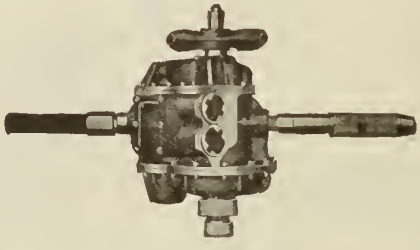

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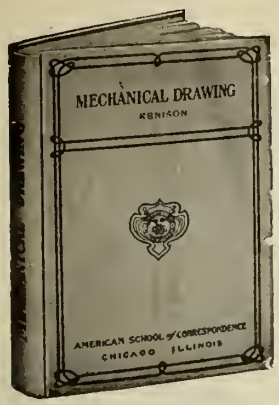

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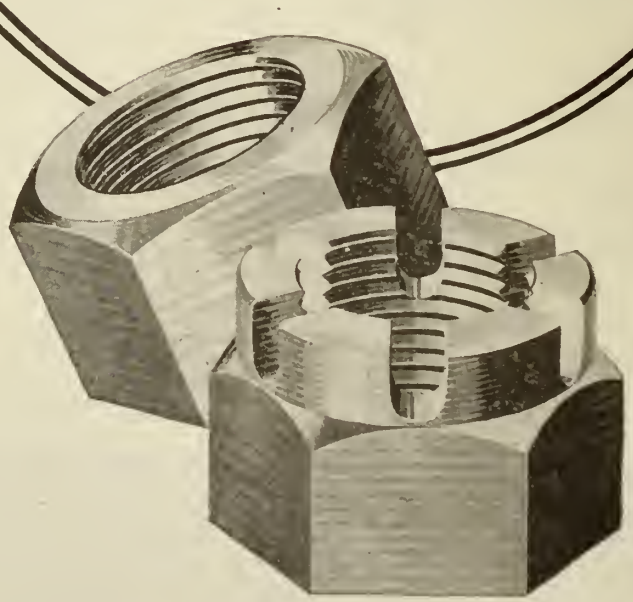
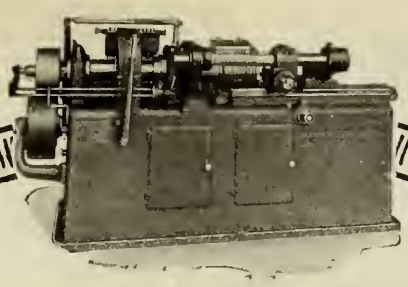
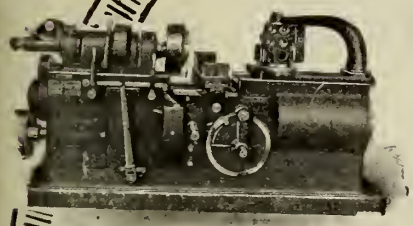
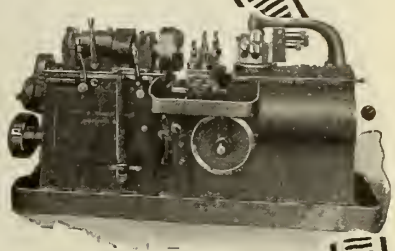




Follow the Automatic Line





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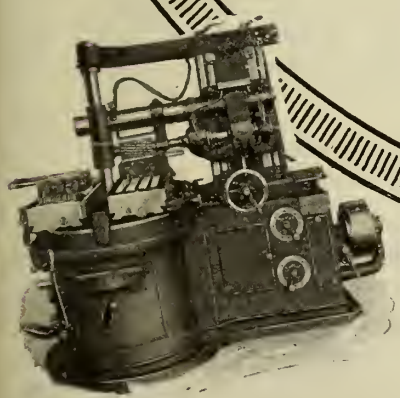

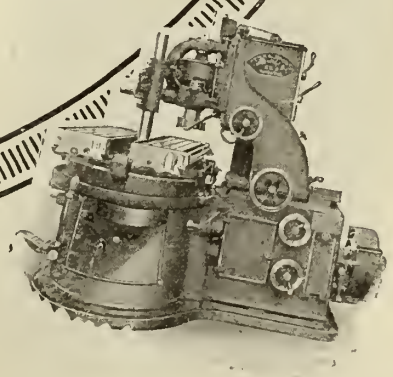

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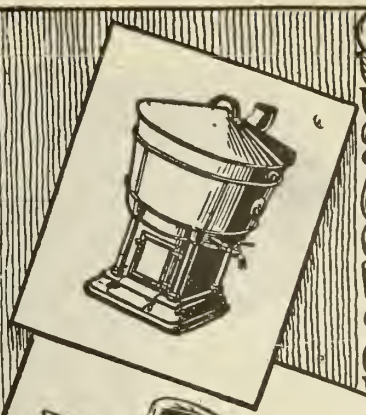
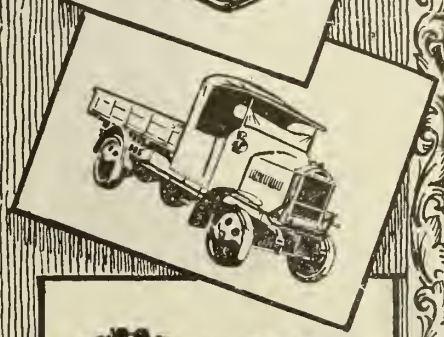
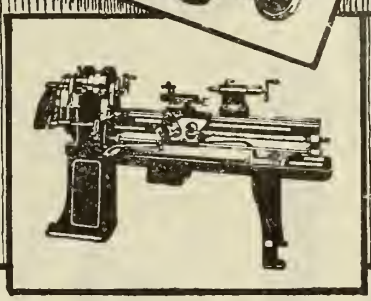
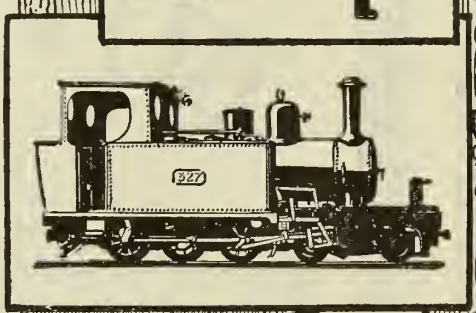

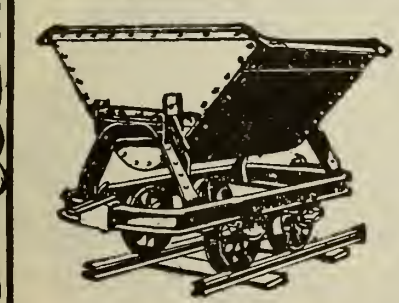
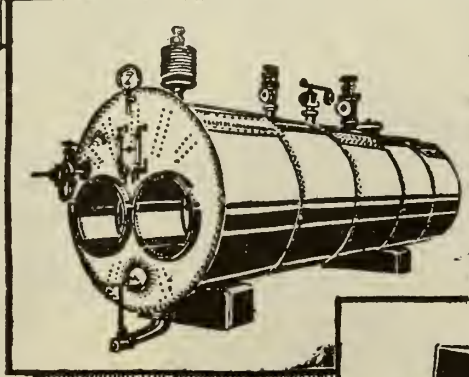
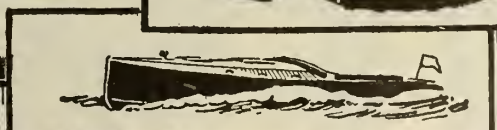

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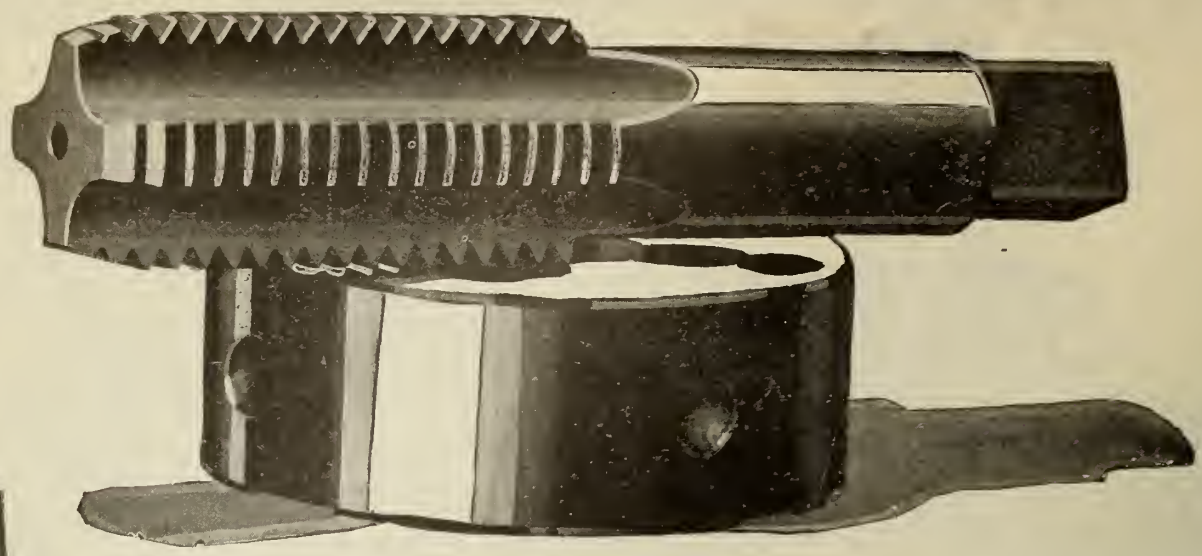

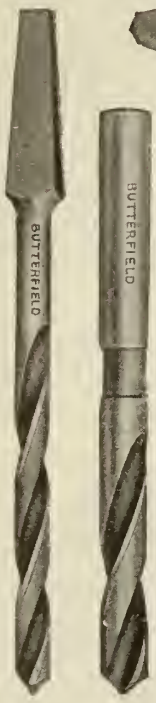

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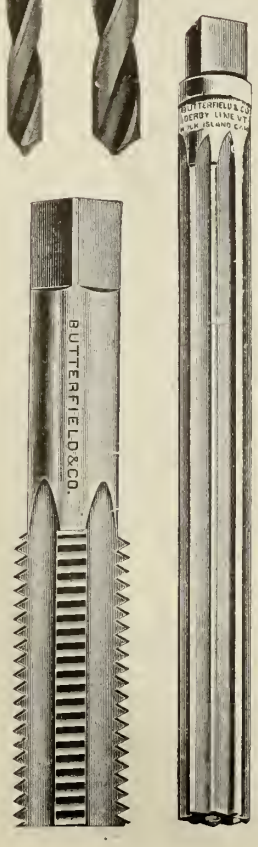

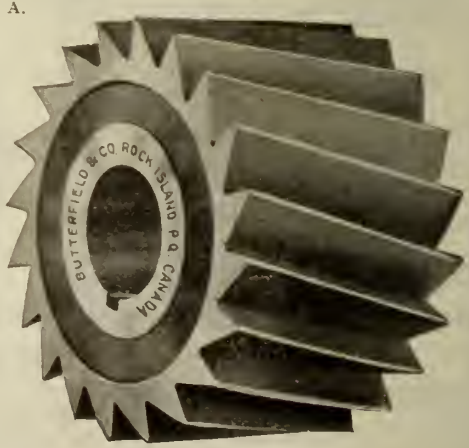

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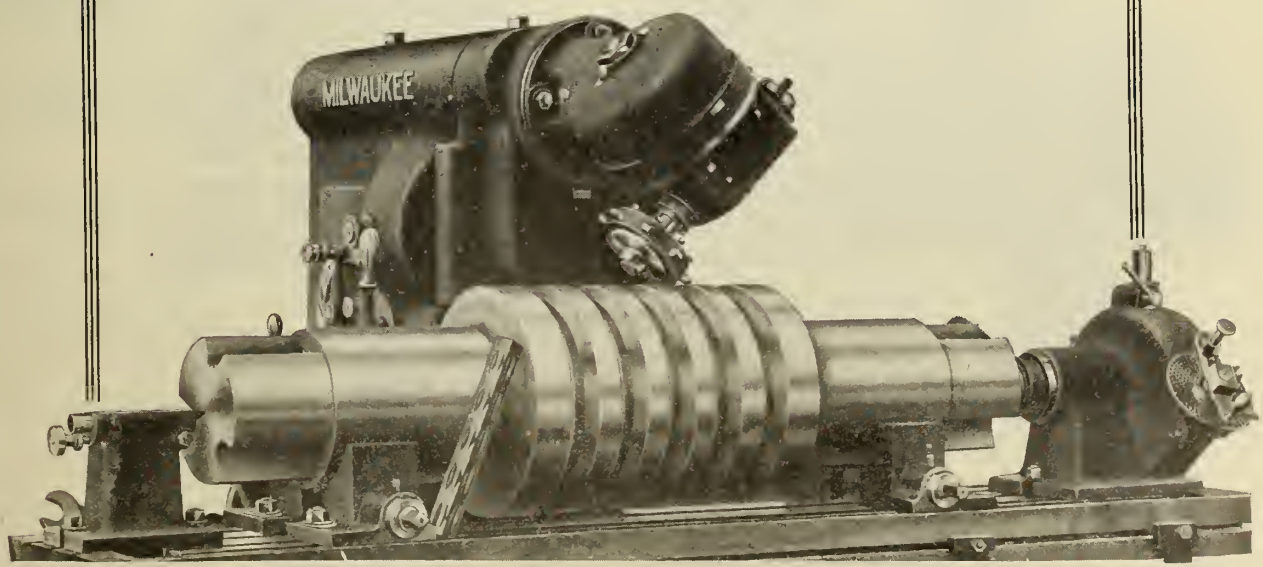

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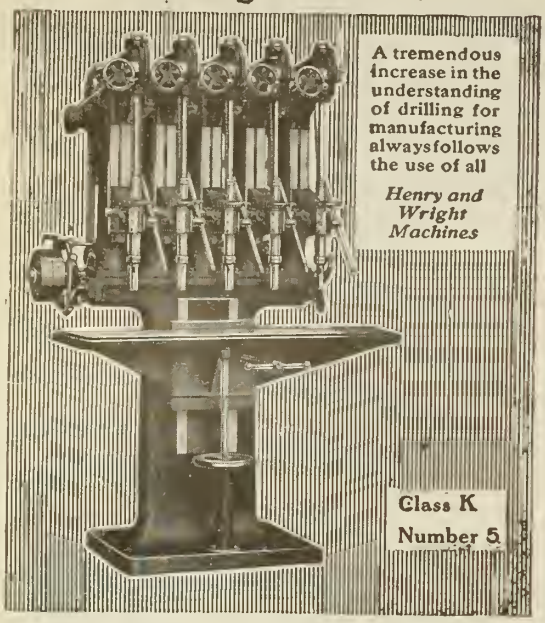
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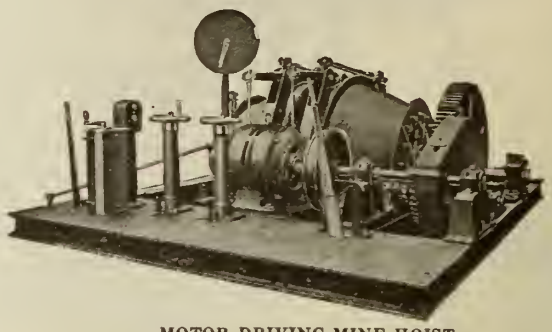

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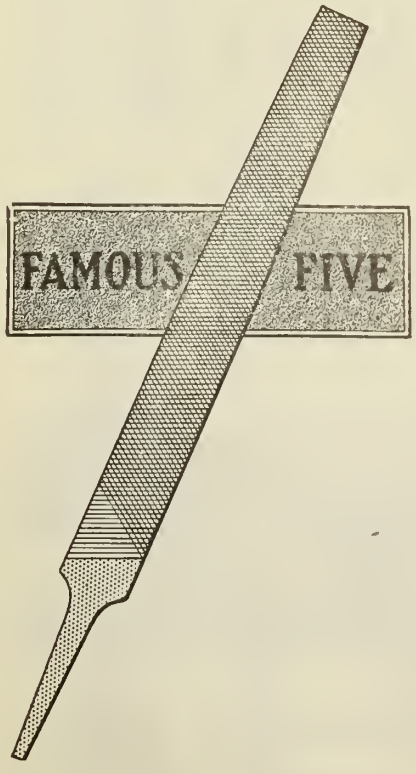

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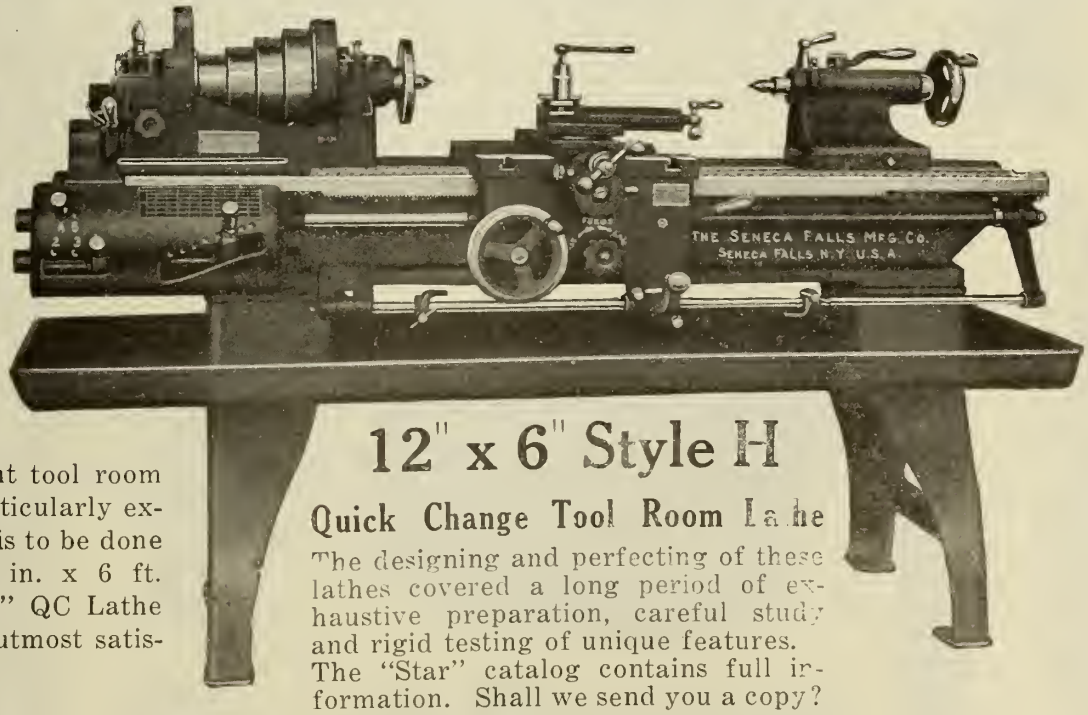

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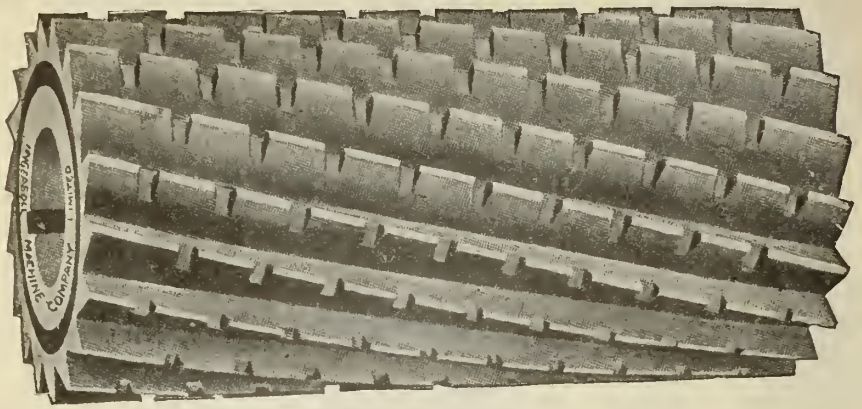

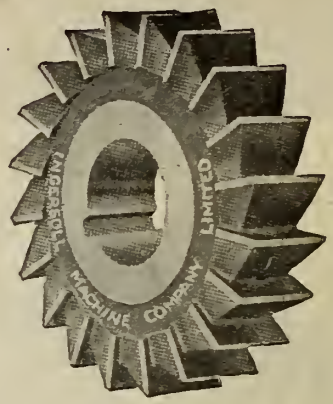

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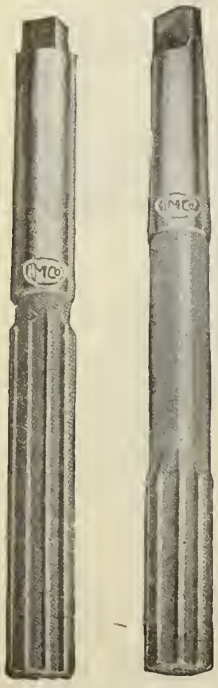

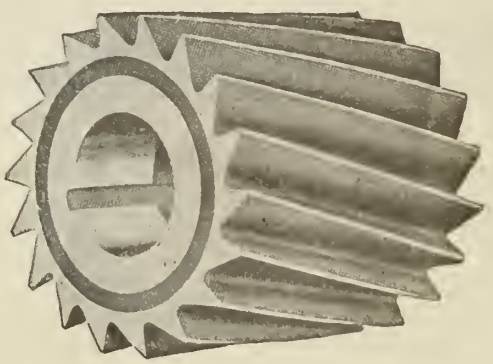

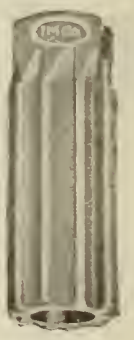

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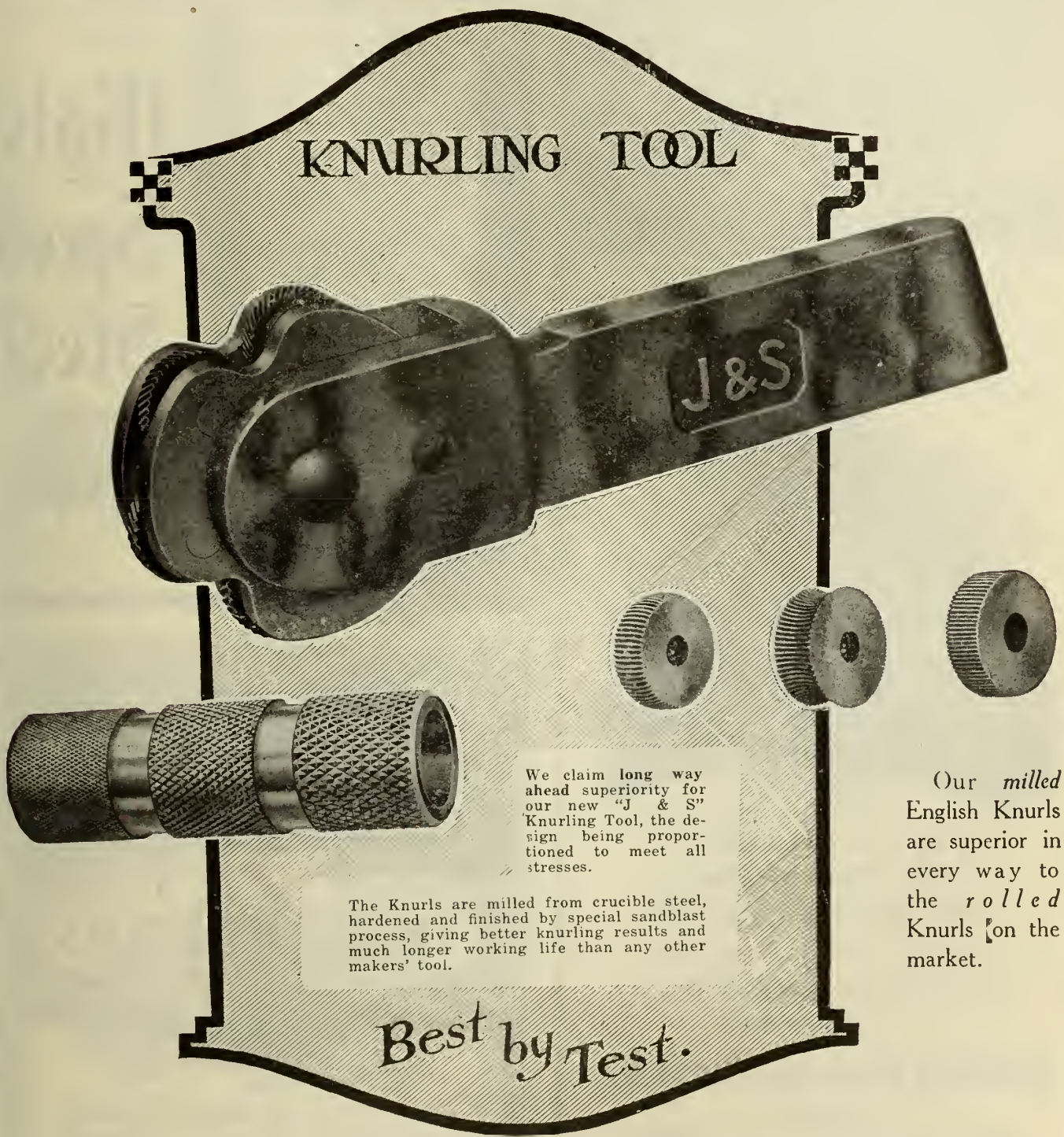
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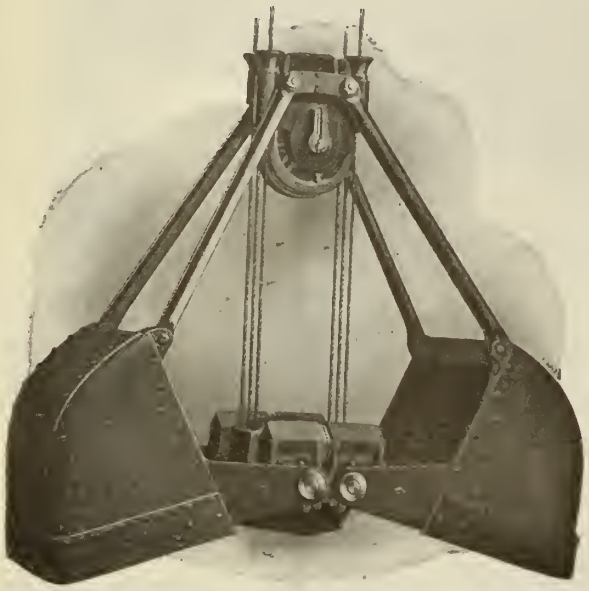

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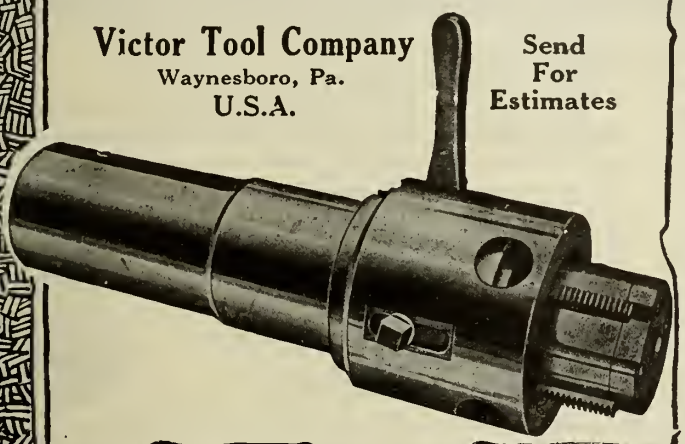

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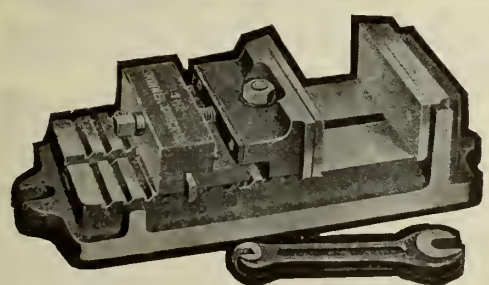

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You Can't See a Belt Leak

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The Graton & Knight Standardized Series of Leather Belting is made up of many brands and sizes of belting, tanned and manufactured under rigid inspection and built to standard specifications. This series contains the one best belt for every class of drive. Once our belting experts know your transmission problem, it is an engineering matter to specify the proper belting.

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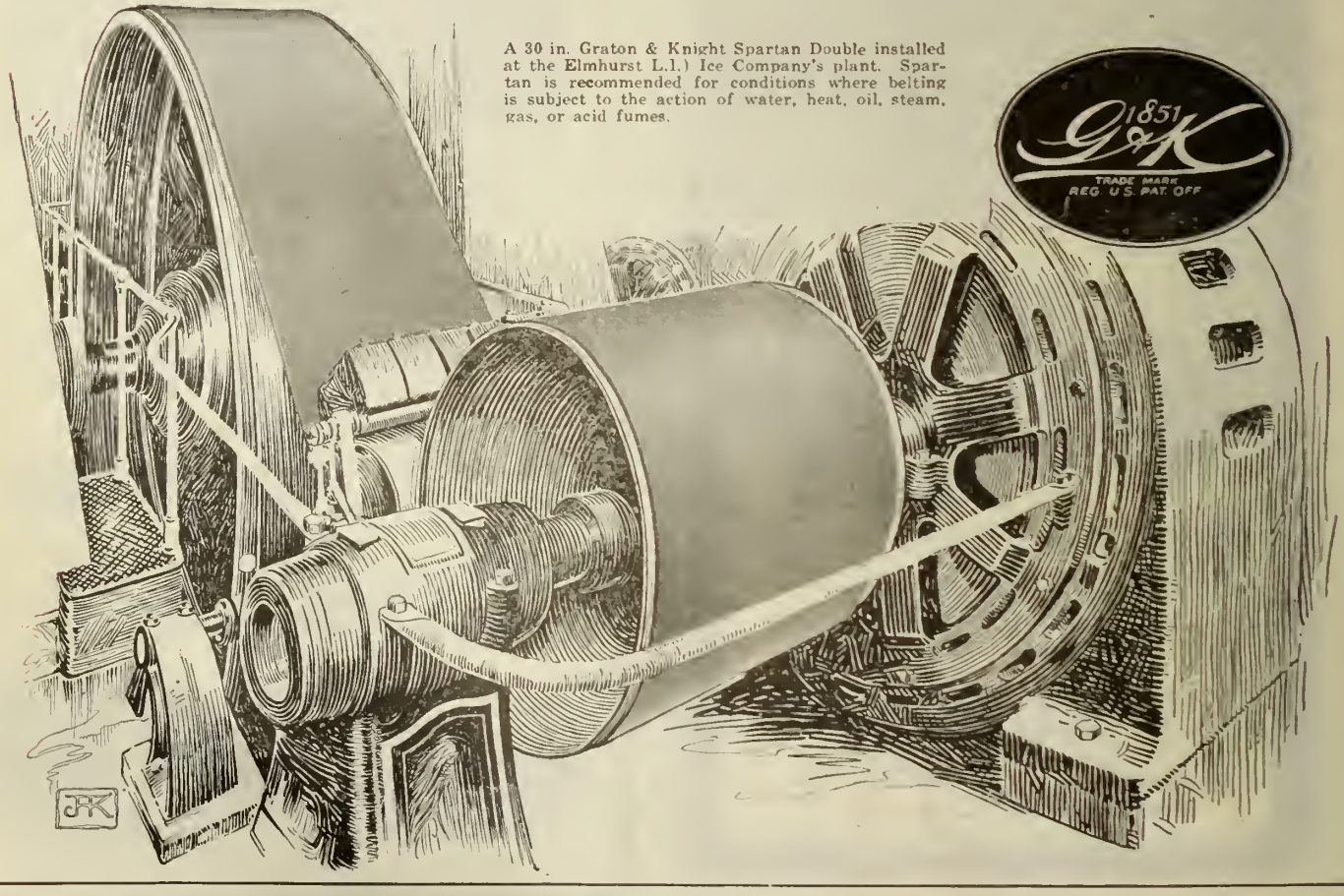

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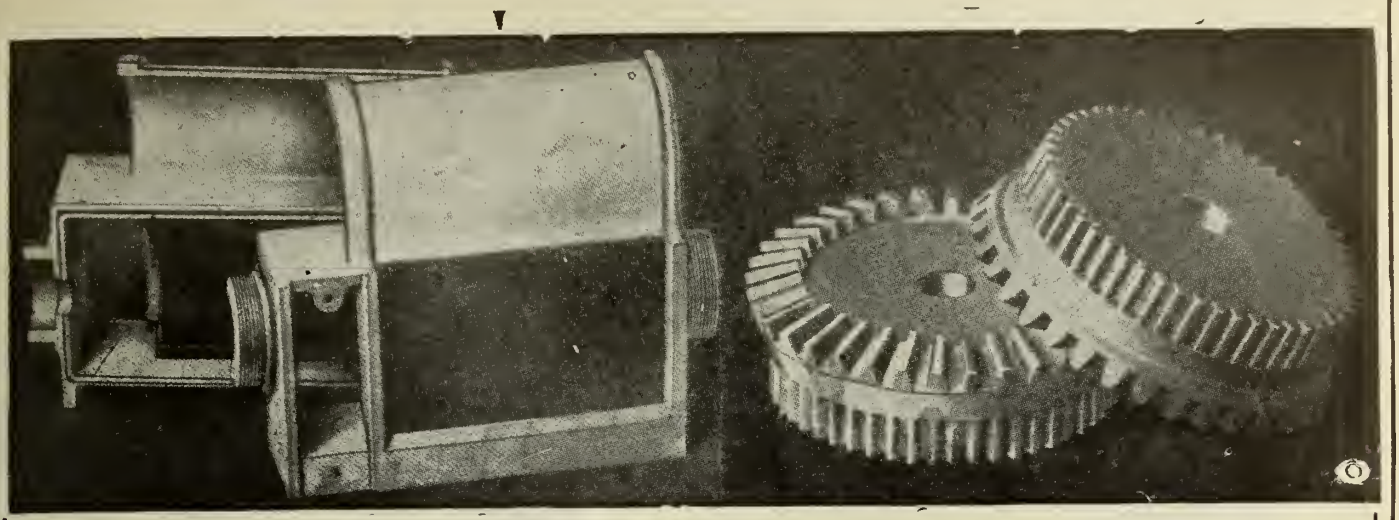

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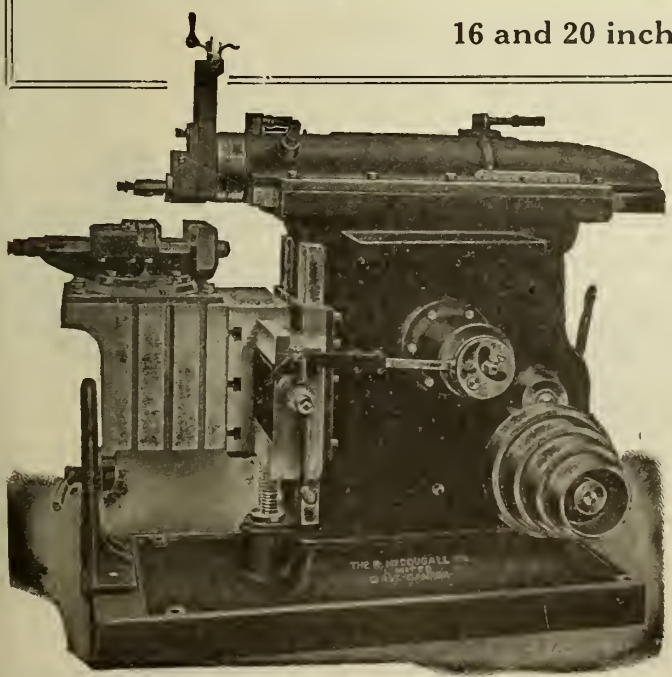

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THE R. McDOUGALL COMPANY, LIMITED, Galt, Ont., Can.

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A Few Points on Grinding Worth Remembering

By Charles H. Norton

The faster the work revolution the harder the wheel must be, whether roughing or finishing.

The slower the work revolution the softer the wheel must be, whether roughing or finishing.

Slow work revolution, hard wheel, and deep cut cause the wheel face to load with steel, preventing the wheel from cutting.

Slow work revolution and hard wheel with light cut cause the wheel to glaze, preventing the wheel from cutting.

Relatively fast work revolution with soft wheel causes the wheel to wear away rapidly.

The slower the work revolution and the softer the wheel the deeper the cut may be, and with this combination the maximum amount of metal can be removed in the minimum time, with the minimum loss of wheel and minimum consumption of power.

The harder the material being ground the softer the wheel should be, or the faster the work surface, or both.

The softer the material being ground the harder the wheel should be, or the slower the work surface, or both.

The larger the work the softer the wheel should be, or the faster the work surface, or both.

The smaller the work the harder the wheel should be, or the slower the work surface, or both.

The larger the work the longer the arc of contact between work and wheel.

To counteract the effect of longer arc of contact the surface speed of the work must be increased. In fact the cutting action of the wheel can be controlled entirely by the work speeds.

Relatively hard wheels are used for soft material and for small work, and softer wheels for larger work and harder material.

By the use of the variable work speeds of grinding machines we can use on small, hard material the wheels graded for large, soft material and vice versa.

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Niagara Falls, N.Y. **Chippawa, Ontario, Canada**

Canadian Agents: The Canadian Fairbanks-Morse Co., Ltd., Montreal, Toronto, Ottawa, St. John, N.B.; Winnipeg, Calgary, Saskatoon, Vancouver, Victoria. F. H. Andrews & Son, Quebec, Que. Simonds Canada Saw Co., Vancouver, B.C.

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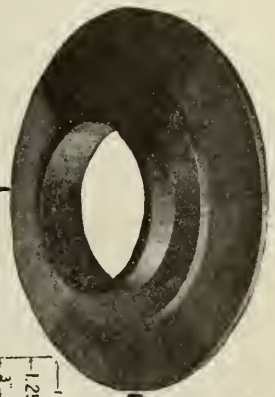

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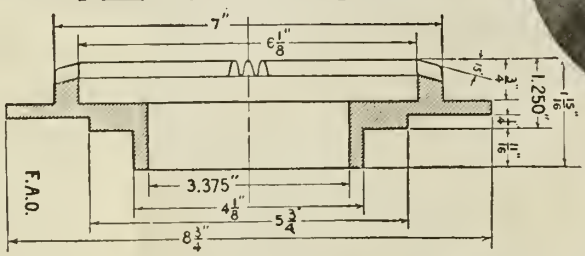
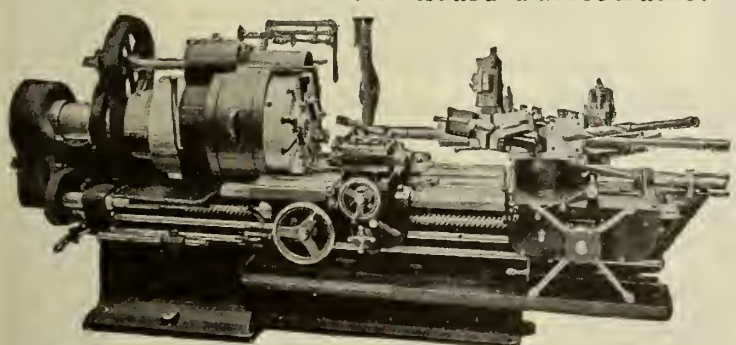
This cast iron piece was finished all over in 12 minutes with a Standard Gisholt Turret Lathe with Standard Tools only.



Consider your time on similar work.

Are you content to keep on doing it your way or will you put it on the Gisholt Standard Turret Lathe?



Standard Gisholt Turret Lathe Equipped with Standard Chucking Tools

This piece is but one of hundreds of jobs that can be done on Gisholt Lathes, each with its own worth-while saving in time.

The way is open to you to secure greater economy. Why not let a Gisholt Salesman call and explain more fully.

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CANADIAN MACHINERY
AND
MANUFACTURING NEWS

Vol. XXIV. No. 4. July 22, 1920

Electric Rocking Furnace of Novel Design

The Melting of Non-Ferrous Metals by Means of the Electric Furnace is a More Difficult Task that the Average Person Realizes —One Such Type is Herein Described.

By W. F. SUTHERLAND

WHILE the electric furnace has been used successfully for many years for the melting and refining of steel and iron, it is only of comparatively recent date that its use in the non-ferrous field has been attended with that success that one might reasonably expect. At first glance the problem of adapting electric heat to the brass foundry and other allied industries would appear simple and easily solved. This is not the case for the securing of a proper furnace design, one which will conserve the more volatile elements in the charge, and one which will melt economically, is not easily secured.

Although this is the case much research work has been done and the electric furnace, for brass and non-ferrous alloy melting, is rapidly replacing many other types of furnaces fired with some form of fuel. The reason for the present rapid growth of electric brass melting lies principally in the important saving of metals, especially zinc and lead, which its use makes possible. The electric furnace has certain other important advantages over older methods of melting.

H. M. St. John states in the Electric Journal for September, 1919, page 374, that: 'It has been found that a more uniform quality of metal can be produced in the electric furnace than in fuel fired furnaces operating under similar conditions, and that it is easier to produce an alloy of closely specified composition. The molten metal is also much cleaner and can be poured free from metallic drosses without the use of charcoal or flues of any kind. In general, these advantages are to be considered as inherent in properly conducted electric furnace operation, as a result of the greatly reduced loss of volatile metals and the elimination of contaminating combustion gases.

The saving of metal, otherwise unavoidably lost, is the principal economic advantage which the electric furnace is required to show in the melting of copper alloys, particularly yellow brass. It has been demonstrated, both in the laboratory and in the plant, that such a saving is possible by virtue of the fact that the electric furnace can be tightly closed during the melting period and a neutral or reducing atmosphere maintained.

The production of perfect castings or billets, with the least possible number of defectives, depends in a large degree upon the use of metal at a temperature which conforms closely with that known to be most favorable for the work in hand. The electric furnace lends itself readily to exact temperature control and thereby enjoys an important advantage.

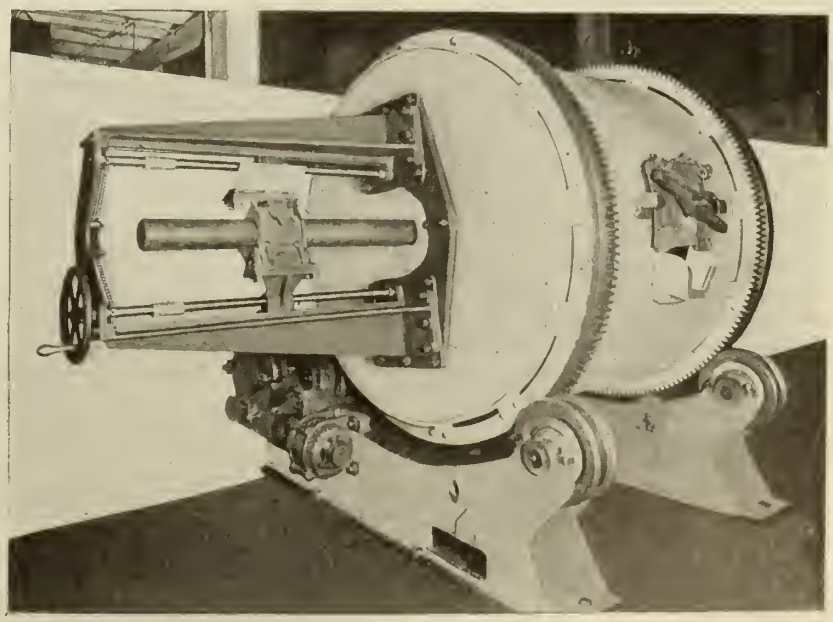
In general, the speed of melting is greater with electric furnaces than with fuel fired furnaces, because of their higher operating temperature and greater efficiency. The electric furnace can also be used in larger units than is commonly the case with fuel fired furnaces.

The cost of crucibles has always been a considerable item in the brass foundry. The electric furnace eliminates this item of expense, and while large fuel fired furnaces also effect the same saving from a metallurgical point of view they are seldom as satisfactory as fuel fired crucible furnaces.

More favorable working conditions result from the use of the electric furnace, this tends to increase their efficiency as well as their comfort.

Much depends upon the wisdom with which metallurgical requirements have been met in the design of a furnace. The non-ferrous metal melting furnace is a different type of design altogether as compared with the steel furnace and has different obstacles to overcome. Steel melts at a high temperature and may be heated quite rapidly while even the appex in brass is somewhat volatile and oxidizes more readily than steel. Lead is more volatile than copper and oxidizes very easily. Tin is exceedingly volatile at molten brass temperatures. All copper alloys must be treated carefully during the melting process in order that loss of metal by oxidation and volatilization may be kept low.

Yellow brass for thin castings must be poured at a temperature not far be-



VIEW OF POURING SIDE OF FURNACE.

low its boiling point in order that the metal may be sufficiently fluid. At this temperature zinc which comprises 30 to 40 per cent. of the alloy, has a tendency to vaporize rapidly. So long as this metal is contained in a tightly closed furnace chamber, which can easily be done in the electric furnace, this tendency is counterbalanced by the vapor pressure of the metal which has already been vaporized and with which the furnace atmosphere is saturated. When the furnace is opened for pouring the metal, or for any other purpose, the vapor pressure is released and further quantities of zinc will escape from the alloy without restraint. If the heating has been perfectly uniform and all portions of the melt are at approximately the same temperature, the loss of zinc which ensues will constitute an unavoidable minimum. If the heating has not been uniform some portions of the melt will be at a temperature higher than the desired pouring temperature and such portions will lose zinc at a higher rate. If the lack of temperature uniformity is very great the loss which occurs after the furnace is operated and during pouring, will be decidedly excessive. In fact, some portions of the metal may be so seriously overheated during melting that the high vapor pressure generated within the furnace will force considerable quantities of zinc through crevices in the furnace structure. In some cases it may be practically impossible to keep the furnace chamber closed even to a reasonable degree.

Since electric heat is more costly than that derived directly from fuel, it is important that the thermal efficiency should be as high as can be obtained consistent with other requirements. A high thermal efficiency in electric melting, unless the heat is generated in the metal itself, requires a high temperature heat source, located as close as may be to the metal, under conditions which offer the least possible opposition to the flow of heat from the source to the metal. In addition, the walls of the furnace must be sufficiently thick and of high heat-insulating quality in order that heat may not be dissipated uselessly.

The electric furnace, to reap the full benefits of its economic possibilities, must operate in large units and must not use crucibles. The higher its speed of melting the better, so long as speed is not detrimental to metallurgical results.

The electrical characteristics of the furnace must be such as to make it a desirable load for the central station company or the factory power plant. Its power factor must not be abnormally low and its power fluctuations must not be so violent as to endanger transformers and other electrical equipment, or to interfere with satisfactory service to other customers of the central station company who may be connected to the same power line.

In order to be thoroughly satisfactory the electric brass melting furnace should be highly flexible. That is to say it should be able to operate under any desired foundry conditions, and to handle a charge of any ordinary nature and composition. The furnace should be readily applicable to any schedule; one-shift, two-shift, or three-shift daily operation. The melting of new metal, or composition ingot or course scrap or fine scrap or a charge with a high non-metallic content, should all be practicable in the same furnace, and it should be possible to change from one composition to an entirely different one in successive heats, without affecting adversly the operation of the furnace or the quality of the metal produced. With reference to these features the electric furnace must at least equal the performance of fuel fired furnaces. As a matter of fact, the electric furnace can be made more flexible than other furnaces and thereby gains a material advantage.

From an inspection of the above considerations as outlined by H. M. St. John, it will be seen that the proper design of an electric furnace for the melting of a non-ferrous metal is a somewhat difficult task and has occupied the minds of investigators for some little time. Several designs are now on the market, and it is the purpose of this article to describe the rocking furnace now made by the Detroit Electric Furnace Company, of Detroit, Michigan, who are licensed manufacturers under the U.S. Bureau of Mines Patents.

This furnace consists essentially of a cylindrical shell lined with refractory brick and provided with a combined charging door and pouring lip. The ends are provided with electrode gear which serves to support the electrodes in position and to advance them into the interior of the furnace. Graphite electrodes are used and they pass through stuffing boxes located in the ends of the furnace so as to make a gas-tight joint. Water cooling is provided for the electrode clamps on the larger sizes of furnaces.

The shell is provided with bearing tracks for the supporting rollers and also with two gear rings which engage with the rocking mechanism. This is motor driven and the amplitude of the rocking motion is adjustable according to the requirements of the melt.

The efficiency of this type of furnace is high. This is due to the heat reclaimed from the walls of the furnace by a sort of regenerative action. In any stationary arc furnace all parts of the furnace chamber which are located above the metal line are superheated by the arc to a temperature considerably above that of the metal and the radiation losses from the roof and walls are high.

In the rocking furnace about four-fifths of the area of the brick exposed to direct radiation from the arc is washed twice each minute by the cooler metal, which absorbs the excess heat in the brick work and thus increases the percentage of heat usefully applied.

The vigorous mixing which the metal in the furnace undergoes results not only in uniformity of temperature but also in uniformity of composition. This is a particularly important feature in the melting of alloys high in lead, which are notoriously difficult to produce in homogeneous mixtures. In this type of furnace alloys containing as much as 25 per cent. of lead have been poured into homogeneous ingot and castings without any mechanical stirring other than that offered by the furnace itself.

Although rocking of the furnace is unnecessary during the first few minutes of the heat, while the metal is entirely solid, it is necessary to begin the mixing process before all the metal is melted since otherwise excessive volatilization of zinc will begin. The initial rock begun at this time is moderate in degree for otherwise pieces of solid metal will fall against the electrodes and break them. This initial rock is gradually increased until, when the charge is entirely molten, the full rock is employed. In this way the degree of agitation is always suited to the condition of the charge and metal losses are avoided without endangering the electrodes.

The makers state that as compared with combustion furnaces, the Detroit furnace reduces the melting cost by approximately 50 per cent., saves at least 75 per cent. of the metal wasted by oxidation and volatilization, and effects a very substantial improvement in foundry conditions and in the quality of the metal produced.

Production.

It also produces metal very rapidly because the use of the indirect arc makes possible a more rapid and efficient application of heat to the metal, without injury to the refractories, while the rocking motion of the furnace absolutely prevents injury to the metal by stirring it vigorously and thus maintaining it at a uniform temperature.

It is stated that a large rolling mill, melting 60-40 yellow brass in Detroit furnaces, has attained an average, over 500 consecutive heats of 50 minutes melting time per heat, accompanied by a net metallic loss of less than one per cent., while a smelting plant reports that it has melted 44,000 lb. of red brass borings per 24 hours, in one 2,000 lb. Detroit furnace, averaging 20 2,200 lb. heat.

In many cases yellow brass has been melted at the rate of 2,000 lb. in 40 minutes without the slightest injury to the metal.

Quality

The use of the indirect arc lends itself to exact temperature control, while the rocking motion of the furnace keeps the metal thoroughly mixed and results in remarkable uniformity of composition.

A foundry in a large automobile plant gives the following analysis as the average result from 13 consecutive heats of phosphor bronze

	Copper	Tin	Lead	Zinc	Phos.
Av. composition	87.05	8.24	1.27	3.42	.017
Av. deviation	0.22	0.26	0.10	0.23	.004

Max. deviation	0.75	0.60	0.36	0.54	.008

In addition to the uniformity of analysis, this plant found that the tensible strength of the electrically melted metal was 40,000 lbs. as compared with 35,000 lbs. for the same metal melted in their combustion furnaces.

A smelting plant, melting a high-lead bearing bronze, took analysis on four consecutive 2,000 lb. heats from the first 25 lb. ingot poured from the first ladle of the heat in each case, as compared with the last ingot poured from each heat, and reported the following deviation in composition:

	Copper	Tin	Lead	Zinc
Composition of alloy	66.00	4.50	26.0	3.0
Av. deviation. .	0.63	0.18	0.34	0.43

It has been found possible to use cheap scrap, such as borings, chips and grindings, in place of a large portion of the new metal and composition ingot used, without in any way impairing the quality of the finished product.

Economy.

The rolling mill previously referred to melted 500 consecutive 2,000 lb. heats of 60-40 yellow brass at an average electric energy consumption of 224 kw. hrs. per ton: 50 consecutive heats showed an average of 215 kw. hrs. per ton. These figures include preheats and reheats. The entire consumption of electric energy during the periods named. On several occasions five or more consecutive heats averaged less than 200 kw. hrs. per ton. During this time the net metallic loss from this high-zinc alloy varied from 0.7 per cent. to 1 per cent.

A large smelting plant has melted red brass (80 copper, 4 tin, 8 lead, 8 zinc) in 2,500 lb. charges at 246 kw. hrs. per ton.

Another smelter reports 256 kw. hrs. per ton for red brass (83 copper, 3 tin, 4 lead, 10 zinc), made up from a charge containing 2.0 per cent. oil and moisture: the metal loss was 0.7 per cent. despite the fact that oily yellow borings made up 30 per cent. of the charge. The same firm reports an energy consumption of only 215 kw. hrs. per ton in melting borings of another red alloy (85 copper, 5 tin, 5 lead, 5 zinc).

It is stated that the refractory lining of the furnace lasts for 600 heats or more before extensive patching or renewals become necessary, a performance which reduces this element of cost to less than 25 cents per ton of metal melted.

Under favorable conditions the following cost figures have been attained with the 2,000 lb. furnace:

	Cost per ton
Electric energy (225 kw. hrs. @ 1c)	$2.25
Refractories	.25
Electrodes	.63
Labor	1.42
Incidentals	.50
Interest and depreciation	.43
Total melting cost	$5.48

The two following tables giving data obtained on actual runs may be of interest in the estimation of the furnace performance:

Furnace No. 1.—General Aluminum and Brass Co.:

Alloy melted—Copper, 85%; Tin, 5%; Lead, 5%; Zinc, 5%.

Amount metal melted, 68,401 lbs.
No. of heats, 35.
Average heat, 1,954 lbs.
Total working time, 59.67 hrs.
Heats per day, six.
Av. kw. hrs. per ton, 280.
Av. electrode consumption per ton, 3.47 lbs.
Av. melting time per ton, 1 hr. 1min.
Gross metal loss, 0.44 per cent.
Av. pouring temperature, 2,084° F.
Character of charge—

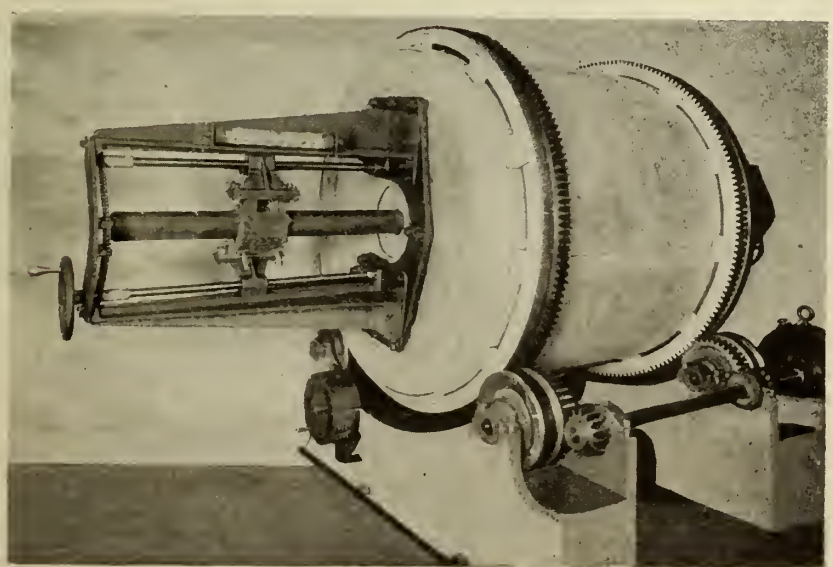
Copper ingot	29.1 p.c.
Brass ingot	4.4 "
Foundry scrap	38.2 "
Borings	24.0 "
New lead	3.4 "
New zinc	0.1 "
New tin	0.9 "
	100.1

Furnace No. 2.—Cleveland Brass and Copper Rolling Mills:

Alloy—Copper, 60%; Lead, 2.5%; Zinc, 37.5%.

Amount of metal melted, 66,500 lbs.
No. of heats, 35.
Av. heat, 1,900 lbs.
Heats per 9-hr. day, 7.
Av. kw. hrs. per ton, 210.
Av. melting time per ton, 43 min.
Gross metal loss, 1.0 per cent.
Character of charge—

Light scrap	50 p.c.
Heavy scrap	50 p.c.



THE REAR END SHOWING ROCKING MECHANISM.

The manufacturers of concrete pipes by the "Hume" centrifugal process—Hume Pipe Company, South Africa, Limited—is described in a paper by Mr. W. Wolstenholme recently read before the South African Institution of Engineers. The materials employed with the cement are crushed stone from the mines in the Witwatersand area, and, for reinforcement, discarded winding ropes, of which large quantities are available. The ropes which are slowly rotated, are cut into suitable lengths, annealed, and unstranded, and then woven into cages which are placed in the pipe moulds first. The concrete is thrown into the moulds until the required amount is furnished, the machine is gradually speeded up, and the centrifugal force causes the material to be evenly distributed throughout the length of the moulds; water is also driven out by this method. Six 4-in. or 6-in. diameter pipes can be completed in eight or nine minutes, and four 15-in. or 18-in. pipes in fifteen minutes. Larger sizes up to 60 in. diameter can be finished in about twenty minutes. Sizes up to 9 in. diameter will withstand a working pressure of from 300 to 350 lb. per square inch, while larger sizes have been tested up to 210 lb. per square inch. When subjected to excessive pressure these pipes become a mass of pores, and have cracks which allow the pressure to escape. The pipes do not, therefore, fail in the manner of a cast iron pipe.

A recent communication to the French Academy of Sciences, states that coal has been discovered in the region of Port Gueydon, French North Africa. This coal appears to belong to very extensive beds lying in the region mentioned. Analysis taken have revealed the following composition:—"Moisture, 1.05 to 1.15 per cent.; ash, 37.15 to 53.65 per cent.; volatile matter, 8.05 to 12.27 per cent.; fixed carbon and sulphur, 37.25 to 49.45 per cent; the calorific value varies from 3960 to 5390 calories.

According to preliminary figures published by the United States Geological Survey, the total output of crude petroleum in the United States in 1919 was about 377,719,000 barrels, as compared with 355,927,716 barrels in 1918. The home consumption last year was some 375,559,000 barrels, as compared with 380,242,153 barrels in 1918. Some 52,000,000 barrels of crude petroleum were imported from Mexico out of a total output of 80,556,228 barrels in that country last year, and handed to the refineries on the coast.

Ideas of Interest to the Practical Mechanic

DIE FOR MAKING ROOF LOCKS

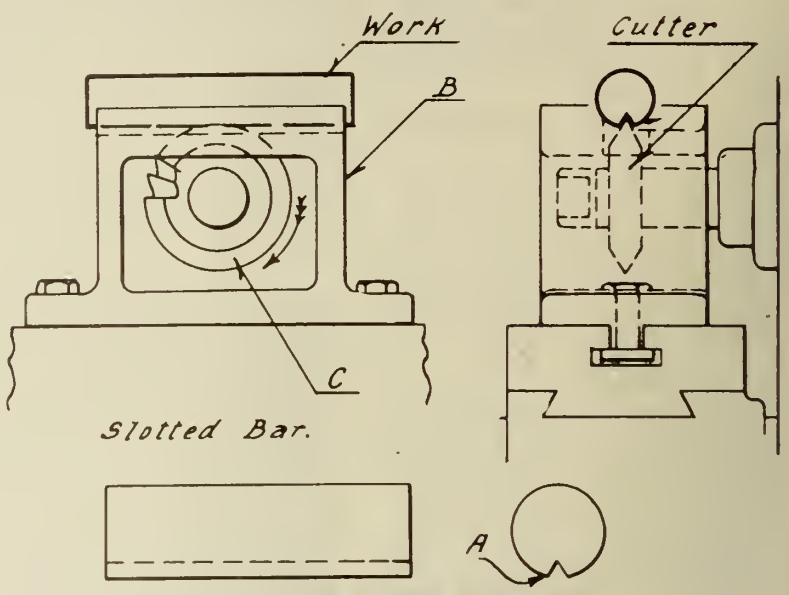
By John S. Watts

An interesting device for making the U-shaped Chicago roof locks, used in the construction of steel frame box cars, is shown in the accompanaying sketch. The die here illustrated was designed to make the roof lock in one operation—cutting to length from the coil and bending to shape—at one stroke of the machine. The fixture is constructed as an attachment for a shaper, but may be modified and adapted to any other suitable machine.

The female holder A is made to bolt to the head of the shaper ram, after first removing the tool post and the clapper box. On the lower left side of the piece A, a circular shear block B is fitted, extending a little clear of the edge, and provided with six grooves, so that by reversing the block and rotating twelve cutting points are available. At the opposite or right-hand side an extension is provided to carry two special shaped pin blocks C, C, which have suitable grooves for guiding the wire when forming the roof locks.

The male die or stationary portion D is firmly secured to the shaper table and kept in alignment by the tongues shown, which fit into the slots in the table top. A shear block E is held in a notch at the left of the piece D, and the forming block F is bolted in a slot that is located in a central position below the pin blocks C, C. On the entering end, the forming block is provided with a tapered slot that facilitates the entrance of the wire G. The gauge H is bolted to the side of the base, and is made from strap iron

In operation, the wire is fed from the coil through the hole in the shear block E and up against the gauge H. The cutting die is set a little ahead of the forming block so that the wire is cut off slightly in advance of the bending operation. In this particular instance the shaper was operated at a speed of 20 strokes per minute, giving an output of about 1,200 pieces per hour. The spring of the wire, after forming, was sufficient for the piece to be carried back with the movable head, from which it was automatically ejected by an extending finger.



DETAIL OF THE FIXTURE FOR MILLING.

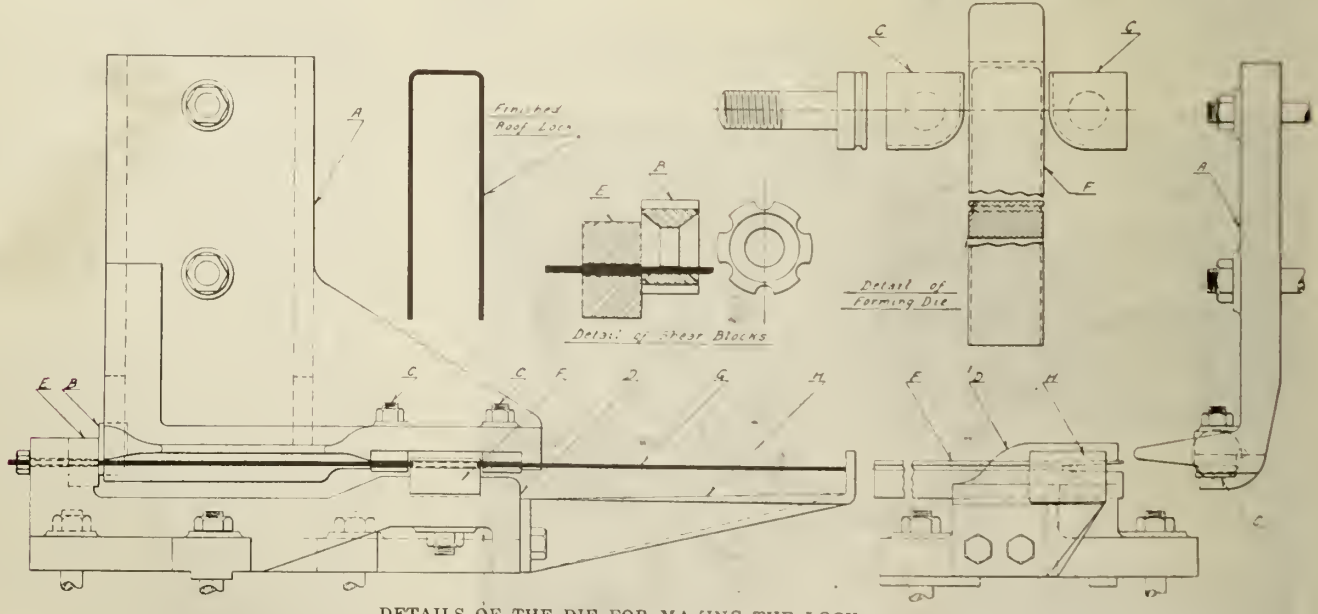
The report of the Lackawanna Steel Company for the year's second quarter, shows a profit of about $1,882,000, against a deficit of $233,000 in the same quarter of 1919.

MILLING A SLOT WITHOUT CLAMPING THE WORK

By F. M.

A rather interesting job is shown by the accompanying illustration, the proposition being to mill the slot A along the rod without clamping the rod in any manner, it being understood that the groove is very shallow, about 1-16 inch wide by the same depth.

To accomplish this, a bracket B was made and the cutter C is caused to revolve beneath the upper face of this bracket in the manner indicated. In this bracket, a vee groove is cut, and the work is held in and pushed along this groove by hand in much the same manner as a board would be split with a circular saw.



DETAILS OF THE DIE FOR MAKING THE LOCK.

What is a Hack Saw and How Should It Be Used?

Continuation of Article Dealing with Above Subject from Last Issue—One Should Be Able to Choose Wisely as Far as Hack Saws Are Concerned, After Perusal of this Matter.

The most important factor in determining the efficiency of a properly selected saw is the regulation of pressure so that the blade will give the greatest number of cuts in the shortest time and for the least money. Obviously, mere endurance without cutting effect, as exemplified in a saw that is worked too "gingerly," does not represent efficiency.

The cost of the saw is so small in comparison with that of the incidental labor, that even a slight increase in the cutting time represents a cost far in excess of what is saved by using the saw for a few cuts more.

The effect of the regulation of weight on the time per cut is clearly shown by the curves in Fig. 4.

On these curves each point marks the time required by a new saw to make the first cut. In each case the material cut was such as the blade was adapted for by design and the weight used is indicated by the figures at the bottom of the diagram.

To follow the performance of a single saw, let us take the curve for saw No. 254. In this experiment a new blade was properly placed in a Starrett Hack Saw Machine, a piece of three-inch machine steel put in the vise, the weight set at 20 pounds and a cut was made. The time required was 35 minutes, which gives us the first point on the graph. Another blade was then placed in the machine, the pressure increased to 25 pounds and another cut made. The time required was 30 minutes. With 30 pounds weight a new saw completed the first cut in about 24 minutes. Another saw was inserted, the weight increased to 40 pounds, and the time of the first cut was reduced to 15 minutes. The next increase was to 44 pounds, which is the weight recommended on the Hack Saw Chart for this particular saw, and a new blade made its first cut in 11 minutes and 30 seconds, which is slightly better than a good average time for a first cut on this size and class of material. The weight was then increased to 50 pounds and subsequently in increments of 10 pounds to 70 pounds, a new blade being used each time, and the time of the first cut noted. Connecting these points gives us the curve AB.

While the time per cut continued to decrease as the weight increased, the saw in each case was actually cutting at a destructive rate when the weight was increased beyond the amount recommended for that particular blade. For instance, the curve for saw No. 256 shows a decrease in time for all weights from 65 to 100 pounds, but had any of the saws used been tested for the number of cuts per blade and general efficiency, as well as for the time per cut, it would have been seen that when the weight rose above 70 pounds on the first cut, the life of the saw was considerably shortened.

It should be borne in mind, that, as stated before, the ability to cut in the shortest time is but one of three objects that determine the value of a Hack Saw, and, therefore, when time only is considered as of value, the chances for a loss of efficiency are exactly two out of three. In other words, to test a Hack Saw by cutting with it at a rate that is known to be destructive, is to disregard deliberately two of the three factors that determine economy in this field of shop work. For this reason, any test of hack saws, which depends upon a destructive cuting speed, is not only misleading in character, but dangerous when made the basis for action in the selection of saws.

The maximum efficiency is to be found in the saw that "cuts quickest and lasts longest"; that combines cutting efficiency with endurance.

The gradual lowering of efficiency as a saw is used and the effect of successive increases in the pressure are very clearly displayed in Fig. 5. This is not presented to show just when increases should be made, but rather to emphasize the rate of increase in time required per cut, or corresponding decrease in efficiency, when the pressure is permitted to remain constant, and the immediate effect of increasing the pressure. The curve for 44 pounds shows how rapidly the saw was running beyond the limit of efficiency, while that for 64 pounds makes clear how the tendency was immediately restrained by the application of more weight. An example of efficient control of pressure is shown in the curves representing the entire life history of saws shown in Fig. 8.

Fig. 5 further illustrates the effect of weight or pressure on the rate of cutting and the efficient endurance of the saw, identical blades being used on the same material in this test and different

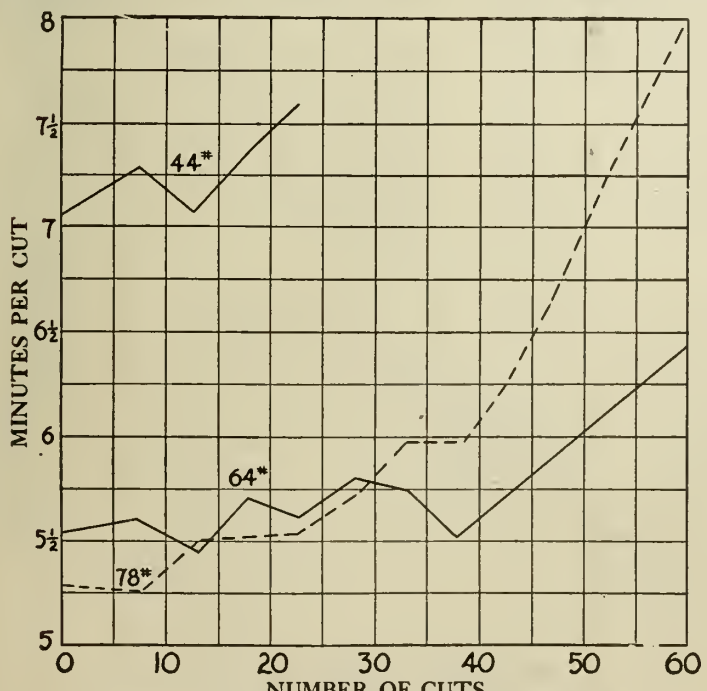


FIG. 5—EFFECT OF PRESSURE ON TIME PER CUT AND EFFICIENCY OF SAW.

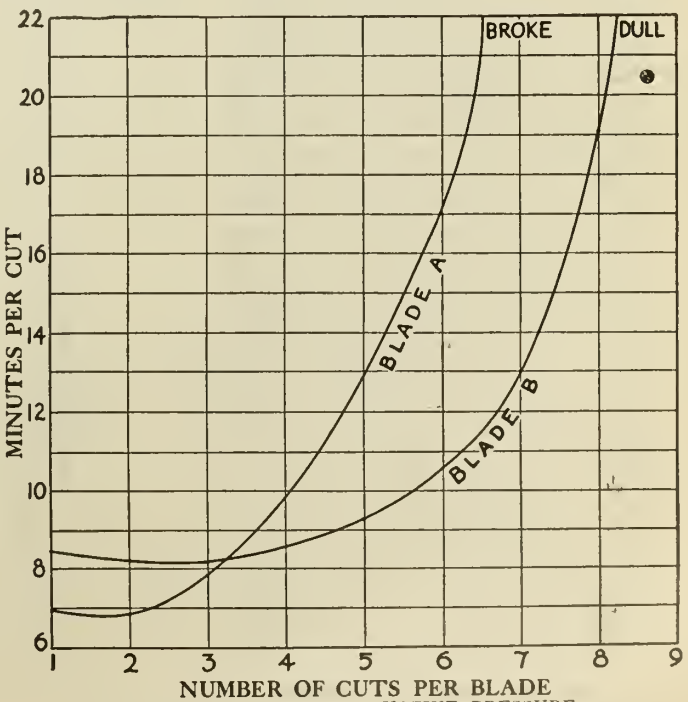


FIG. 6—EFFECT OF DESTRUCTIVE PRESSURE.

weights employed, the starting weight remaining constant throughout the test in each case.

In this experiment one of the weights used was below that recommended for the blade employed and the result is indicated by the upper curve in the chart, marked "44-lb. weight." The second solid line shows the performance of a similar saw using the proper weight of 64 pounds, and the dotted line, the result when a weight of 78 pounds, or a slightly excessive pressure, was employed.

Insufficient weight resulted in an excessive time per cut, 7 minutes and 15 seconds being required for the first cut, an amount of time in excess of what is considered a good average cutting speed on the class of material used in the test.

Better Too Much Weight Than Too Little

From this chart two conclusions may be drawn; First, it is better to exceed the proper weight a little at the outset than to use too little pressure: Second, no matter how nearly correct the weight is at the outset, after a certain number of cuts have been made, the pressure must be increased, not only for the sake of reducing the time per cut to a point within the limits of efficiency, but also to prolong the life of the saw. The effect of a slight excess in weight, not only on the life of the saw, but on the average time of all cuts made before the blade is dulled beyond all use, is clearly shown by the two lower curves in Fig. 5. For the first 15 cuts the advantage lies clearly with the heavier weight, but from that point on, it is apparent that the first saving in time was made at the expense of the general average for the entire series of cuts.

An example of what an excess of pressure will do is shown in Fig. 6. In this case, both saws were pushed to the limit from the very start by applying a pressure far in excess of that recommended, and one which it was known in advance would force the blades to cut at about twice their normal rate. Blade "A" was weighted 10 pounds more than "B" and was destroyed in one and a half less cuts. In each case there was little or no increase of time for the first three or four cuts. Beginning with the fifth cut, however, the time per cut mounted rapidly, with the result that one saw broke after six and one-half cuts, while the other was worn smooth in slightly more than eight cuts. While a hack saw must be made to withstand a great amount of abuse, there are, nevertheless, limits beyond which it will not go; and where a saw is forced to cut at a greatly excessive speed, the user must decide for himself whether or not the gain in time per cut offsets the loss in saws, spoiled stock, etc. So far as its value as a test is concerned, however, the practice of using excessive or destructive pressure not only has nothing to recommend it, but is actually dangerous and misleading.

Effect of Insufficient Pressure

The conditions in the tests charted in Fig.7, were exactly the reverse of those shown in Fig. 6, a weight being applied in each case which was considerably less than that recommended for the particular blade used in the test. Not only was the time per cut far in excess of what should have been required to cut the class of material on which the test was made, but the life of the saw was destroyed almost as rapidly as when too much weight was used. In each case the teeth of the blades were destroyed by slipping and sliding over the work, rather than by cutting. Blade "A," which had the greater weight (and shortest life) in the preceding test, had the least weight here and was worn dull in about five less cuts than were made by blade "B." These results make it evident that using too little pressure is almost as inefficient and costly as using too much, while the practice of using insufficient pressure has not even the doubtful advantage of saving time at the expense of the blade and stock, as is the case where too much pressure is employed.

Effect of Proper Regulation of Weight

In this test, Fig. 8, each of the blades was started with the weight recommended for that saw by the Hack Saw Chart. With the exception of Saw No. 256-C, the time required for the final cut, befor the saw was completely ruined, was less than that for the first cut, and, in practically every case, an increase of weight was followed by a recession of the curve to a new low level. While the number of cuts per blade was unusually high for each test, the curve is typical of the performance of a Starrett saw under proper regulation of weight or pressure when cuting a material for which it was designed.

There is a slight tendency in some shops and by some manufacturers to recommend the use of a flexible blade in power saws, for the same reasons that are advanced in hand sawing. The two bottom curves on the chart show the comparative efficiencies of the all-hard and the flexible, or "soft-back," blade on the same material.

Performance of Flexible and All-hard Blades Compared

Saw No. 250-B is a 14-pitch, 22-gage, flexible or "soft-back" blade. The starting pressure used was 24 pounds. Saw No. 255-B is a 12-tooth, 18-gage, all-hard saw, designed for use in a medium power machine under a starting pressure of 44 pounds. Both are designed to cut machine steel. The comparative efficiencies, under the conditions of the test, and the conclusions to be drawn regarding the use of the flexible blade in a power frame, are clearly indicated by the two curves. (See Fig. 8).

From the very first cut, the "all-hard" blade, designed for use in machines, required less time per cut than was needed by the flexible blade, while the total number of cuts made by each blade was practically identical and both saws ultimately failed in almost the same manner. The "hump" in the curve for the flexible saw might have been avoided by the use of greater pressure were it not for the fact that its very flexibility militated against such a step, for the reason that had extra pressure been put on while the teeth still retained something of their first keenness, the blade would have in all probability "buckled" to such an extent that it would have been impossible to make a smooth, straight cut. It, therefore, appears that the use of flexible saws in power machines is unavoidably attended by a loss of time in cutting speed without any corresponding gain in the life of the blade.

Improper vs. Proper Starting Weights

Fig. 9 is especially interesting because it compares the results of starting with too light a weight, combined with proper subsequent regulation, with those obtained by using a slightly ex-

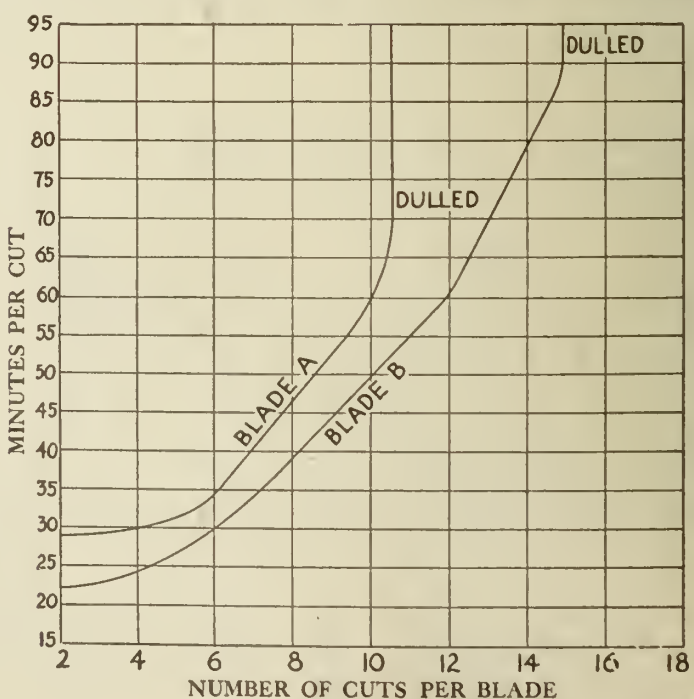


FIG. 7—EFFECT OF INSUFFICIENT PRESSURE.

cessive weight to start with and then regulating it properly as the number of cuts progresses.

The first blade tested was a No. 255-C, used in a medium power machine on 1¾ x 3 inch machine steel, the weight being taken as 24 pounds, which is less than that recommended on the chart. Almost from the first, the time per cut was excessive until about the 30th cut, when the weight was increased to 32 pounds, with a resultant drop in time per cut from 13 minutes and 35 seconds to 10 minutes and 35 seconds. However, the mischief had been done by cutting with too light a pressure, and the blade dulled so much by sliding over the work that it was not until the weight had been increased to 48 pounds, after nearly 120 cuts had been made, that the time per cut dropped to within the limits of efficiency. After 180 cuts, the time again rose to an excessive amount, and the blade failed after making the remarkable total of nearly 260 cuts.

In the second test, the weight recommended for the saw used, No. 256-C, is 43 pounds, whereas, that recommended for No. 256, or 64 pounds, was employed. The blade was used in a heavy machine to cut 2½ x 2½ inch machine steel, the square area cut being a little greater than that cut by No. 255-C.

In this case the blade, while overweighted at the start, cut well within the limits of efficiency for nearly 40 cuts, rising during the next 20 cuts to a maximum time of 8 minutes and 45 seconds. At this point the pressure was increased to 78 pounds, and the time per cut reduced to about 5 minutes and 30 seconds. At no time during the next 240 cuts did the time rise above 8 minutes. When the blade failed it had cut a total area of 1742 square inches, or a trifle over twelve square feet as compared with the 1365 square inches, or nearly nine and a half square feet, which were cut by the No. 255-C.—both of which are truly remarkable performances.

It may be worth while, at this point, to call attention to the fact that it is the number of square inches cut by two saws, rather than merely the number of cuts made by each, that determines their relative efficiencies. It often happens in actual practice that it is inconvenient to test all saws on exactly the same size of material and when this is the case, so long as the different stocks cut are near enough in size and shape to require the same type of blade, according to the recommendations in the Hack Saw Chart, the purpose of the test may be served by converting the number of cuts made by each blade into the total square inches cut, and making deductions or conclusions on that basis.

Comparing the average time per cut for each of the series, and noting especially the comparative "flatness" for the curve for Saw No. 256-C and the greater percentage of cuts it made at a less time than that required by No. 255-C, it is evident, as previously stated, that, of two evils, it is far preferable to use a slightly excessive weight at the outset than to use too little pressure.

The graphs in Fig. 10 above show characteristic curves for average performances, as regards the number of cuts, and also show in two cases the effect on the time per cut of using a saw under conditions for which it was not designed, and with an excessive starting pressure. Saw No. 112 is intended for use in a hand frame, and in any case should be started with an actual weight, or pressure on the blade, of 12 pounds. The result of starting with a 24-pound weight is indicated by the curve. Saw No. 256 was started with the proper weight, but the pressure was increased at an unnecessary rate and the life of the saw greatly shortened.

Effect of Lubricant

Fig. 11 shows vividly the comparative efficiency of a blade when used with compound and when cutting dry. The blade used in each case was a Starrett No. 250 and the entire series of cuts for all blades was made on the same bar of metal. A flexible back saw was chosen because, in the test, the abuse of the blade was intentional in the first two instances; and had an all-hard saw been selected, the probabilities are that it would have failed even sooner, especially as the strokes per minute, when cutting dry, were excessive. All these blades were started under the same pressure of 24 pounds. No. 1 saw, whose performance is shown by the line AB, was run without lubrication at 65 strokes per minute, an excess of 15 strokes over the recommended speed and failed when partly through the fifth cut. No. 2, curve CD, was run "dry" at 100 strokes per minute, or double the proper speed, and failed when about half way through the third cut. No. 3, used with compound at 100 strokes per minute, completed 50 cuts at a fair average speed, and was cutting at its apparent maximum efficiency under 56 pounds of pressure, when the test was discontinued.

The importance of lubrication, in its effect on the time per cut and the number of cuts per blade, is clearly shown here. Just to what extent the excessive speed employed with the blades that were run "dry" contributed to their early failure is a trifle uncertain, but its influence is none the less unmistakable. It may be said in this connection that, when cutting dry, an excess speed of as little as ten strokes per minute will ruin a saw by drawing the temper.

Cutting Costs

Naturally, all comparisons of saws or methods of use of saws, resolve themselves into a consideration of dollars and cents — the ultimate measure of Hack Saw economy. The cost of the saw, its cutting efficiency and endurance, the labor cost and overhead chargeable to its use, must all enter into the comparisons. Attention must be centered upon the reduction of labor cost through the use of machines and the maintenance of saw efficiency and endurance. All this has been carefully considered by manufacturers in the development of hack saw machines and in the design of various types of blades, but perhaps the most practical step was the standardization of hack saw practice through the medium of the hack saw chart.

The cost of the saw is always small —practically negligible—as compared with the value of the time of a man to use or tend it. Seldom, in fact, does the saw cost as much as an hour's ordinary wage. The total difference in cost between the best and the poorest saw is so slight as to be hardly discernible when reduced to the cost per cut, or even to the cost per hour of its use-

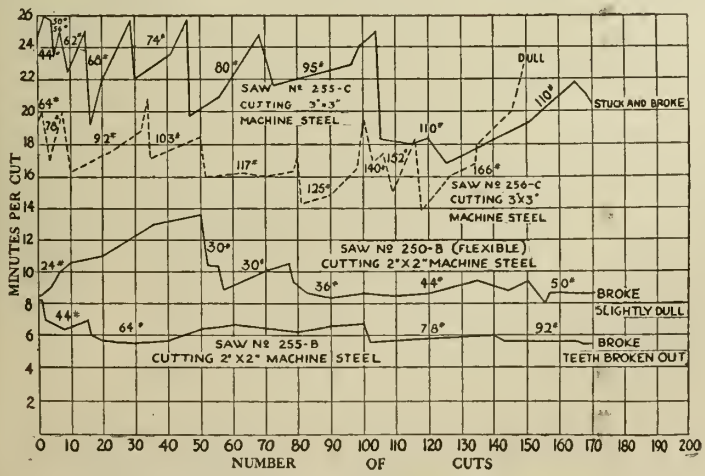

MINUTES PER CUT
NUMBER OF CUTS
SAW Nº 255-C CUTTING 3"x3" MACHINE STEEL
DULL
STUCK AND BROKE
SAW Nº 256-C CUTTING 3"x3" MACHINE STEEL
SAW Nº 250-B (FLEXIBLE) CUTTING 2"X2" MACHINE STEEL
BROKE
SLIGHTLY DULL
SAW Nº 255-B CUTTING 2"X2" MACHINE STEEL
BROKE TEETH BROKEN OUT

FIG. 18—EFFECT OF PROPER REGULATION OF WEIGHT ON CUTTING SPEED AND LIFE OF SAW.

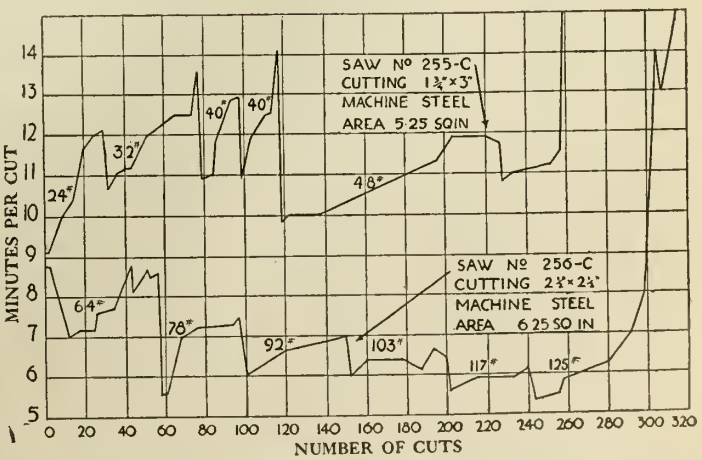

MINUTES PER CUT
NUMBER OF CUTS
SAW Nº 255-C CUTTING 1¾"x3" MACHINE STEEL AREA 5.25 SQ IN
SAW Nº 256-C CUTTING 2½"x2½" MACHINE STEEL AREA 6.25 SQ IN

FIG. 9—EFFECT OF PROPER AND IMPROPER REGULATION OF WEIGHT ON CUTTING SPEED AND LIFE OF SAW.

ful life. For comparison with hourly labor cost, it is convenient to divide the cost of the saw by the hours it endures and thus get an hourly rate.

From the accompanying table, page 48, which gives the "Cost per Hour for Saws of Different Costs and Endurance," it will be noted, for instance, that a blade costing 20 cents and cutting for 20 hours, would be chargeable at only 1 cent per hour. At a cutting rate of, say 10 cuts per hour, this would make the cost per cut for the blade but one-tenth of one cent. Even though a blade costing 20 per cent. less could be found that would show exactly the same efficiency—an obvious impossibility — the saving per cut would be only one-fifth of one-tenth of a cent, or one fiftieth of a cent. The chances are, however, that a 20 per cent. reduction in the cost of the blades would show as much or even greater reduction in efficiency, so that the cost per cut would actually be increased.

The most careless comparison of saw costs with prevailing labor costs emphasizes most forcefully the fact that it is "penny wise and pound foolish" to buy anything but the best in the way of hack saws. It stands to reason that any standard product that is cheaper than the dearest is poorer than the best. Therefore, it is actually economy to get the best by paying the price.

Cost Per Cut Only True Basis

Ultimately, all expenses must be reduced to the cost per cut, as the true measure of efficiency and output. This may be readily determined from the accompanying tables for "Combined Cost per Hour for Saw, Labor and Overhead" on page 49. Thus, for instance, from Table B, 7 cuts per hour for a period of five hours at a labor and overhead charge of 30 cents per hour, the blade cost being taken at 15 cents, represented a cost for these items of 4.7 cents per cut. This figure is derived as follows: From Table B the cost per hour, for a five-hour period, of a saw costing 15 cents and a labor and overhead expense of 30 cents per hour, is 33 cents. Multiplying this by 5, the number of hours, we get $1.65; dividing by 35, the total number of cuts made during the period, we get a cost 4.7 cent per cut. A blade costing 30 cents, making an average of 7 cuts per hour for a period of 5 hours, or a total of 35 cents, the labor and overhead charge being 30 cents as before, would cost 5.1 cents per cut. From these two examples it is again made manifest that the cost of the saw is a relatively small factor, and that in order to keep the labor and overhead down to the minimum, it is of the utmost importance to use only the best blades. With present labor costs it is better to discard a blade too soon than run it too long.

The sum and substance of all hack saw efficiency is—how long should it take to cut any particular piece of work, and how many cuts should a blade be expected to make before it is dulled?

As has been shown already, the characteristics of the metal which is being cut is the most important factor in determining how long it will take to cut it and, as every machinist knows, no two pieces of steel or iron are exactly alike as regards hardness, crystalline structure, etc. Therefore, no hard and fast limits regarding the cutting time of any individual blade may be, the average time required to cut any given material, and the average number of cuts any blade will deliver, will in the course of the year's work be found to be very near the figures given. In power sawing, as in hand sawing, though in a lesser degree, the skill and attention of the operator will affect the efficiency of the blade. A careful man, who observes the recommendations of the manufacturers, will have little difficulty in obtaining better than the average time per cut and a greater number of cuts per saw, while a careless or indifferent operator may lag far behind the average.

Extended Tests Necessary

Comparisons, while odious, are nevertheless often profitable in the deductions which may be made from them. The following test, for instance, shows how necessary it is that any test be carried over an extended period and a large number of cuts before any final conclusion is drawn.

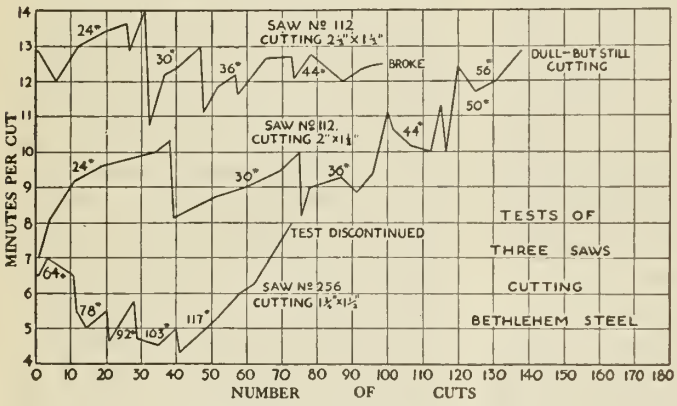


FIG. 10—EFFECT OF THE REGULATION OF WEIGHT ON CUTTING SPEEDS AND LIFE OF SAW.

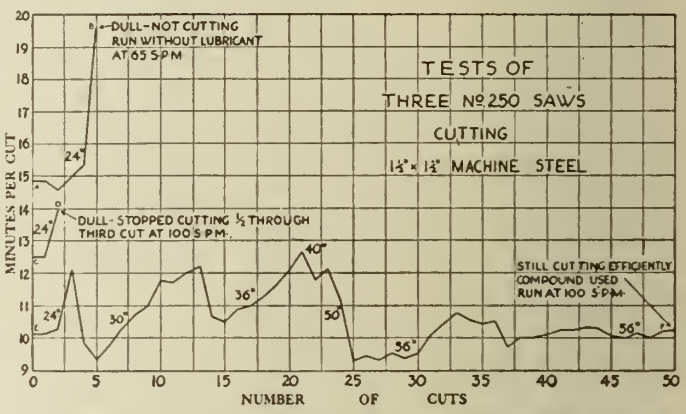


FIG. 11 EFFECT OF USING LUBRICANT, ON TIME PER CUT AND ON LIFE OF SAW.

Some Average Performances

It must be remembered that the following figures are only averages, and because of differences in the material being cut, differences which only a chemical analysis could reveal, the very first saw that is compared with them may show a great many more cuts during its life, or may fail completely before it has made half the "average" number of cuts. On any given material, it may require half as long again per cut, or it may make a great many more cuts than the "average" blade and in half the time. But however far from the "Tables of Averages" the performance of various saws nor their life can be given nor can it be said with certainty, just how long it will or should take to cut any given piece of material. We can, however, take the average of as many cuts of each class of materials as possible and say that, if such of the factors as are under the control of the operator are made to conform to the recommendations given in this treatise, this average represents approximately the time in which a certain material should be cut and, in the same manner, we can say that it is reasonable to expect that a certain blade will deliver approximately so many cuts before becoming dull.

Both makes of blades were run at 92 strokes per minute with a starting pressure of 44 pounds and a maximum pressure of 132 pounds. The greatest number of cuts was made with an average weight of 80 pounds.

On the face of it, this test clearly demonstrated the superiority of Blade "A," but following the test through, step by step, shows that Blade "B" put up a much more creditable performance than the final result would indicate, and that if the test had been stopped, after two blades of each manufacturer had been used, the result would have been reversed. When four saws of each brand had been tested, the results were in favor of Blade "A" to a much greater degree than after nine of that make had been used, but had the test stopper there, any conclusion as to the comparative merits of the blades would have been decidedly misleading. In other words, it was only by carrying out the test for a considerable number of cuts that a fair conclusion could be drawn.

Hack Saw Practice

Because a hack saw is so simple a tool, it is one of the most abused. Most of the waste in breakage, and most of the blame for inefficient cutting, is due to the inexperience of the user rather

Total Hours Used	Net Cost of Blade							
	$0.05	$0.10	$0.15	$0.20	$0.25	$0.30	$0.35	$0.40
5.	.01	.02	.03	.04	.05	.06	.07	.08
7.5	.0067	.0133	.02	.0267	.033	.04	.0467	.0533
10.	.005	.01	.015	.02	.025	.03	.035	.04
12.5	.004	.008	.012	.016	.02	.024	.028	.032
15.	.0033	.0067	.01	.0133	.0167	.02	.0233	.0267
17.5	.0028	.0057	.0086	.0114	.0143	.0171	.02	.0228
20.	.0025	.006	.0075	.01	.0125	.015	.0175	.02
25.	.002	.004	.006	.008	.01	.012	.014	.016
30.	.0017	.0033	.005	.0067	.0083	.01	.0117	.0133
35.	.0014	.0029	.0043	.0057	.0071	.0086	.01	.0114
40.	.0013	.0025	.0038	.005	.0063	.0075	.0088	.01
45.	.0011	.0022	.0033	.0044	.0055	.0067	.0078	.0089
50.	.001	.002	.003	.004	.005	.006	.007	.008

TABLE A—COST PER HOUR FOR SAWS OF DIFFERENT COSTS AND ENDURANCE.

than to a lack of quality in the blade. Even a little instruction will be thoroughly worth while in the interests of hack saw economy.

In hand work, see first of all that the blade is well strained in the frame, with the rake of the teeth such that it will cut on the forward stroke. A flexible-back blade, because it lacks natural rigidity, should be strained tighter than an "all-hard" saw. A slack or a light blade has a much greater tendency to buckle and break than a taut or heavy saw, and will prevent the user from doing as much or as good work. The tendency of a saw to "drift," that is, to cut at an angle, depends on its gauge, on the skill of the mechanic and on the tension of the blade. The saw should be taut, but not over-strained. A properly strained blade, when "thumbed," gives a clear, humming note, which, once heard, is easily remembered. In using a flexible blade, the tension should be increased while cutting, as the blade stretches while in use

Rigidity of Work Essential

Rigidity in the material to be cut is scarcely less important than proper tension on the blade. If possible, lock the work securely in a vise. In cutting sheet metal, if the gauge and size will permit, place the work in the vise so that a flat surface, rather than an edge, is in contact with the saw. If this is impractical it is well to put a light strip of wood on either side of the sheet of metal and cut through both the wood and metal at the same time. The angle at which any work is placed in the vise has a direct effect, not only on the time per cut but on the number of cuts the saw will make. This is a subject, the importance of which is often overlooked, and it may be worth while to state here that the proper "cornering" of the material to be cut is essential to economy in this class of work. Always place the work in the vise so as to provide as great a bearing for the saw as possible. That is, set the work, if a piece of structural steel, channel or similar material, so as to engage the maximum number of teeth throughout the cut. The diagrams as shown illustrate the proper manner in which to "corner" certain common shapes of material. When placing work in a vise, the tendency of coarse teeth to "straddle" must be borne in mind, and also that the fewer the teeth engaged at any particular moment during the cut, the greater the strain on each tooth and consequently the greater likelihood of stripping the blade.

Three Fundamentals

There are three fundamentals to be observed if efficiency is to be obtained in sawing with a hand blade. Be sure that the blade cuts, rather than slides or rubs. Always lift the saw on the return stroke. Don't crowd the work—40 to 50 strokes per minute should be the maximum.

Start the cut slowly, using the same motion as in filing. Put on enough pressure to make the blade cut and not slide or slip over the metal. This point is most important. Too little pressure in the first stages of a cut will take more out of a saw than fifty cuts made under proper conditions. By starting with a very light pressure, allowing the saw to rub rather than cut the work, and then increasing the weight at a destructive rate, once the first sharp edge is worn off the blade, it is possible to so completely ruin a saw that it will not make one full cut on a 2-inch round. Slipping or sliding the blade over the work simply glazes the cutting edges of the teeth and makes the saw blunt. If there is scale on the material to be cut, more pressure will be required than if the surface is smooth and clean. On the other hand, care must be taken not to use so much pressure that the teeth will engage the work too rapidly, or stripping of the blade may result. At the end of the forward stroke lift the blade slightly to avoid dragging or rubbing the teeth on the stock during the return stroke. Pressure during the return stroke is a frequent cause of premature loss of efficiency in hand hack saw blades.

Generally speaking, hand hack saw blades should not travel faster than 50 strokes per minute; thirty-five to forty strokes are even better. Blades for hand frames are comparatively thin and their teeth small; therefore, care must be exercised to avoid overheating the blade by too rapid cutting, and so drawing its temper. Too fast a stroke also almost inevitably results in dragging on the return stroke. In hand sawing it will generally be found worth while, after the first few strokes, to retighten the blade in the frame. This takes up any stretch that may have occurred, prevents drifting, and tends to produce better cutting. When using flexible or "soft-back" blades it is absolutely essential that the saw be re-tightened during use.

When starting on the corner of a square bar, it is worth while to notch it with a file, so that at least two teeth can engage at one time. Otherwise the teeth may straddle the metal, in which case there is a great tendency for them to strip. This danger also exists in sawing through tubing or conduit, hence a fine pitch blade should be used. When sheet metal is being cut, it is preferable, where possible, to saw along the flat surface rather than across the edge, thus preventing vibration as well as

Hours Used	Cost of Labor and Overhead per Hour Chargeable to Operation of Sawing						
	.10	.20	.30	.40	.50	.60	.70
5	.13	.23	.33	.43	.53	.63	.73
7.5	.12	.22	.32	.42	.52	.62	.72
10	.115	.215	.315	.415	.515	.615	.715
12.5	.112	.212	.312	.412	.512	.612	.712
15	.11	.21	.31	.41	.51	.61	.71
17.5	.1186	.2186	.3186	.4186	.5186	.6186	.7186
20	.1175	.2175	.3175	.4175	.5175	.6175	.7175
25	.116	.216	.316	.416	.516	.616	.716
30	.115	.215	.315	.415	.515	.615	.715
35	.1143	.2143	.3143	.4143	.5143	.6143	.7143
40	.1138	.2138	.3138	.4138	.5138	.6138	.7138
45	.1133	.2133	.3133	.4133	.5133	.6133	.7133
50	.113	.213	.313	.413	.513	.613	.713

TABLE B—COMBINED COST PER HOUR FOR SAW, LABOR AND OVERHEAD (Net Cost of Blade .15).

Hours Used	Cost of Labor and Overhead per Hour Chargeable to Operation of Sawing						
	.10	.20	.30	.40	.50	.60	.70
5	.14	.24	.34	.44	.54	.64	.74
7.5	.1266	.2266	.3266	.4266	.5266	.6266	.7266
10	.12	.22	.32	.42	.52	.62	.72
12.5	.116	.216	.316	.416	.516	.616	.716
15	.1133	.2133	.3133	.4133	.5133	.6133	.7133
17.5	.1114	.2114	.3114	.4114	.5114	.6114	.7114
20	.11	.21	.31	.41	.51	.61	.71
25	.108	.208	.308	.408	.508	.608	.708
30	.1067	.2067	.3067	.4067	.5067	.6067	.7067
35	.1057	.2057	.3057	.4057	.5057	.6057	.7057
40	.105	.205	.305	.405	.505	.605	.705
45	.1044	.2044	.3044	.4044	.5044	.6044	.7044
50	.104	.204	.304	.404	.504	.604	.704

TABLE C—COMBINED COST PER HOUR FOR SAW, LABOR AND OVERHEAD (Net Cost of Blade .20).

avoiding stripping by bringing the greatest possible number of teeth in contact with the work at one time. For work which is not rigid or has a spring to it, the flexible back is the logical blade to use. It is particularly valuable on intricate work, or on work which is difficult of access.

Cornering Work

In either hand or power work, the efficiency of the saw, when cutting angles, shapes and similar material, is directly affected by the way the material is "cornered," or placed in the vise. A fundamental is to always start the work with the least angle facing the thrust of the saw teeth. Disregarding this point increases the tendency of the saw to strip. Too much stress cannot be laid upon the necessity of keeping the work rigid. In cutting small work with a hand saw, do not lay it across the knee, or merely hold one end on a bench. Put it in a vise. If there is no vise obtainable, drive a couple of nails into the bench and jam the piece to be cut between them, cramping it so that it will be held firmly.

To tire is human. It is, therefore, natural that as a man's efficiency is diminished by continued effort, neither speed nor quality of work is likely to be maintained. Hand work will not be so uniform nor will a hand blade last so long as one used in a power machine. More important, however, than the difference in quality or quantity of work produced by the two methods, especially while the present high wages prevail, is the fact that no man can be thriftily employed in hand sawing except on transient and odd jobs.

The machine never tires, assures uniformity in cutting, an output in excess of human effort; and, because it never requires the undivided attention of a man, costs less to operate where reasonably continuous work is to be done.

Importance of Proper Blade Selection

The hack saw chart naturally plays a very important part in the successful operation of saws in a machine. The careful selection of blades for different types of machines, and for different materials, makes it easy, where the recommendations of the chart are followed, to avoid picking too heavy a blade for a light machine or too light a blade for a heavy machine, and insures the proper saw being used for the material to be cut. If a blade is too light, it will tend to "drift," and will break if the pressure is not carefully regulated.

In power work, as with the hand frame, the same fundamentals must be observed if efficiency and economy are to be obtained. Most machines are made to cut upon the "draw stroke." This should be remembered when placing the saw in the machine; the rake of the teeth should always be in the direction the cut is to be made. In a "push stroke" machine, made to cut in the reverse direction, the blade should be placed with the rake of the teeth forward, while in machines cutting on the "draw stroke," they should point toward the shaft. Retighten the blade after a few strokes have been made.

As in hand sawing, the cut should be started with comparatively light pressure, so that the teeth will not "bite" too rapidly and thereby be stripped. As has already been stated, too much weight put upon a new saw will destroy it quickly—while pressure insufficient to prevent the saw from slipping or sliding without cutting will dull the blade rapidly. It is good practice to relieve the blade of part of the weight of the frame during the first stroke or two, by holding it up with the hand, after which it may be released. Otherwise the teeth may "straddle" the metal and there is a great tendency to strip the saw. In sawing tubing or conduit, a fine-tooth blade should be used, not only because of the comparative softness of the metal, but because the small cross-sectional area will permit the teeth of a coarse saw to "straddle" the walls of the tube.

Increase of pressure to compensate for the wear of the blade is absolutely essential to economy in hack saw work. The common tendency among machinists is, not only to use too light an initial pressure or weight, but to practically ignore the necessity for increasing the weight as the work progresses and the saw is dulled by successive cuts.

The exact speed which will give the best results with each type of saw and kind of material can be determined for the individual machine only by comparison. In a general way, however, in power cutting, 50 to 60 strokes may be considered a maximum when water or compound are not used. With the use of lubricant, however, this speed can be increased to 100 strokes per minute on soft steel; 65 to 80 strokes on annealed tool steel; and 60 to 80 strokes on unannealed tool stteel.

Compound should always be used except when cutting iron castings, as it greatly increases the output, doubling it at least. Either water or "compound" may be used, but never oil.

Whatever the liquid employed, its purpose is not so much to lubricate the work as to cool the blade, since the high speed of cutting generates considerable heat which draws the temper of the blade. The work should be kept flooded, for a scanty flow of compound simply increases the likelihood of chips sticking in the cut and breaking the blade.

Formula for Compound

A formula for making compound is as follows: To a quart of sal soda thoroughly dissolved in ten gallons of cold water, add four quarts of equal parts of mineral and lard oil, and mix thoroughly. The compound will be ready to use ten or twelve hours after it is made.

The necessity of increasing the weight as the saw is dulled must not be overlooked, and is a factor for which no absolute rule can be given. The most that can be said is, knowing approximately the time in which a certain blade should cut an average specimen of a certain kind and size of material, the weight should be increased by increments of from 5 to 10 pounds as often as the time of three successive cuts is above the average. Remember that the weight on a heavy gauge saw must be increased faster, in proportion to the extra amount of dulled surface or contact area, than for a thinner gauge saw, regardless of the difference in weights on the first cut with each. In hack sawing, as in any other form of work, common sense, attention to detail and observation of manufacturers' instructions, are great assets.

To sum up: The attainment of real efficiency in cutting metals with either hand or power hack saws depends upon:

1 The selection of the proper make of saw.

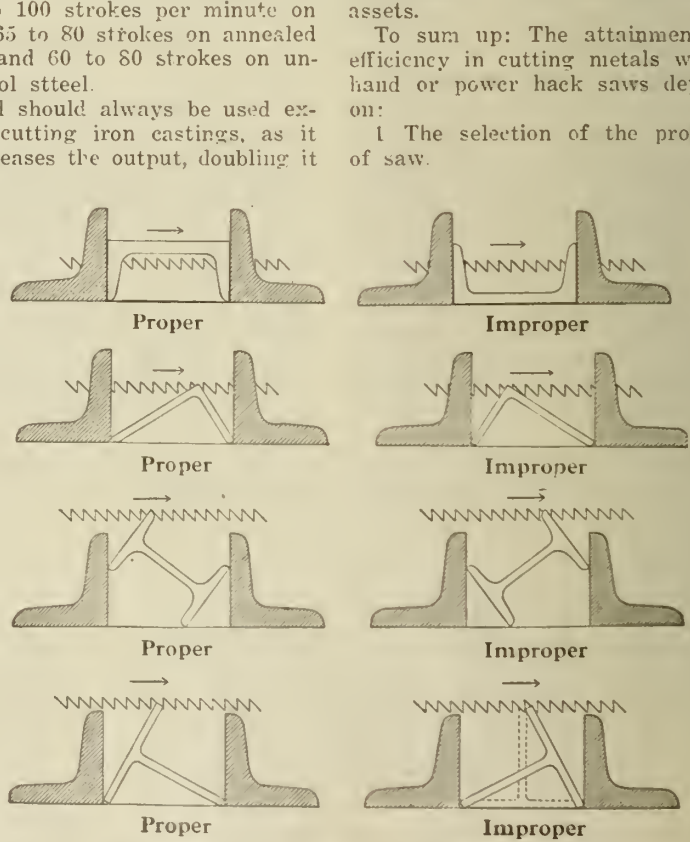


FIG. 23 SHOWING HOW TO CORNER WORK.

2.The selection of the proper saw of that make for the material that is to be cut.

3. The proper use of the saw selected.

It is possible for any user of hack saws, at the expense of time and money, to evolve for himself a system for selecting and using hack saws to the best advantage. It is likely there are many machinists whose experience is sufficiently wide to warrant their making their own selection of saws and establishing their own code of usage. To this class of men, this article will have been but little more than a confirmation of facts they already know. To the man who has not had the advantage of such wide experience, it is hoped that this matter will prove of value in his search for the means of more efficient work and methods.

Making Cold Punched and Machine Made Nuts

Choice of Material is a Very Important Feature in the Making of Nuts of Either Variety, and the Press Operations in the Cold Press Type Will No Doubt be of Interest.

By J. H. MOORE

IN this the third, and concluding article dealing with the John Morrow Screw and Nut organization, we will discuss the method of manufacturing their varied line of nuts. A full line of cold-punched, and machine-made nuts is produced, also special nuts for any requirement; but first let us consider the routine of operations adopted in the making of a standard cold punched nut.

The first point considered is the choice of raw material. This is a very important matter and one that receives careful attention. Only first quality stock is used, and all material used undergoes a test of its ability to stand up under pressure, etc.

Having decided on the grade of stock to be used, the material is cut off into certain lengths, depending upon the style and size of nut to be made. Next comes the punching operation, which consists of punching the centre hole. This operation is depicted at Fig. 1. It will be noted that owing to the thickness of stock, together with the close proximity of the holes, the material takes a peculiar curl, really bending into the form of an arc. This, of course, does not injure the stock in any way, and the operator gets so used to handling the material in this shape, that it is no disadvantage to him.

After coming from this press it goes through what is known as the cutting-out operation. This really consists of the punching out of blanks from stock shown at Fig. 1, at the same time rounding the corners. This makes the blanks look like A at Fig. 2. The nut now passes to another press where it is rough cornered, or made as shown at B, Fig. 2.

After this comes the chamfering operation as shown at Fig. 3. It will be noted that the operator feeds the blanks down a hopper at the side of press. The trip action shown at front of press actuates a slide that pushes a small ram out and in at the proper time. As each stroke ascends, this ram goes forward, pushes the completed nut out of the way, allowing another nut to slip down the hopper into place under the chamfering punch.

A trimming operation is next in order, and as this is a very simple one, we will pass on to the next, which is re-trimming, or final trim as it is termed. After the final trimming punch has performed its duty the nut looks like C at Fig. 2.

When this is completed the nut is reamed on multiple spindle machines of both horizontal and vertical type, after which they are tapped on special machines for the purpose. Two of these machines are shown at Fig. 4, and they

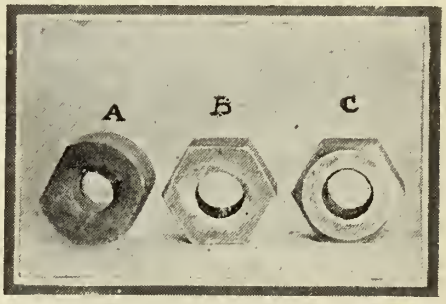


FIG. 2—THE NUT IN VARIOUS STAGES OF COMPLETION.

are of the multiple spindle type. The spindles raise and lower at predetermined rates, taking their action from cams and rollers, so that one operator can tap an enormous quantity of nuts in one day.

After tapping, the nuts are faced on machines of both vertical and horizontal design. This practically completes the product with the exception of inspection.

The Bar Variety

Making nuts from the solid bar is an entirely different proposition, and briefly the procedure is as follows: The hexagon bar is placed in the turret lathe, and with proper tooling, the nuts are turned to proper thickness, chamfered, and cut off.

Next comes the operation of drilling, which is accomplished as shown at Fig. 5, on a battery of Colburn drills. Of course lighter nuts are drilled on lighter machines, but the operation shown is that of the heavier variety.

After drilling, comes the regular tapping operaton,. and as the shaping of the nut was accomplished in the turret lathe, this completes the work with the exception of removing of burrs, and final inspection.

In the inspection department every nut is gone over. Plug and screw gauges are used and unless a nut is perfect it is rejected. At various stages of man-

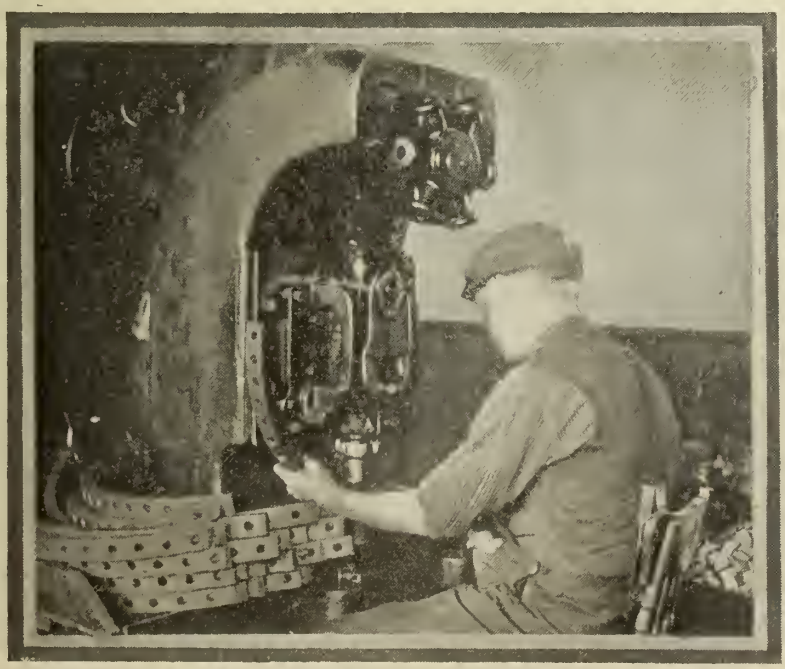


FIG. 1—PUNCHING THE CENTER HOLE. NOTE HOW STOCK CURLS.

ufacture, sub-inspection takes place, but the final inspection is most exacting. Between facing and inspection operations, the nuts, are thoroughly washed in order that no grit remains when entering inspection department.

Some Points of Interest

This concern has a rather good method of storing completed stock which is worth calling attention to. The stock bins are arranged in pillar form, being approximately 12 ft. in height. An elevator takes the completed product up to the top and there the nuts are dropped into the bins. When needed they are let out of a sliding door at the bottom. Should any overflow occur on the opening of this door, a hopper, about the height of a man's shoulder, is provided in which any such overflow is placed, these working their way gradually to the bottom. The arrangement, as described, is very neat and helps the attendant to keep track of his stock supply, which he does in the following manner: A card is attached to each bin in a sheet metal holder, and on the card is marked the number of nuts contained. As they know definitely how many nuts of a certain size there are to 100 pounds, this totalling is an easy matter.

It might be mentioned at this point that after every operation in the making of the nuts, they are rumbled in barrels to take off all rough edges.

A cost system is also in force that enables them to keep track of all stock going through their plant. They not only know the cost, but the actual output of each workmen for every day.

They have their own tool room in which are made their dies and other fixtures, in fact in as far as possible they accomplish everything themselves, even to the castellating of special nuts. This operation is accomplished on various styles of machines depending upon the size of the nut.

The plant is particularly lucky in having a splendid location and good light,

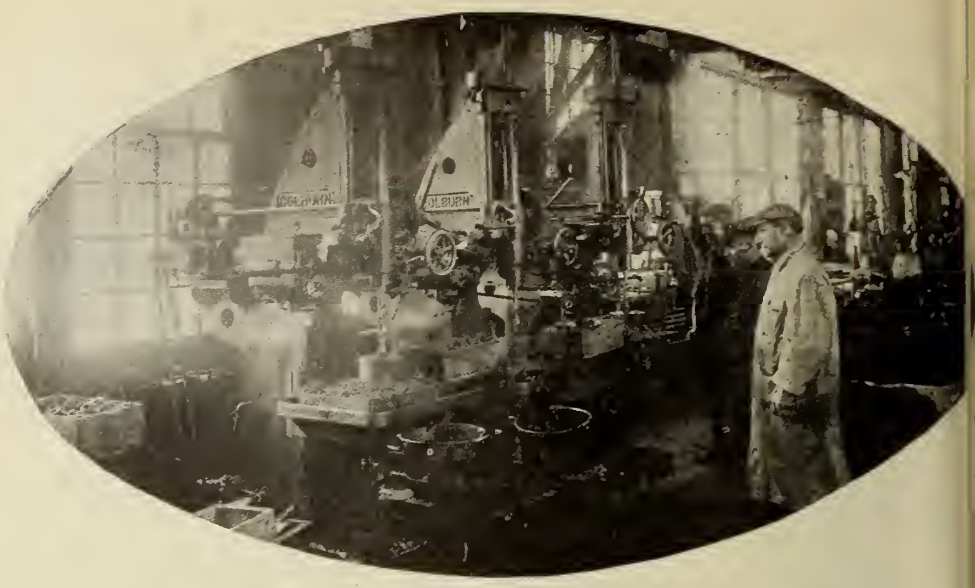


FIG. 5—DRILLING NUTS FROM THE SOLID COLD STOCK.

which naturally makes for ideal working conditions, and maximum production.

Over 752 tons of nuts are produced every year so that readers can see that efficiency and production has been developed to a high degree.

Much interest has been taken throughout England in a new plan for the building of a city about 20 miles from London on model lines. Under this Welwyn Garden City scheme, it is intended that a town of ultimately about 50,000 inhabitants shall be gradually constructed as a complete unit, with its own factories, warehouses, shops, and residences, in contrast to the many districts which are almost exclusively confined to dwelling houses for people who go into the metropolis daily in pursuit of their livelihood. Such places have come to be known as dormitory suburbs, and the new scheme is based on the theory that the only solution of the whole problem of comfortable housing and convenient transport is to set up instead, what are described as satellite cities, in the sense that London itself is the centre of all things, but that within a radius of 20 to 25 miles there should be a ring of these almost self-contained communities. An interesting feature of the scheme is that the capital provided will only receive a maximum interest of 7 per cent., and as the town is gradually built, any increment of values arising from the settlement of the people will be conserved for their own social advantage.

To Consider Application.—The Board of Railway Commissioners has acted upon the application of the Railway Association of Canada filed on July 10, asking for a general increase in freight tariffs of 30 per cent. over those charged at the present time. The board has decided to consider the application at Ottawa, Aug. 10, at which time and place all interested parties, both for and against the application, will be expected to appear ready to proceed.

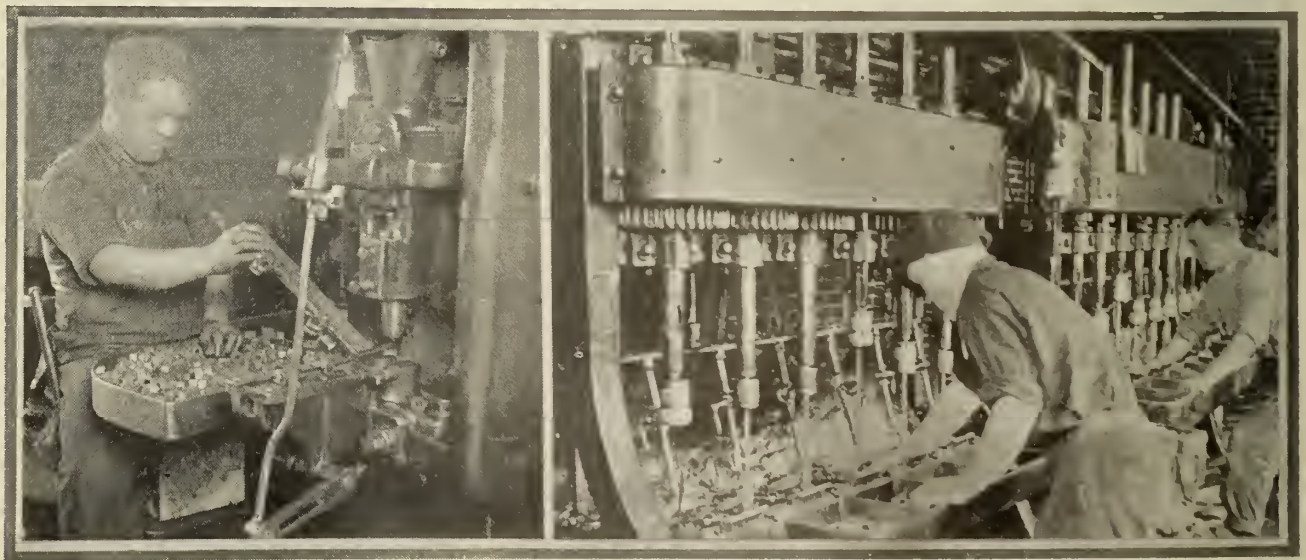


FIG. 3—CHAMFERING THE NUTS. NOTE THE HOPPER.

FIG. 4—TAPPING THE NUTS ON MULTIPLE SPINDLE AUTOMATICS.

The Use and Abuse of Arc Welding Equipment

Welding Equipment of Any Kind Should be Used Intelligently— A Thorough Understanding of the Equipment is Essential if Good Work is to be Performed.

By H. L. UNLAND *

THERE are several simple precautions to be observed in the use of electric arc welding equipment whatever the nature of the apparatus may be.

Many of the accidents which occur are generally the result of a misconception of the nature of the equipment and its proper use. This applies more particularly to the auxiliary apparatus.

The eyes should be thoroughly protected from the light of the arc. Painful and more or less serious burns to the interior of the eye will certainly result from carelessness in this respect. No chinks or holes in the mask should be permitted, since only a brief exposure of the eyes is required to bring on painful results. The inside of the mask should be kept painted dull black to prevent reflection of the light from behind.

The mask is principally used where carbon electrode welding is being done. It consists of a thin sheet of aluminum formed to the proper shape and provided with an adjustable band for supporting it from the operator's head. An opening in the front of the mask is provided for a window of glass. This glass may be either a number of individual sheets of different colors or a single compound sheet of glass may be used.

The colored protective glass should be sufficiently dense to reduce the light intensity to a value not objectionable to the eye and at the same time the definition of the area immediately around the arc should be clear to enable the operator to properly follow the work. Different color combinations are used but the most general seems to be a combination of red and green glass.

The glass is held in a recess in the front of the mask by means of a clamping frame secured by four small bolts. By this means it is rendered impossible for light from the arc to pass through joints or cracks around the edge of the glass. The bolts should always be in place when the mask is used, as the small amount of light coming through one of these openings would in a short time affect the eyes of the operator.

To change the glass, the bolts and clamping frame are removed, the glass changed and the frame and bolts replaced. It is advisable to keep a piece of clear glass on the outside, since in welding, this outside, surface will be struck by numberless particles of molten metal, and will become roughened to such an extent that it becomes useless and must be replaced.

The Hand Shield

The hand shield is principally used in doing metallic electrode welding. It consists of a light wooden frame with provision for a protective glass window. The protective glass is the same as used in the mask. The shield is also used by inspectors and others who require the protection only for short periods and at infrequent intervals. A light box frame surrounding the window is fitted to the operator's face, preventing light from the side or rear reaching the operator's eyes, thus eliminating any interference of a number of operators due to the light from the arcs. The protective glass of the hand shield is supported in guides on the front of the shield and is clamped in place by a wooden wedge driven through openings in the guides.

Electrode Holders

The function of the electrode holder is to electrically connect the electrode used to the cable connected to the welding equipment. The requirements of this service are:

First: It must securely grip the electrode so the welder can operate it without play in the mechanism or without the electrode becoming loose in the holder while being used.

Second: The clamping arrangement should be such as to facilitate changing electrodes.

Third: It should be so constructed that the minimum heat reaches the operator's hand.

Fourth: The weight should be as low as possible and the balance such as to facilitate manipulation by the operator.

Fifth: The construction should be such that the operating parts are protected from accidental contact to avoid injury by burning or by being struck.

Sixth: The general construction should be substantial to avoid light or flimsy parts subject to bending or jamming.

The carbon electrodes should be rods of hard, homogeneous uncored and uncoated carbon. The diameter used will vary with the current to be used and this information is given elsewhere. The length depends on the particular class of work to be done. Long carbons reduce the percentage of short ends thrown away, but are more liable to breakage. The average lengths range from 9 to 12 inches.

For welding iron and steel the metallic electrode should be a high grade of low carbon steel wire. A large number of tests were made by the Emergency Fleet Corporation to determine the best chemical analysis of wire for this purpose, and the wire now made by a number of manufacturers meets these requirements. This material can be purchased either direct from the makers or through jobbers and can be obtained either in rolls or in short lengths, cut and straightened. In ordering, "Electric Welding Wire" should be specified, since wire for acetylene welding is often treated in such a way as to render it unsuitable for electric welding.

The electrode wire should be cut into pieces convenient for the operation. A length of 18 inches is satisfactory, since it is about the greatest length an operator can handle; at the same time it reduces the number of times the electrode is changed, and consequently the wastage, to a minimum.

Cables

On account of the intermittent nature of the work, it is possible to use smaller cable for the welding circuits than is standard for the current capacities. In this way, there is also a gain in flexibility which permits better control of the welding arc, by facilitating the manipulation of the electrode holder.

In metallic electrode welding a length of at least fifteen (15) feet of extra flexible cable should be connected to the electrode holder to allow the operator to fully control the arc through manipulation of the holder. For the ground or return cable the standard extra flexible apparatus or dynamo cable insulated with varnished cambric for low voltage circuit and covered with double weatherproof braid has been found suitable.

The carbon electrode welding arc is not as unstable as the metallic arc and therefore the manipulation of the electrode is not so important. For this reason the standard extra flexible dynamo cable referred to above may be used for connection to the electrode holder, as well as for the return circuit.

It is difficult to give universally applicable figures covering amperes, speed, etc., for electric arc welding due to the effect of conditions under which the work is done, the character of the work, and to a very large extent the skill of the operator.

The following figures are based on favorable working conditions and a skilled operator. However, they are approximations only and are given merely as a general guide.

Metallic Electrode Welding

Light work .....25 to 125 amperes
Heavy work .....up to 225 amperes

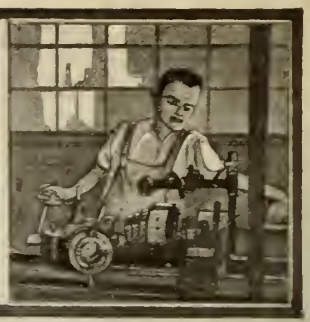
Electrode Diameter Inches	Amperes	Correspondence Plate Thickness Inches
1/16	25-50	up to 3/16
3/32	50-90	up to 1/4
1/8	80-150	1/8 to 3/8
5/32	125-200	1/4 up
3/16	175-225	3/8 up

The same size electrode may be used

Continued on page 67

*Power and Mining Engineering Department, General Electric Co.

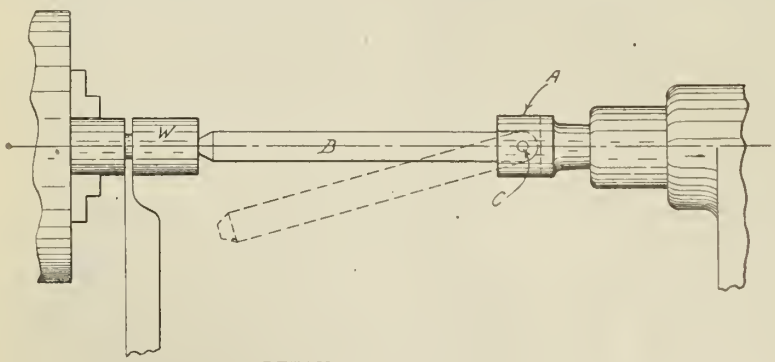
WHAT OUR READERS THINK AND DO



GAUGE FOR USE IN CUTTING-OFF LEAD

By Tyke

One of the most rapid operating devices that the writer has ever made is shown in the accompanying sketch. A large number of brass rods had to be cut off in the lathe and one end tapered. Practical accuracy had to be maintained but not to extremely fine limits, and the device shown speeded up things very materially and at the same time showed no variation from the desired dimensions in the finished work. A machine piece A was turned to fit the tailstock sleeve, slotted and drilled as shown, a pin of cold-rolled steel ¼ x ¼ x 7 inches long, was inserted in the slot, drilled in position and pinned. The piece was a very close fit so that it would remain in the position desired. A parting tool was set to approximate position and carriage clamped. The stock to be cut was put through the lathe spindle and advanced just the right amount for cutting off. Rod B was brought in line and the tailstock spindle advanced until the rod B touched the end of the stock W, then the tailstock spindle was clamped and the rod B tapered down slightly as shown by dotted line. The piece W was cut off, rod B raised to centre alignment, and stock advanced till it touched the end of the rod and the chuck tightened. After cutting off the compound, rest was set for the proper taper, and one roll held in the chuck and rod brought into position. A trial cut was taken, adjustments made, then as before the tailstock was clamped and the tapers finished with a surprising degree of accuracy. This device can be used to advantage on any cutting-off job where even but a few pieces are wanted, the big feature being that the bar is always within easy reach, and a light tap with the chuck wrench just clears it from the work. No scale is required after setting the first one correctly, and greater accuracy can be obtained, to say nothing of the increased output, which is very marked.



DETAILS OF THE CUT OFF GAUGE.

DIE CASTING MACHINE

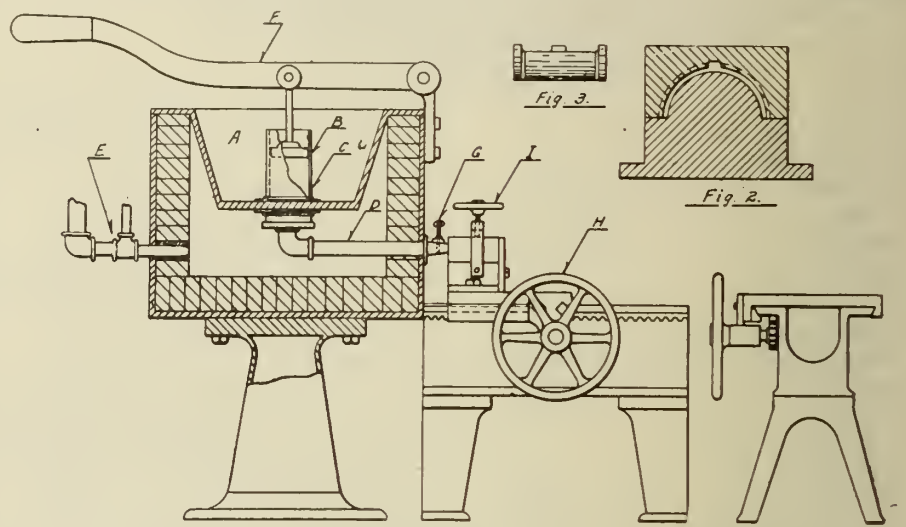
By G. Barrett

The illustration depicts a die casting machine as used to cast connecting rod bearings.

Fig. 1 shows a sectional view of the melting pot, and die set in place. The big feature of this pot is that the hottest metal is always nearest the discharge to the mould.

The main chamber is shown at A, Fig. 1. This carries the bulk of the metal; also a cylinder B which is connected by two flanges shown. The opening C acts as a valve. When the metal begins to melt, it falls through the opening C into the pipe D and is kept at correct heat by the action and location of the burner E. The metal is then forced into the die by a plunger which is connected to lever F.

The die which is shown in section at Fig. 2 is bolted to a carriage, and is placed into position by the hand wheel H, Fig. 2. The operation of the machine is to turn hand wheel H until the die comes close to mouth of melting pot, then lift the gate valve G, and pull down lever F. Close the gate valve to stop the metal from running out, then turn back hand wheel and separate mould by releasing clamp screw I.



SECTIONAL AND GENERAL VIEW OF DIE-CASTING MACHINE.

The small sketch, Fig. 3, shows the bearing which is made from hard babbitt, but may be made of different kinds of metal. Various shapes of dies may also be used on the same machine to advantage, and this method is well worth the expense where there is any quantity of casting to be made.

INTERESTING THREAD DATA

Some very useful thread data is published in the current issue of threads in the "He wants to know section," and we reproduce the same for readers' perusal.

The first question asked is this: "I have formulas for measuring internal threads by the three wire system, but have not been able to check these correctly. Can you send me correct formulas for U.S.S. and V internal threads?" Here follows the answer:

As to the three wire system for measuring internal threads, we believe that

this system cannot be used satisfactorily on internal threads, for the reason that the wires will not set into the internal thread as they do on the external.

The wires on the external thread will properly rest on the point of tangency, but on internal threads this is not so, as the wire would have to be made to conform perfectly to the internal diameter and the point of bearing.

We know of no satisfactory method of measuring internal threads except with standard gauges.

The second question is equally interesting:

"Is the A. S. M. E. thread another name for the A. L. A. M. thread?" The answer follows:

The thread standards of the A. S. M. E. (American Society of Mechanical Engineers), and that of the A. L. A. M. (Association Licensed Automobile Manufacturers), are not the same.

The A. S. M. E. and the A. L. A. M. threads have the same form—the United States standard form—but have their own standard diameters and pitches.

The A.S.M.E. sizes are given by numbers, and are the same in diameter as the machine screw sizes.

In 1911 all A. L. A. M. standards were adopted by the S. A. E. (Society of Automotive Engineers).

The name of the association of Licensed Automobile Manufacturers has been changed to the National Automobile Chamber of Commerce (N. A. A. C.)

The present S. A. E. standard for screw threads gives the present thread standard of the automboile industry.

The third and last question should prove useful: "What is the reason that a thread is tapered on the back end of a stud six inches long?"

Should this be a matter of the thread tapering smaller at the end of the cut, it is then quite likely that the machine on which the die head is used is out of alignment wiht the work.

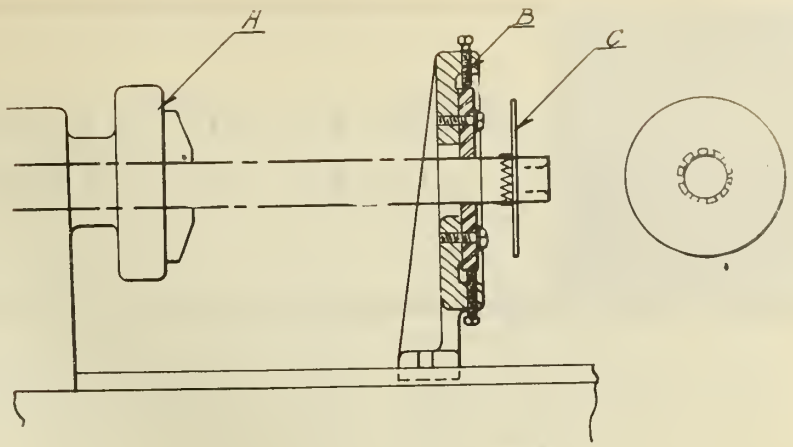
New machines have sometimes been proven out of alignment, and so it would be well to test the machine alignment. Prove alignment of the machine by fitting centres in head of machine and in the turret hole. Or, by turning a piece of stock held in the chuck or collar, to the diameter of turret hole, and then bring the turret up to the piece.

If the turret is out of alignment, this test will show which way the machine is out of line.

Should the thread taper larger at the end of the cut, the thread chasers are probably cutting either ahead or behind. All cutting should be done on the chamfer, and not back on the chasers.

If the lead is short, it can be corrected by stoning the back edge of the first tooth on each chaser.

If the lead is long, it can be corrected by stoning the front edge of the first tooth on each chaser. To anyone interested in thread work these questions and answers should prove well worth while.



SHOWING HOW THE GUARD IS USED.

SHEET METAL CHIP GUARD

By F. M.

While boring a hole in the end of a bar considerable trouble was caused by small chips lodging between the steady rest jaws and the work, the work in this instance being gripped in a chuck A, Fig. 1, with a rest B, at the outer end. To overcome the trouble mentioned a circular disc, C, was employed.

This is flanged inward and the flange is prong shaped as shown, and made so it will spring on the bar and revolve with it, thereby forming a protecting hood against which the chips are thrown.

INTERESTING GRINDING FACTS

By H. W. DUNBAR

Many times one is asked why they use hardened steel shoes in some cases and wood shoes in other cases.

Normally, in the production of commercially ground parts in large numbers, the work shoe must be of such shape, size and proportions as to remain a constant factor in the grinding operation, because the operator is constantly turning out piece after piece at short intervals. If he had to take into consideration variation in size due to change in the work shoe, his production would be cut down materially. Therefore, the hardened steel work shoe of the size of the finished work for finishing, and of the size of the rough ground work for roughing, provides a means of supporting the work and removing one of the variables in the grinding operation, because the hardened steel work shoe retains its size longer and can be depended upon to produce parts of the same size, piece after piece, without consideration on the part of the operator.

When a machine is used for general all-round grinding, when there are seldom more than one half-dozen pieces to be ground at one given time, it would be manifestly unreasonable to hope to have hardened steel shoes of the proper size for all the various pieces being finished. Therefore, a steadyrest with adjustable wood shoes is provided which has a range within the capacity of the size of machine being used, and can be readily adjusted to the diameter of work being ground.

Much discussion has been met with in connection with the use of hardened steel shoes, because, it is argued, the work being ground is liable to be scratched. This has proved to be a false line of reasoning, and it is readily understood when one considers that steadyrest shoes of soft material will pick up particles of dirt, abrasive, chips, etc., and retain them, really converting the shoe into a lap, and consequently the hardened steel shoes will not become imbedded with these particles so easily. Therefore, if it fits the work properly and is in line with the work, hardened steel is less apt to scratch than the soft materials.

In the case of hardened steel shoes it is very important that they be properly constructed and properly mounted in the steadyrest. The shoe must present a considerable portion of its bearing surface to the work being ground. It must be in line with the axis of rotation of work, securely fastened in the steadyrest, and properly hardened and smooth.

The other forms of steadyrest do not need such careful attention as the hardened steel, for, since they are soft by nature, they quickly wear to a point where they meet all of these conditions. The fact that the hardened steel shoes do not wear so rapidly is the reason why they must have more attention in the making.—Grits and Grinds.

In the course of a paper on the "Air-lift System of Raising Oil," read before the Institution of Petroleum Technologists, Mr. R. Stirling mentioned that the arguments against the use of the air lift are that the inflow of the water is induced thereby, and that with very heavy viscious oils, if over 5 per cent. and under 20 per cent. of water be present with the oil an emulsion may be formed from which it is difficult to separate the water. In a well with 10 to 15 per cent. of water, the difficulty was overcome by running into the well an additional 20 per cent. of water. No serious emulsion was then formed, and the discharge was much facilitated and increased.

DEVELOPMENTS IN SHOP EQUIPMENT

CARBURIZING COMPOUND MIXER

The Kent Machine Company, Kent, Ohio, is now manufacturing a machine for mixing bone meal and the various compounds used for pack hardening and carburizing steel. We believe it to be of great interest to all who do this class of work, and in particular, to the manufacturers of roller bearings, etc.

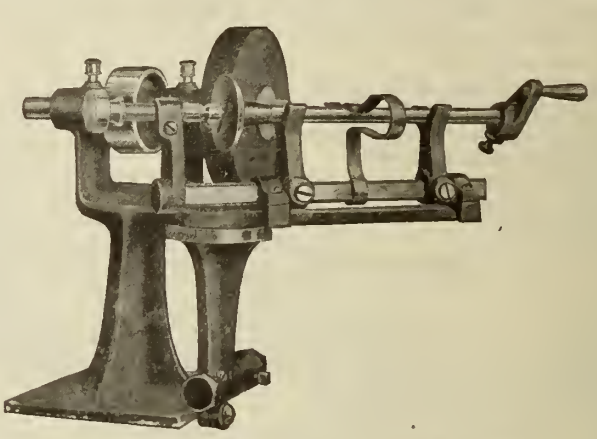
After each heat it is customary to replenish the used compound with a certain amount of new, usually about 25%, which, to insure a uniform depth of penetration, should be thoroughly mixed with the old. The machine as designed is adapted to this specific work.

The operation of the mixer is continuous and it automatically proportions, feeds, mixes and discharges the mixed material without requiring any man labor beyond the loading operation. This machine has been used for a number of years in the Canton, Ohio, plant of one of the largest manufacturers of roller bearings in the world. This same company recently ordered another mixer for their new plant at Columbus, Ohio.

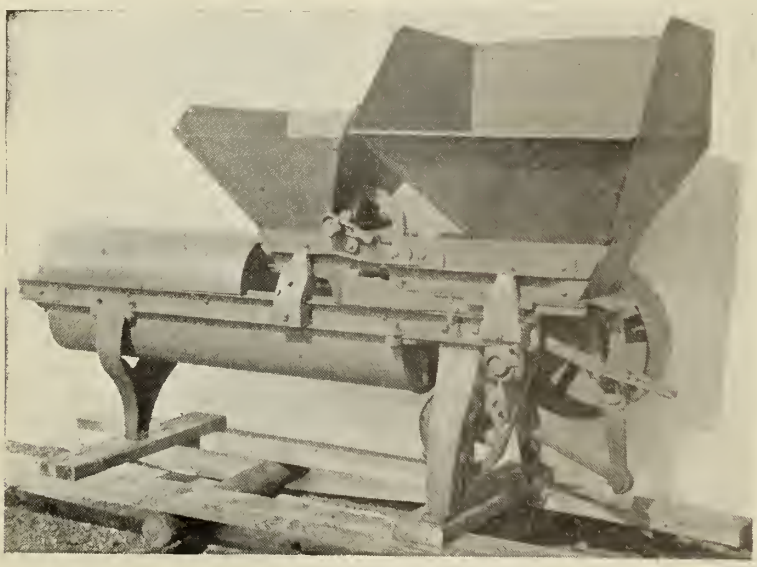
Referring to the cut of this machine, the large hopper holds the used material, and the smaller the new bone meal or compound that is to be mixed with it. On the throat of the small hopper there is a gauge or gate which can be adjusted to restrict the opening through which the material is carried by the reciprocating action of the feed plate. This adjustment makes it possible to obtain any proportion of the new and used material desired.

The action of the feed plate is as follows: The material in the hoppers rests upon the feed plate and at each forward stroke a layer of the compound or bone meal is carried into the throat, the material in the hopper settling down as the plate moves forward. During the backward motion of the plate this layer, which cannot be carried back into the hopper on account of the material behind it, is dropped off the edge of the plate into the mixing trough.

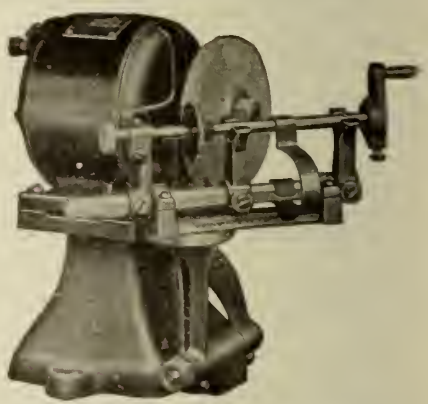
Both new and old materials drop into the mixing trough at approximately the same place. The mixing is done by a long horizontal shaft on which there is a series of specially designed paddles or blades which thoroughly mix the materials, and at the same time convey them toward the discharge end of the trough. Careful experiments were made to determine the length of time required to obtain a thorough and uniform mix and the mixing shaft is so designed that it is impossible for the material to be discharged from the trough before complete and thorough mixing has taken place. The mixing trough is provided with a cover which prevents the excessive amount of dust which is usually found where bone meal or compound is being mixed.



ILLUSTRATING THE BELT TYPE MACHINE.



GENERAL VIEW OF COMPOUND MIXER.



THE MOTOR DRIVEN MACHINE.

A particular feature of the machine which will appeal to those who are operating plants where large quantities of bone meal or compound are used in the possibility of building large bins over the present hoppers. These can be used as storage bins and it is not necessary to mix more material than can be used in any particular heat. In some plants these bins are carried up to the floor

above and the material is dumped into them through a trap door, while in others a small belt conveyor or bucket elevator is used to elevate the material into the bins.

GRINDER FOR VALVE FACING

D. F. Dunham, 830 West 37th Street, Los Angeles, Cal., supplies us with the following information of his valve grinder which he has placed on the market:

The machine, as illustrated, is arranged to face valves of any size and angle, and if the valve centre has been mutilated it makes no difference, as an adjusting screw with a ball and socket joint overcomes this defect. The valves are ground true with the stem and not with the centre.

A spring stop can also be arranged for grinding valve seat reamers.

The valve is worked back and forth on the face of the wheel, the valve being revolved meanwhile. The arm on the machine is graduated from 30 to 60 degrees, and the strong, rigid construction can be clearly noted. Three models are made Nos. 1 to 3, the first a motor grinder, the second a belt-driven grinder, and the third a grinding attachment, as shown.

GUARD FOR PUNCH PRESS

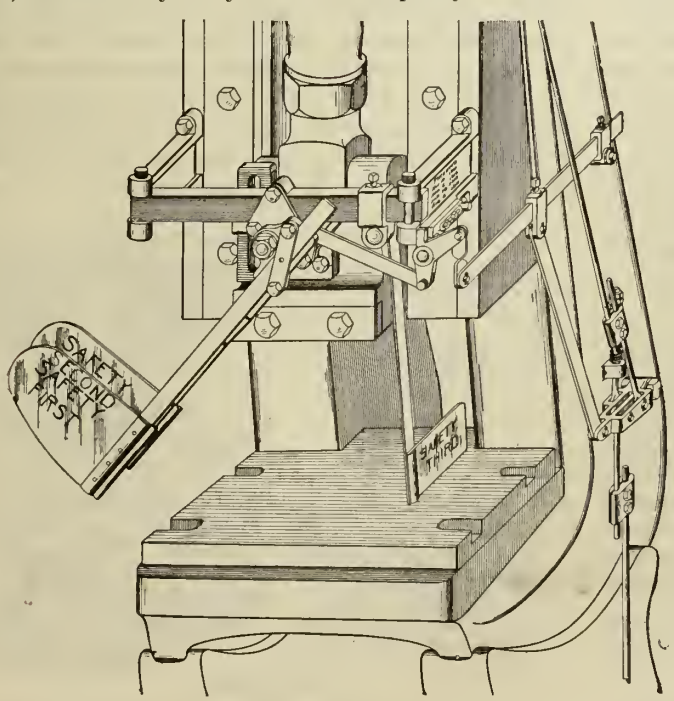
The D. & M. Guard Co., Rochester, N. Y., have placed on the market what is known as their D. & M. guard for punch presses.

This guard has two vanes or guards, both swinging as pendulums from a stud on the bridge of the guard. The guard is really three-fold, and as the makers term it, Safety First, Second and Third. The first guard swings outside of the bridge; the second, inside the bridge, and the third is a blinker or side guard. The first guard is moved by every stroke of the treadle, the second by every stroke of the ram, and the third swings from the bridge and prevents the operator feeding press from the side.

The feature of the inner or second guard is, of course, the fact that if the ram repeats unexpectedly after the treadle has been raised, the guard does its duty as soon as the ram starts to descend. This, of course, kicks the operator's hand out of danger, as the guard moves faster than the ram.

The swinging bridge which we have been speaking of carries all three guards. This bridge is hinged at the left and is locked by a pin and padlock on the right. The pin can be unlocked and quickly withdrawn and the bridge can then be swung to the left, thus removing bridge and guards from front of press. The pitman, press head, etc., are then readily accessible. A few seconds completes the operation just described.

This style guard has been thoroughly tested before placing on the market, and the Eastman Kodak Co. have over 140 in operation with great success. The illustration will clearly illustrate the features spoken of.



THIS VIEW SHOWS THE ACTION OF GUARD CLEARLY.

NEW THINGS IN MACHINE TOOLS

DOUBLE END TAPPING MACHINE

A special machine for simultaneous tapping both ends of such articles as turn-buckles, etc., with right and left-hand threads, has been designed and built by the Cadillac Tool Company, of Detroit, Mich. The machine is built with beds of different lengths to accommodate work from 12 inches to 60 inches long. The maximum size tap used is ⅝ inch. The machine is fitted with adjustable stops that operate the switch for reversing the motor when the desired depth of thread is attained. A connecting rack, with pinions on either head, provided equal movement to tapping spindles when starting the thread by hand.

MULTI-SPEED PLANER

The Conradson Machine Tool Company have added a new type of planer to their machine lines. The design was primarily intended for motor drive, but equally efficient service may be had when arranged for constant speed drive with belt pulley. When a motor is used the drive is made direct to the main shaft through a Clark flexible coupling. Reverse mechanism is operated by means of pneumatic clutches, which, it is claimed, provides self-compensation for wear, and requires little attention. Reverse clutch levers are directly connected, so that air is admitted to one while being discharged from the other. There are four operating speeds ranging from 25 to 45 ft. per min., with a return speed of about 120 ft. per min. These speeds may be varied to suit special conditions. All small gears and pinions are of chrome-nickel steel, heat-treated, large gears and rack being of cast steel with herringbone teeth. Splash system is used for lubrication. Rack feed is operated pneumatically, and this is controlled automatically from the table trips. Where shops are not provided with compressed air, a small compressor may be provided and driven from the main shaft of the machine. These planers are built in five sizes, ranging from 24 x 24 to 48 x 48 inches, the working length of table being 6, 8 and 10 feet. Net weight of the complete machine will approximate 8,000 lbs. for the small machines and about 32,000 lbs. for the heaviest.

RECIPROCATING TYPE MILLING MACHINE

The Ingersoll Milling Machine Company, of Rockford, Ill., has developed a special type of reciprocating milling machine that may be designed to meet specific requirements, and for this reason no attempt has been made toward this particular type of machine. These millers are intended for working on duplicate pieces, where setting up may be carried at one end while the cutter is operating on the other piece. When working cut is finished, the feed is automatically reversed and the table is rapidly traversed until it approaches the new piece, when the normal feeding speed is again resumed. The release, reversal of feed, rapid traverse, and reduction to normal cutting speed, continues indefinitely, while the operator is removing and replacing the work. These machines may be designed for any class of work. All cutter spindles are adjustable and all feeds controlled by the one lever located at the front of the machine.

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THE WEEK IN PASSING

IT is now costing the English mine owner as much to produce a ton of coal as it costs in United States, and in that some of the U. S. coal interests see a chance for world conquest for the coal trade. They count on the increasing costs in Britain, the coal-producing country of the world, to make it possible to crowd in on the market, providing they can secure ocean transport at fair prices. Now, this is all very well, until one stops to read that the Western States are apt to have their feet frozen this winter because they can't get coal enough to keep them warm, and the Canadian market continues to take all the coal U. S. cares to ship in this direction. Does it seem reasonable that United States is going to peddle coal all over the world, when her own people and her nearest market are sifting the cinders and wondering where the next shipment is coming from?

* * *

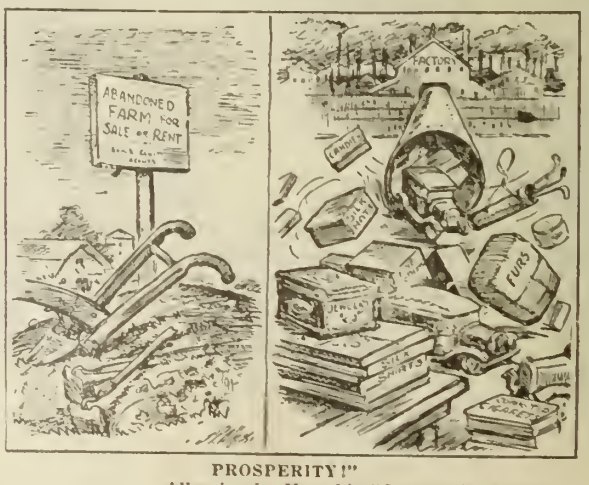
At the present time the shops of the Government roads, located at Moncton, are advertising for tenders for a long list of small tools, and the chances are that they will get a number of answers to their specification list. Dealers and jobbers like to deal with the Moncton office better than with any other branch of the Government-owned railroads, because they get their settlements more promptly. Some of the firms claim that the Moncton authorities are the old order, and have been running their business for a long time, while the branches coming under Government control recently have not acquired the habit of paying quickly. There is a lesson for them in the attitude of the dealer. There is a desire to get the Moncton business, and to give the very best service in the matter of shipment, whereas in the other branches of the Government service dealers are not nearly so keen to get the business, nor do they get as prompt treatment in the settlement of debts.

* * *

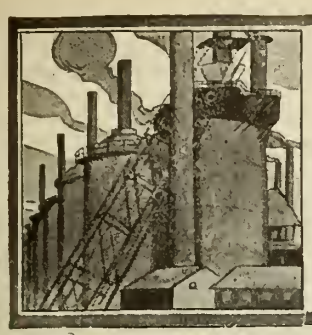
A freight car rolling into a Toronto yard with over sixty tons of steel shows the way United States is dealing with the car shortage. The trouble is that many of the cars on the track these days are not physically able to take care of such a tonnage, and were they put to the task would be returned as cripples. Thirty per cent. of the car miles are computed to be empties, as loading to capacity has not yet become a real art in the transportation business in this country. United States figures show that the best movement ever attained in that country was in 1916, when 26.9 car-miles per day was attained. Of course, it is much below that figure to-day. To reach anything like a working efficiency that will meet the present congestion it would be necessary to raise the standard to at least 32 miles per day. To do this will call for something approaching real honest-to-goodness sweat, and the trouble seems to be that fewer people every day are inclined to indulge in any form of labor calling for this accompaniment.

* * *

Mayor Church wants to spend millions to build radials to develop Toronto to a population of one million. The representatives of the surrounding towns and villages want them for the same reason. Neither explain from where the population will come. If the big cities are to be built up the population must come from the towns and villages. If the latter are to grow to the figures in Sir Adam Beck's fairy tales, the people must move from the farms. This is exactly what a Farmer-Labor Government does not want. The farmers want to keep the people on the farms and the city laborers do not want to increase local competition. The back-bone of the towns and villages is the local business people and they certainly do not want to be taxed to send villagers to the city to do their shopping, or to reduce their local field by moving their population to the big cities. E. M. Trowern, manager of the Retail Merchants' Association, makes this view very plain. He might have gone further and shown that having numerous happy and prosperous business centres near by makes rural life bearable. The absence of it is what makes the Western conditions so hard.



PROSPERITY!"
—Alley in the Memphis "Commercial Appeal."



MARKET DEVELOPMENTS

Holiday Season Dulls Machine Tool Market

Buying that is Done is Not on a Large Scale—New York Reports that Little is Being Done There—Montreal Needs Cars and Coal —Scrap Market Continues Dead.

MACHINE tool dealers report that trade has been quieter for the past week or so. Buying that is going on now is not in large volume. The New York market is dull now, and there have been some cancellations. But the makers are well booked with orders and any dullness or cancellations will not likely have the effect of forcing down prices, as there has been practically no letting off in the cost of building.

Importers in this district have been getting indifferent service in the matter of delivery. Some of the yards have received quite a tonnage, while in other cases there has been nothing at all. Some of the cars that do get across from American points are loaded to the hilt, much the same as they were doing in the strenuous days of the war. One car carrying steel brought over a load weighing better than sixty tons this week. This is not always possible owing to the poor physical condition of much of the rolling stock that is in use. The arrival of plate has relieved some anxious times in the shipyards, which were getting close to the point of closing down for want of material. In many lines, such as sheets, blue or black, tubes, bars, etc., there is a scarcity that in many cases can be described as acute.

Scrap yards report very little business as being done. There are no large buyers in the market. The steel mills, considering the difficulty they have in securing sufficient supplies of coal in the first place, are not buying much scrap, and their absence from the list of buyers leaves matters rather flat.

Some of the dealers intimate that they consider that trade will be resumed at a fairly early date, but with this guess they insist on coupling up the provision that the resumption will be on a lower price basis.

SHORTAGE OF COAL AND CARS IS BEING KEENLY FELT IN MONTREAL

Special to CANADIAN MACHINERY.

MONTREAL, July 22.—Acute coal conditions and the strenuous efforts to relieve the tension in the meat industry, are the features of the present activities. The Dominion Board of Railway Commissioners are taking immediate steps to conserve the available supply in anticipation of a scarcity that is apparently developing for the coming winter requirements. One of the first moves will probably be the restrictions placed on coal going out of the country. It is likely that the Board will prohibit the exportation of Canadian coal, except to Newfoundland and the United States. Further bunkering of ocean-going vessels at Montreal with American coal will be curtailed, if not entirely prohibited. This practice of coaling Atlantic steamers requires large quantities of American coal that is intended for consumption in this country, so that Canada is deprived of considerable coal that is delivered here from the United States mines. In future, these vessels will be forced to take on coal produced from the Canadian mines. It is also given out that additional measures will be enforced if coal conditions warrant it. There is little doubt that the business outlook in Canada is temporarily clouded by the evident scarcity of coal, as the situation has been so acute in certain quarters as to necessitate the closing down of some industrial plants, which in normal times, use, and at present are unable to get, large quantities of coal. It is stated that the Montreal Light, Heat and Power Company, who use about 800 tons of coal per day in the operation of their gas plant, and at present time have only a few thousand tons ahead, are threatened with serious curtailment if coal supplies are not forthcoming in normal quantities.

Car Regulations Affect Shipments

The steel situation has experienced little relief during the past week, and dealers report themselves in very much the same position, where difficulty in obtaining material dominates the market. Dealers here state that shipments from the Canadian mills are relatvely better than where the material is coming in from the States, and as the greater amount is from the latter source, the industry is not much benefitted by the local improvement. While other factors combine to affect business, that of car shortage is probably the chief reason for present disruption. The diverting of cars for coal carrying purposes has created a partial famine in other directions, and frequently the reported improvement in production figures is counteracted by the fact that this additional output must be stored at the mills awaiting better transportation facilities to get it into the hands of dealers and consumers. Asked as to the possible result of the recent order of the Interstate Commerce Commission, to the effect that all open-top cars would be used for coal transport, one dealer stated that: "It would, perhaps, curtail the shipment of ore to the blast furnaces, and also other raw materials to the mills, but stocks now on hand would prevent any immediate shortage of finished material. The apparent difficulty at the present time is in getting this completed material from its stored position at the mill to its intended destination."

Seasonable Quietness in Tools

The machine tool situation offers little of interest just now, owing to seasonable quietness in the market. This is the general tendency, but isolated cases of good demand are now and then reported. Dealers who are awaiting shipment of equipment from the States have stated that delivery is still very uncertain owing to transportation difficulties. Several industrial firms here are temporarily held up awaiting the coming of some

heavy tools. Supplies are moving normally, with advances reported on many lines. This condition will be further emphasized should increased freight rates become effective.

Little Doing in Scrap

The market here is a repetition of continued dullness and reported sales are on a low standard. Local mills and foundries are regular buyers but the volume is not excessive. The activity of grey iron foundries, since the strike, has aided in the movement of machinery scrap, but apart from this the situation is devoid of even normal demand. Dealers are in a conservative mood and are not anxious to stock more than they require for immediate needs.

CAN GET GOODS IF THEY GO AFTER THEM

Harder to Get Material—Government Roads Have a List of Small Tools Out Now

TORONTO.—A tendency to load cars to the limit seems to be growing if a few of the cars that have crossed the line recently from U.S. points is anything to go by. One of the steel warehouses had a car placed a day or so ago and the papers showed that it had a few pounds better than sixty tons. Some of the dealers report that they are getting good service in the matter of said delivery, while in others practically nothing at all has come through. There seems to be no way of finding out when cars are likely to arrive, as some of the shipments that have slipped across are well ahead of the schedule of expectations.

There is a fair amount of machine tool business being done, but orders are not large, and the holiday season seems to have been quite an effective stop on a good deal of the trading. Several of the inquiries that are in the market now are for machines to turn out a special piece of work, preferably by automatic operation, if at all possible. Very often, in this way, if the firm is able to give good suggestions, business results in what would otherwise be a dull season. The firms that seem to be getting quite a number of inquiries are those that are able to take a man's blue prints and show him the best and the most effective way of turning out the work he requires.

Very Small Shipments

There is no general improvement in the steel market. Now and then some lucky dealer comes out with the information that he has a number of cars placed, but against this there are firms that have received nothing at all to place against the big list of orders in the office.

Bars took an increase on July 13 to $5 per 100 at some of the Canadian mills. Some of these mills, especially in the Montreal district, have been able to ship quickly, but it is unlikely that this advantage will be continued, as some of them are having labor troubles which threaten to interfere with their business. Of late the Canadian mills have not been able to do very much for the trade here in the way of bar mill products, and there are many lines that are feeling the effects.

The lack of good shipping keeps buyers guessing as to the best way to handle the material. One Hamilton firm, using trucks that will accommodate five tons, has moved as much as 150 tons now. The firm bought this material, and it was drawn some time ago when prices were less than at present, so it is really a paying proposition to use the trucks as prices have gone up considerably since the order was ready for shipment.

In one yard a car came in this week that weighed better than sixty tons. There are cars getting over now that have never carried steel before. Some of them are in poor physical shape, and the right place for them would be in the repair shops of the roads handling them.

POINTS IN WEEK'S MARKETING NOTES

Pittsburgh says that the shipments of steel have fallen behind last month. One large firm says the decrease is from 20 to 25 per cent. in its case.

When mills cannot ship, they prefer to run and pile semi-finished material, fearing that some of the finished article may not be acceptable when it gets through the rollers.

The Government railroads have a requisition out now for small tools for the Moncton shops.

New York reports state that the machine tool market there is very dull, but makers have so much business on their hands that there is not much chance of prices dropping.

The delivery of many lines of machine tools would be much improved were the shipping facilities better.

Montreal needs more cars and more coal. The lack of these hinders business in several lines.

The scrap metal market is dull. Dealers believe there may be a resumption of business later on but hold that it may be at a lower level.

One car of steel which came into a Toronto yard this week carried over 60 tons of steel.

Officials claim that cars should be loaded much nearer capacity than at present if traffic congestion is to be relieved.

Looking for Material

A man from the head of the Great Lakes with a penalty job on his hands was in Toronto a few days ago looking for reinforcing material. He was quoted cut of stock here on goods that had been taken in at a fairly high price. He went on to Montreal and left an open order there hoping to beat out the price he had received in Toronto. The chances are that he will be a long time getting his material, as many of the places turning out what he wants in the east are not supplying it now. Buyers are constantly on the road between mills and warehouses seeing what they can find. Very often a stiff warehouse price does not represent any more actual profit to the dealer than the old price. He has to pay high in the first place for his stock and it takes more money to keep a warehouse up to a well-assorted stock.

The attitude of some of the mills can best be shown by the following letter which was sent out this week by one of the large companies, showing the conditions under which they would accept business. Here are some of the conditions named:

New specifications will be accepted only on the basis of rolling and piling the material for shipment at a later date, except:

(a) Where a customer can haul material from our plant or supply barges for river shipment.

(b) Where a customer can furnish us with a privately owned car not controlled by the railroad company.

(c) Where a permit can be secured to load cars which it is not possible to load under the ruling of the Interstate Commerce Commission.

All tonnage except covered by the above will be taken with the understanding:

Shipments subject to our car supply at the time of rolling, railroad conditions in general and other conditions beyond our control. Will you kindly note on your orders whether if cars are not available at time of rolling, we shall roll, order and pile, or withdraw from schedule and roll at a later date.

All orders accepted are understood as not being subject to cancellation.

The arrival this week of some cars of plates, bars and sheets, has meant relief for several industries, as some of the shipyards were more or less embarrassed in their operations owing to the scarcity of material.

Railroads Have List Out

The National Railroads have a long list out for small tools for the Moncton shop. Strange as it may seem, dealers are more eager to do business with this shop than with others in the government ownership ring. One dealer explained it this way to Machinery: "We like to do

business with the Moncton shops because they are very quick at settling up their bills. They seem to be under separate management from the government shops that have been taken on in this district, where they keep us waiting a long time to straighten up accounts. When Moncton sends out a requisition we want the business as it is quick pay."

The last few days has been better for small tools than for some before.

Scrap Market is Poor

There is little in the scrap market. Business is very slow, and buyers are few and far between. Some of the yards fear to buy as they don't want to stack stuff. Some of them intimate that they look for a resumption of business a little later on, going so far as to couple with this the belief that the resumption will be on a lower level than the one they are trying to retain at the present time.

NEW YORK MARKET IS VERY DULL NOW

But Makers of Tools Will Have to Need Business Before Prices Come Down

NEW YORK, July 22.—Machine tool business in this market has dropped to about the lowest point in nearly a year. Most of the current orders are for single tools, and the aggregate of such orders is not very large. There is, of course, a mid-summer lull every year, but the situation is aggravated this year by the transportation conditions and the tightness of money. Moreover, many large buyers of machine tools seem to be convinced that there will be some price reductions, but it is not apparent that machine tool builders will make any move toward reducing prices until they are in greater need of orders than is the case at present. Nearly every plant is comfortably well off for two or three months, at least, and some have orders booked that will keep them busy from six months to nearly a year. Certain types of tools, however, are now to be had for earlier delivery than could have been obtained 60 days ago. There have been cancellations, and the machines cancelled have become available for sale to other customers.

The shipping situation shows improvement. It is still far from normal, but many plants are making better shipments than 30 or 60 days ago.

Most of the large industrial companies in the East have declared to sellers of tools that they are definitely out of the market, for the immediate future, at least. For example, the General and Electric Co. will make no further purchases for its old established plants, but will continue to buy such equipment as is urgently required for its new plants at Baltimore, Md., and Bridgeport, Conn. A new inquiry for one of these plants calls for fuel oil furnaces, a blower, six moulding machines and one or two machine tools.

The Willys Corporation, Elizabeth, N. J., as bought a number of tools to balance up the equipment of the new automobile plant now under construction. This plant will be in production some time in the early fall, but it will be a year before full production is reached.

BUYERS NOT URGENT, KNOWING THAT THEY CANNOT SECURE DELIVERY

Special to CANADIAN MACHINERY.

PITTSBURGH, July 22.—The iron and steel markets are extremely quiet. Consumers are buying only what they absolutely must have, and that is not a great deal. As sellers are difficult to find when it is so hard to ship it does not require a great deal of demand to give the markets an appearance of strength.

Pig iron and steel producers continue to complain of railroad conditions and it really looks as though they felt the restriction in freight movement more than the consumers. A very awkward market situation is presented. Whether values will advance or decline is almost as uncertain a question as to which way the cat will jump. In pig iron it is almost impossible to buy promp deliveries, while pig iron is piling up in furnace yards and buyers are consuming less, partly from not having as much business, partly from not getting the pig iron and partly from not getting coke or other supplies. In steel there is the situation of assured prompt deliveries still commanding premiums over deliveries in say two to four months, if the mills really succeed in making those deliveries, and such deliveries in turn being $10 or $20 a ton higher than the Steel Corporation prices, which are for delivery in rotation, the material to be shipped after present obligations to the customer are filled, whenever that may be. As the Independents have been catching up with their order books for months past while the Steel Corporation has been falling farther behind, on account of its heavy bookings, there is easily a possibility of advancing prices by independents on account of the much earlier deliveries they will be able to make, while just along the same line there is a possibility of their prices declining through their orders running out.

Shipping Conditions

It is illustrative of the spirit of the times, which is one of criticism and complaint rather than one of enthusiasm and progress, that Service Order No 7 of the Interstate Commerce Commission, requiring that priority be given to coal cars for coal mines, seems to provoke nothing but criticism and complaint, when obviously the order is necessary and is calculated to provide the greatest good for the greatest number. The coal operators insist that it does not give them any more cars, or at any rate not many more, while the blast furnace and steel interests complain that it has taken nearly all their cars away from them. The newspaper reports put it in the form that closings of steel works are "threatened" on account of the car order, as if that would be a calamity, the circumstances being that the mill warehouses and yards are filled with steel, about 2,500,000 tons, while the northwest is threatened with freezing next winter.

There is little doubt but that in general the shipments of steel thus far this month have fallen behind those in the same period of last month. One large interest reports tonnage figures that indicate a decrease of 20 to 25 per cent. So large a decrease can hardly be typical, but it is illustrative of the general situation.

Improvement in railroad conditions is all for the future, it being certain that no definite improvement has yet begun. Executive officials of the railroads seem now to be alive to the situation. One of the most prominent has admitted very publicly that the officials have not been co-operating as they should. One may infer that the lack of co-operation is due in part to the government guarantee of earnings, which was extended for six months after the return of the roads to their owners, or to September 1. It is common talk in steel circles now that the guarantee has not worked out well and hopes are entertained that when the railroads have to make their money themselves they will do better. Practically no one doubts that if the railroads fail in the test it will be impossible to oppose government ownership and operation of the roads. Shippers are, of course, utterly opposed to that, and they wish they could be sure that the railroad officials are equally opposed. The problem is to get more efficiency out of the physical equipment now existing. Buying cars would not help, the difficulty now being that there are more cars than are being moved, and as to enlargement of yards and terminals, which seems absolutely necessary, that will require years of time. Daniel Willard, president of the Baltimore & Ohio and chairman of the executive committee set up July 1 by the railroad officials, says the best average freight car movement was in 1913, 26.9 miles a day (while of late of course the movement has been vastly less) when the roads ought to and probably can move cars 30 miles a day, that 32 per cent. of the movement is empty, when this proportion could be reduced, and that cars are loaded to only 70 per cent. of capacity, a proportion that must be

increased. If the other railroad officials, and the shippers, will co-operate the traffic situation can be greatly improved.

Mill Closings

While much has been said of closing of mills there is no definite evidence that the production of steel has declined from the June rate, which was very good. The difference is in finished product, as finishing departments have been closed or have been running at reduced rates, semi-finished steel therefore accumulating. The idea is that the semi-finished steel can be piled more rapidly than the finished product, and that steel now finished to customers' specifications might prove quite unacceptable months hence when the material would be shipped. While this procedure has some objectionable features the influence upon labor is very satisfactory. The more steel that is piled the more the men value their jobs. When finishing departments are closed the mills always endeavor to arrange closings in rotation so that the men will not lose time for long periods. The labor situation is described as fairly satisfactory, but eminently satisfactory as compared with conditions in some other industries.

Pig Iron

Both Bessemer and basic pig iron have sold at $46, valley, or $1 advance, while foundry iron remains quotable at $45, valley. This, however, is almost a nominal quotation, as prompt deliveries only are inquired for and prompt deliveries are scarcely to be had. One large interest has made a few sales at $45 in the past few days, but states that the sales have been made to old customers only, inquiries from new sources being turned down flat. The question is which will come first, a buying movement or a selling movement. Some consumers of foundry iron covered only for the first half of this year but as deliveries were delayed, they still have iron due them enough to run into September, as an average period. and some of this iron is at $28.75, valley, so that it would be quite a jump for such consumers to have to pay $45 on their next purchases. Connelsville coke for spot shipment is about $18 to $18.50 for furnace and $19 to $19.50 for foundry, per net ton at ovens, when 14 months ago furnace coke sold at $3.50. Thus while pig iron prices are high a blast furnace may easily be in the position of losing money.

U.S. SCRAP METAL

The scrap market is decidedly slow with indications of softening; however prices remain the same as quoted a week ago with a few exceptions. The car shortage is still acutely felt and the special switching regulations relative to the Chicago district are a great deterrent to business there. There is a reason to believe that other mills will come into the market shortly for old material, and dealers stocks are being held to await this movement.

PIG IRON TRADE

The pig iron market continues to remain irregular on account of the fuel and transportation situation. Sales of fairly large quantities of standard basic iron have just been concluded in the Pittsburgh area for $46. Valley furnace basis and another advance of $1 per ton has been established. There is practically no change in the summer dullness, and there is no buying in great bulk. Prices hold firm on account of lack of fuel and transportation difficulties. $46 furnace is being quoted for the remainder of this year and frst half of next by the Virginia Iron, Coal and Coke Co. This is $1 lighter than the average price for the remainder of the year. There has been active enquiry for export but shipping conditions are too discouraging for anything to materialize.

INQUIRE ABOUT CANADIAN TRADE

Several Firms Want to Get Material and Manufactured Lines From This Country

Enumerated under are a list of foreign firms wishing Canadian trade, Canadian industries interested may obtain full particulars on quoting the indentification numbers to the Intelligence Branch of the Department of Trade and Commerce at Ottawa.

No. 1289. A firm in Roumania desires to receive quotations and other particulars from Canadian firms in a position to export iron.

No. 1290. A young Brazilian firm of general import agents in Rio de Janerio, wish to hear from manufacturers and exporters of paints and varnishes, motor cars, lorries and accessories, pumps (centrifugal, etc.), equipment, machine tools, shaft hardware, brass goods, saw mill machinery, dairy equipment, shovels and tools, bicycles.

No. 1291. A Brazilian firm of general importers in Rio de Janerio wish to import agricultural machinery, metal working machinery, hardware of all kinds, copper and brass sheets, brass and pipes, lubricating oils, paints and varnishes and textiles from Canada.

The Week's Events in Montreal Industry

Jenkins Bros., of Montreal, have just completed a new addition to their plant, and this section will be used for the machining of iron valves which they will now manufacture. This will increase the factory floor space by about 16,000 sq. ft. The opening was inaugurated by a social evening to all the employees and the installation of the necessary equipment will be proceeded with immediately.

Following the developments that will eventually give Montreal additional electrical equipment for the pumping of water at the low level pumping station, the League of Proprietors. at a recent meeting, passed a resolution condemning the proposed contract that had been contemplated for the supplying of electrical energy. The objection is based on the belief that the term of twenty-five years is too long, as changing conditions may make it possible for the city to obtain power at a cheaper rate. The commissioners have decided to call for tenders in connection with these power requirements.

H. T. Bates of London, Eng., is at present in Canada negotiating with different Canadian manufacturing firms with a view of getting some firm to take on the production of certain portions of electric welding equipment. Mr. Bates states that many British firms are reaching out to new fields, both in the way of direct trade and also in the establishment of branch factories to manufacture their products. Mr. Bates is representing the Alloy Welding Process Ltd.; Fuller's United Electric Works, S. Wolf and Company, and the Twiss Engineering and Electric Transmission Company, all of London.

In view of the feeling that has existed for some time among business men in Canada it is not expected that any strenuous objection will be made to the proposed advance of 30 per cent. in freight rates. Should this increase become effective the rate will be practically double what it was before the war. Speaking at the Montreal Board of Trade one of the members stated: "We do not look for any strenuous opposition to the present demand for an increase in freight rates. We have known for months past that such an advance must come. On the last advance of 25 per cent., which was made in August, 1918, the Montreal Board of Trade took the ground that it would not oppose such an advance if the Board of Railway Commissioners found it warranted. That will be the probable attitude taken by the board now."

A Complete Line 8 in. to 50 in. Swing

with or without tapping attachment

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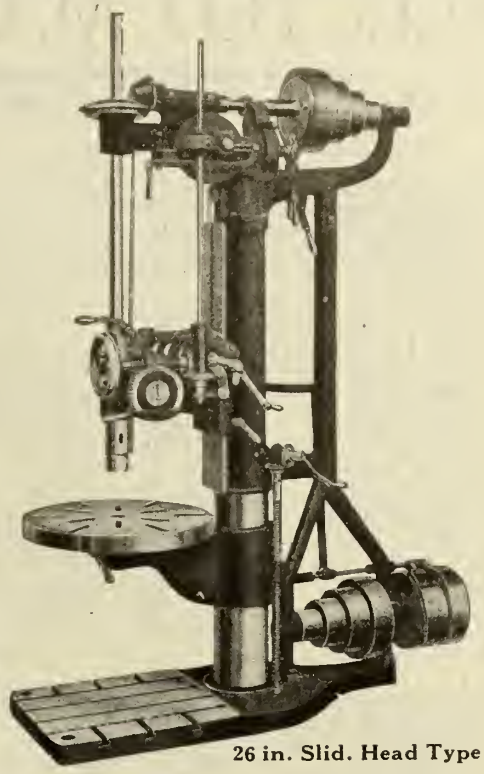
Upright Drills
Horizontal Drills
Gang Drills

Accuracy—Strength
Convenience of Operation

If it's machinery write "Williams"



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MONTREAL ST. JOHN, N.B. WINNIPEG VANCOUVER HALIFAX BUFFALO, N.Y.

Gray Iron and Semi Steel Castings of all Descriptions

From 5 lbs. up to 4 tons

Foundry capacity, 15 tons per day.

Difficult castings our specialty.

Mixtures regulated by chemical analysis and all castings sandblasted.

Estimates from blue prints submitted promptly.

If desired, we can make patterns to your drawings.

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Undoubtedly he who abuses them.

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a leaflet entitled

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See that your employes read this leaflet.

Be File-wise.

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Ingersoll, Ontario.

INGERSOLL

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$42 40
Lake Superior, charcoal, Chicago.	57 00
Standard low phos., Philadelphia.	50 00
Bessemer, Pittsburgh	43 00
Basic, Valley furnace	42 90
Toronto price:—	
Silicon, 2.25% to 2.75%	52 00
No. 2 Foundry, 1.75 to 2.25%	50 00

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	$ 5 50
Steel bars, base, Toronto	5 50
Iron bars, base, Montreal	5 50
Steel bars, base, Montreal	5 50
Reinforcing bars, base	5 00
Steel hoops	7 00
Norway iron	11 00
Tire steel	5 75
Spring steel	10 00
Band steel, No. 10 gauge and 3-16 in. base	6 00
Chequered floor plate, 3-16 in.	8 40
Chequered floor plate, ¼ in.	8 00
Bessemer rails, heavy, at mill	....
Steel bars, Pittsburgh	3 00-4 00
Tank plates, Pittsburgh	4 00
Structural shapes, Pittsburgh	3 00
Steel hoops, Pittsburgh	3 50-3 75
F.O.B., Toronto Warehouse	
Small shapes	4 25
F.O.B. Chicago Warehouse	
Steel bars	3 62
Structural shapes	3 72
Plates	3 67 to 5 50
Small shapes under 3"	3 62
	C.L. L.C.L.

FREIGHT RATES

Per 100 Pounds.

Pittsburgh to Following Points		
Montreal	33	45
St. John, N.B.	41½	55
Halifax	49	64½
Toronto	27	39
Guelph	27	39
London	27	39
Windsor	27	39
Winnipeg	89½	135

METALS

	Gross. Montreal	Toronto
Lake copper	$25 00	$24 00
Electro copper	24 50	24 00
Castings, copper	24 00	24 00
Tin	62 00	65 00
Spelter	11 50	12 00
Lead	10 75	11 00
Antimony	13 00	14 00
Aluminum	34 00	36 00

Prices per 100 lbs.

PLATES

Plates, 3-16 in.	$ 7 25	$ 7 25
Plates, ¼ up	6 50	6 50

PIPE—WROUGHT

Price List No. 44—April, 1920.

STANDARD BUTTWELD S/C

	Steel		Gen. Wrot. Iron	
	Black	Galv.	Black	Galv.
⅛ in.	$6 50	$ 8 50	....	....
¼ in.	5 13	7 26	$ 5 43	$ 7 56
⅜ in.	5 13	7 26	5 43	7 56
½ in.	6 84	8 42	7 27	8 84
¾ in.	8 45	10 58	9 03	11 16
1 in.	12 50	15 64	13 35	16 49
1¼ in.	16 91	21 16	18 06	22 31
1½ in.	20 21	25 30	21 59	26 68
2 in.	27 20	34 04	29 05	35 89
2½ in.	43 00	53 82	....	....
3 in.	56 23	70 38	....	....
3½ in.	71 30	88 32	....	....
4 in.	84 48	104 64	....	....

STANDARD LAPWELD S/C

	Steel		Gen. Wrot. Iron	
	Black	Galv.	Black	Galv.
2 in.	$30 90	$37 74	$34 60	$41 44
2½ in.	45 34	56 16	51 19	62 01
3 in.	59 29	73 44	66 94	81 09
3½ in.	73 14	90 16	82 34	99 36
4 in.	86 66	106 82	97 56	117 72
4½ in.	0 98	1 23	1 24	1 49
5 in.	1 15	1 44	1 44	1 73
6½ in.	1 49	1 86	1 87	2 25
7 in.	1 94	2 43	2 42	2 90
8-L in.	2 04	2 55	2 54	3 05
8 in.	2 35	2 94	2 92	3 51
9 in.	2 81	3 52	3 50	4 21
10-L in.	2 61	3 26	3 25	3 90
10 in.	3 36	4 20	4 18	5 03

Prices—Ontario, Quebec and Maritime Provinces

WROUGHT NIPPLES

4" and under, 60%.
4½" and larger, 50%.
4" and under, running thread, 30%.
Standard couplings, 4-in. and under, 30%.
Do., 4½-in. and larger, 10%.

OLD MATERIAL

Dealers' Average Buying Prices.

	Per 100 Pounds. Montreal	Toronto
Copper, light	$15 00	$14 00
Copper, crucible	18 00	18 00
Copper, heavy	18 00	18 00
Copper wire	18 00	18 00
No. 1 machine composition	16 00	17 00
New brass cuttings	11 00	11 75
Red brass cuttings	14 00	15 75
Yellow brass turnings	8 50	9 50
Light brass	7 00	7 00
Medium brass	8 00	7 75
Scrap zinc	6 50	6 00
Heavy lead	7 50	7 75
Tea lead	4 50	5 00
Aluminum	19 00	20 00
	Per Ton	Gross
Heavy melting steel	18 00	18 00
Boiler plate	15 50	15 00
Axles (wrought iron)	22 00	20 00
Rails (scrap)	18 00	18 00
Malleable scrap	25 00	25 00
No. 1 machine east iron.	32 00	33 00
Pipe, wrought	12 00	12 00
Car wheel	26 00	26 00
Steel axles	22 00	20 00
Mach. shop turnings	11 00	11 00
Stove plate	26 50	25 00
Cast boring	12 00	12 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, 7-16 and up	+10
Carriage bolts, ⅜-in. and less	Net
Coach and lag screws	—15
Stove bolts	55
Wrought washers	—25
Elevator bolts	+10
Machine bolts, 7-16 and over	+10
Machine bolts, ⅜-in. and less	+10
Blank bolts	Net
Bolt ends	Net
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	+25
Machine screws, fl. and rd. hd., brass	**net**
Machine screws, o. and fil. hd., brass	**net**
Nuts, square, blank	+25 add $2 00
Nuts, square, tapped	add 2 25
Nuts, hex., blank	add 2 50
Nuts, hex., tapped	add 3 00
Copper rivets and burrs, list less	15
Burrs only, list plus	25
Iron rivets and burrs	40 and 5
Boiler rivets, base ¾" and larger	$8 50
Structural rivets, as above	8 40
Wood screws, O. & R., bright	75
Wood screws, flat, bright	77½
Wood screws, flat, brass	55
Wood screws, O. & R., brass	55½
Wood screws, flat, bronze	50
Wood screws, O. & R., bronze	47½

MILLED PRODUCTS

(Prices on unbroken packages)

	Per Cent
Set screws —20% 25 and	5
Sq. and hex. hd. cap screws	12½
Rd. and fil. hd. cap screws	plus 25
Flat but. hd. cap screws	plus 50
Fin. and semi-fin. nuts up to 1-in.	12½
Fin. and Semi-fin. nuts, over 1 in., up to 1½-in.	—5
Fin. and Semi-fin. nuts over 1½ in., up to 2-in.	+12½
Studs	+5
Taper pins	—12½
Coupling bolts	+40
Planer head bolts, without fillet, list	+45
Planer head bolts, with fillet, list plus 10 and	+55
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	+60
Collar screws	list plus 20, 30
Thumb screws	40
Thumb nuts	75
Patch bolts	add +85
Cold pressed nuts to 1½ in.	add $1 00
Cold pressed nuts over 1½ in.	add 2 00

BILLETS

	Per gross ton
Bessemer billets	$60 00
Open-hearth billets	60 00
O.H. sheet bars	76 00
Forging billets	56 00-75 00
Wire rods	52 00-70 00

Government prices.

F.O.B. Pittsburgh.

NAILS AND SPIKES

Wire nails, base	$6 10
Cut nails, base	7 00
Miscellaneous wire nails	50%

ROPE AND PACKINGS

Plumbers' oakum, per lb.	0 10¼
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 35½
British Manila rope	0 28
New Zealand hemp	0 28

POLISHED DRILL ROD

Discount off list, Montreal and Toronto ..... net

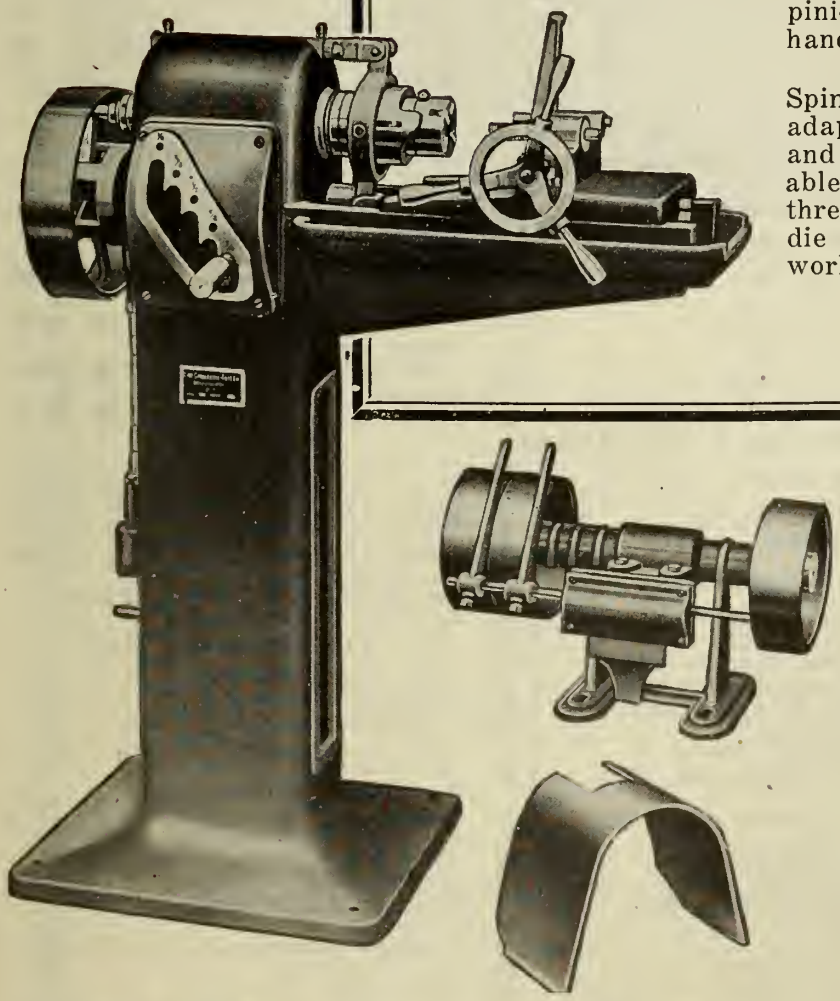
THE GEOMETRIC WAY

Where quantity and exactness have to be considered, the Geometric Threading Machine is just the way that suits. These machines have been tested and proved over and over again on speed, accuracy and endurance.

Geometric Threading Machines are employed on a large class of small threaded parts that cannot be produced economically on the ordinary screw machine.

Made in three sizes—to cut ⅛ to ½ inch, ¼ to ¾ inch, and ¾ to 1½ inch diameter threads. The carriage is mounted on slides and on the largest size machine is moved back and forth by rack and pinion, and in the smaller sizes by hand.

Spindle speed changes readily made, adapting the machine to the diameter and material of the work. An adjustable stop assures accurate length of thread, and automatically opens the die head, permitting of drawing the work straight back.



A line from you brings full details regarding this machine. Tell us your threading requirements—let us recommend the proper Geometric Collapsing Tap or Self-opening Die.

THE GEOMETRIC TOOL COMPANY

NEW HAVEN CONNECTICUT

Canadian Agents:

Williams & Wilson, Ltd., Montreal. The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg, St. John, N.B.

Canadian Fairbanks-Morse Co., Ltd., Manitoba, Saskatchewan, Alberta.

If interested tear out this page and place with letters to be answered

MISCELLANEOUS

Solder, strictly	$ 0 35
Solder, guaranteed	0 39
Soldering coppers, lb.	0 62½
White lead, pure, cwt.	20 35
Red dry lead, 100-lb. kegs, per cwt.	16 00
Gasoline, per gal., bulk	0 38
Pure turp., single bbls., gal.	3 15
Linseed oil, raw, single bbls.	2 37
Linseed oil, boiled, single bbls.	2 40
Wood alcohol, per gal.	4 00
Whiting, plain, per 100 lbs.	3 00

CARBON DRILLS AND REAMERS

S.S. drills, wire sizes	32½
Can. carbon cutters, plus	20
Standard drills, all sizes	32½
3-fluted drills, plus	10
Jobbers' and letter sizes	32½
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	50
Sleeves	50
Taper pin reamers	25 off
Drills and countersinks	net
Bridge reamers	50
Centre reamers	10
Chucking reamers	net
Hand reamers	10
High speed drills, list plus	20 to 40
Can. high speed cutters, net to plus	10
American	plus 40

COLD ROLLED STEEL

[At warehouse]

Rounds and squares	$7 base
Hexagons and flats	$7.75 base

IRON PIPE FITTINGS

	Black	Galv.
Class A	60	75
Class B	27	37
Class C	18	27

Cast iron fittings, 5%; malleable bushings, 22½%; cast bushings, 22½%; unions, 37½%; plugs, 20% off list.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$ 8 50	$ 9 50
Sheets, Blue ann., No. 10	8 50	9 00
Canada plates, dull, 52 sheets	8 50	10 00
Can. plates, all bright	8 60	9 00
Apollo brand, 10¾ oz. galvanized	....	....
Queen's Head, 28 B.W.G.	11 00	....
Fleur-de-Lis, 28 B.W.G.	10 50	....
Gorbal's Best, No. 28	....	....
Colborne Crown, No. 28.	....	....
Premier, No. 28, U.S.	11 50	10 50
Premier, 10¾-oz.	11 50	10 90
Zinc sheets	16 50	20 00

PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13.00; 5-16, $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ¼ in., $9.75; ⅞ in., $9.20; ¾ in., $9.30; ⅝ in., $9.50; 1 in., $9.10; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $13.00; 5-16 in., $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.50; ¾ in., $9.30.

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

BOILER TUBES.

Size.	Seamless	Lapwelded
1 in.	$27 00	$.....
1¼ in.	29 50	.....
1½ in.	31 50	29 50
1¾ in.	31 50	30 00
2 in.	35 00	30 00
2¼ in.	35 00	29 00
2½ in.	42 00	37 00
3 in.	50 00	48 00
3¼ in.	.. ..	48 50
3½ in.	63 00	51 50
4 in.	85 00	65 50

Prices per 100 ft., Montreal and Toronto

OILS AND COMPOUNDS.

Castor oil, per lb.	
Royalite, per gal., bulk	27½
Palacine	30½
Machine oil, per gal.	54½
Black oil, per gal.	28
Cylinder oil, Capital	82½
Petroleum fuel oil, bbls., net	.18

BELTING—No 1 OAK TANNED

Extra heavy, single and double	6½
Standard	6½
Cut leather lacing, No. 1	2 00
Leather in side	2 40 3 00

TAPES

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	$4 60
Polishing wheels, bull-neck	2 00
Emery in kegs, Turkish	09
Pumice, ground	06
Emery glue	30
Tripoli composition	09
Crocus composition	12
Emery composition	11
Rouge, silver	60
Rouge, powder, nickel	45

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	.08½
Grits, 80 and finer	.6

BRASS—Warehouse Price

Brass rods, base ½ in. to 1 in. rod	0 34
Brass sheets, 24 gauge and heavier, base	$0 42
Brass tubing, seamless	0 46
Copper tubing, seamless	0 48

WASTE

XXX Extra	.24	Atlas	.20
Peerless	.22½	X Empire	.19½
Grand	.22½	Ideal	.19
Superior	.22½	X Press	.17½
X L C R	.21		

Colored

Lion	.17	Popular	.13
Standard	.15	Keen	.11
No. 1	.15		

Wool Packing

Arrow	.35	Anvil	.22
Axle	.28	Anchor	.17

Washed Wipers

Select White	.20	Dark colored	.09
Mixed colored	.10		

This list subject to trade discount for quantity.

RUBBER BELTING

Standard ... 10% Best grades... 15%

ANODES

Nickel	.55 to .60
Copper	.38 to .40
Tin	.70 to .70
Zinc	.16 to .17

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	$42 50	$43 00
Copper wire, list plus 10.		
Plain sheets, 14 oz., 14x60 in.	46 00	44 00
Copper sheet, tinned, 14x60, 14 oz.	48 00	48 00
Copper sheet, planished, 16 oz. base	46 00	45 00
Braziers', in sheets, 6 x 4 base	45 00	44 00

LEAD SHEETS

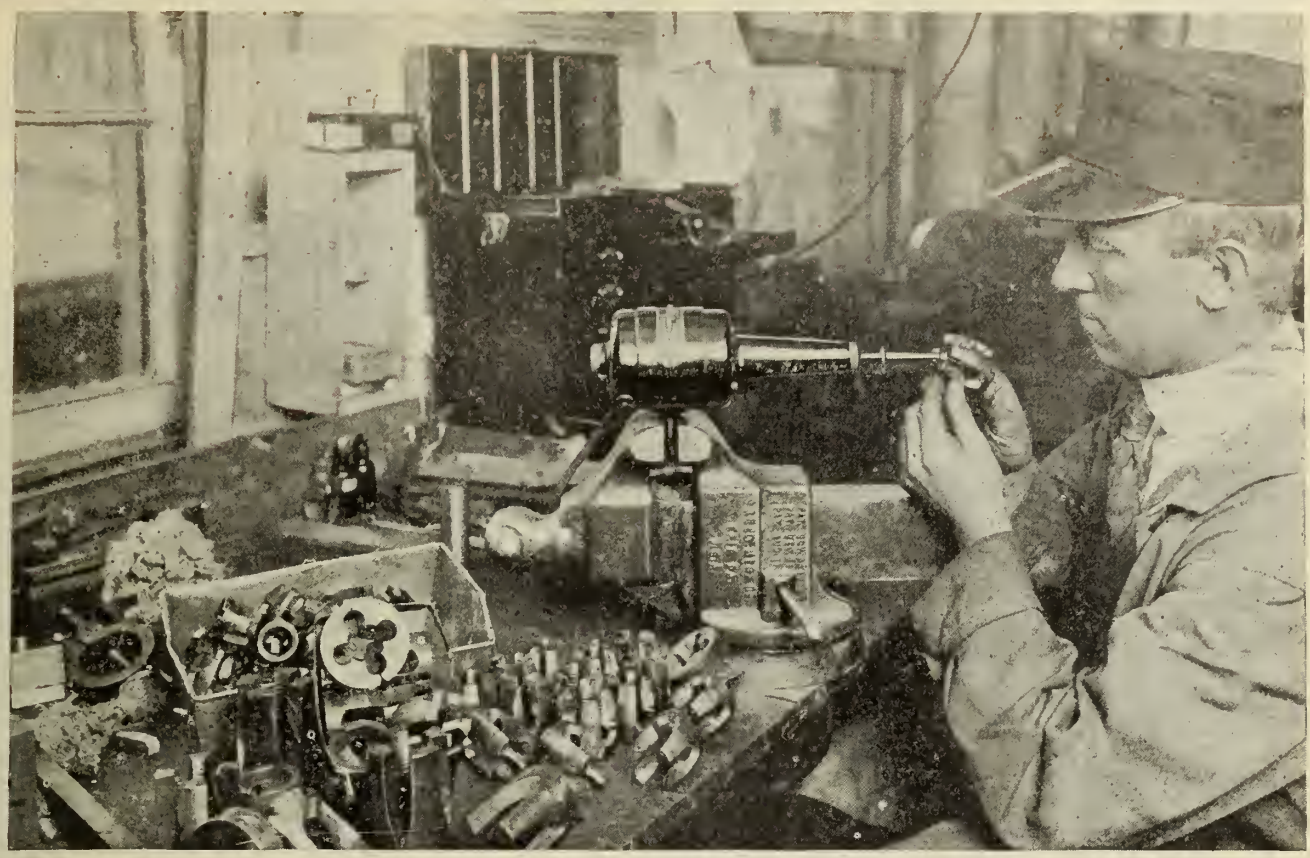
	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$10 75	$14 50
Sheets, 3½ lbs. sq. ft.	10 50	14 00
Sheets, 4 to 6 lbs. sq. ft.	10 25	13 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS

Acid, boracic	$ .23
Acid, hydrochloric	.04
Acid, nitric	.11
Acid, sulphuric	.04
Ammonia, aqua	.15
Ammonium, carbonate	.23
Ammonium, chloride	.22
Ammonium hydrosulphuret	.75
Ammonium sulphate	.30
Arsenic, white	.14
Copper, carbonate, anhy.	.41
Copper, sulphate	.15
Cobalt, sulphate	.20
Iron perchloride	.62
Lead acetate	.30
Nickel ammonium sulphate	.20
Nickel carbonate	.32
Nickel sulphate	.22
Potassium sulphide (substitute)	.42
Silver chloride (per oz.)	1.30
Silver nitrate (per oz.)	1.25
Sodium bisulphate	.14
Sodium carbonate crystals	.06
Sodium cyanide, 127-130%	.38
Sodium hyposulphite per 100 lbs	8.00
Sodium phosphate	.15
Tin chloride	.80
Zinc chloride, C.P.	.30
Zinc sulphate	.10

Prices per lb. unless otherwise stated



These Dies Produce Set Screws by the Million

HERE is an interesting photograph of one of the Dumore Grinders in operation in the Hartford, Conn., plant of the Allen Manufacturing Co., where safety set screws are produced by the million. To maintain this enormous production many dies are necessary, and a large number must always be held in reserve. Day in, day out, all year 'round an operator is busy sharpening dies. Because of the importance of this work, and its difficult character, it is natural that the Dumore Grinder has been chosen for the job.

Chatter-marks, taper and bell-mouth are eliminated through the use of a Dumore.

And the two reasons for this lie in the high spindle speed and dynamic balance of the armature. Even small wheels are thus given the correct cutting speed without a possibility of vibration. The Dumore Grinder is light and portable—easily carried from one part of a shop to the other and quickly set up on a lathe, shaper or milling machine.

Most jobbers carry Dumore Grinders. They will be glad to demonstrate what these handy tools can do for you. Look into the matter today.

WISCONSIN ELECTRIC COMPANY

2925 Sixteenth Street **RACINE, WISCONSIN**

DUMORE HIGH SPEED GRINDERS

If interested tear out this page and place with letters to be answered.

Canadian Exhibition in London Not a Success

Causes Working to This End Set Forth in a Report from One of the Trade Commissioners—Many of the Exhibits Were Slow in Arriving—The Season Was Not a Suitable One.

By HARRISON WATSON, Trade Commissioner

LONDON.—It is to be feared that the Canadian Industries Exhibition, which was held at the Royal Agricultural hall, London, from June 7 to 19, failed to realize the hopes of many of the Canadian exhibitors, because the attendance both of the trade and the public was disappointing, although it improved somewhat towards the close of the exhibition. This was particularly regrettable because, while the display was not representative of all Canadian industries, several important Canadian manufacturers exhibited, and the general display was quite attractive.

The inception of the Canadian Industries Exhibition, which was actually the first of its kind held in this country—although Canadian industries had been represented to some extent in previous Canadian Government exhibitions—was due to an offer made last summer to Mr. Lloyd Harris, chairman of the Canadian Mission in London, by Mr. H. Greville Montgomery, an experienced manager of London trade exhibitions, who, having secured the Agricultural hall for a fortnight in June, suggested that the holding of an exhibition of the products of Canadian industries would advantageously supplement the propaganda work which the mission was carrying on.

Unfortunately, however, ill-fate has dogged the venture almost throughout.

By the time the organizer arrived in Canada last October, many of the leading manufacturers had become extremely busy owing to the revival of an active home market and saw no prospect of being able to deal with export trade; and although sufficient exhibitors were secured to warrant the carrying out of the project, a number of manufacturers who originally promised to make displays subsequently found it impossible to do so.

A further misfortune, and indeed a severe blow to the prospects of the exhibition, was that resulting from delay in transportation and delivery; the bulk of the exhibits were lying at the London docks at the time originally advertised for the opening of the exhibition, which necessitated its postponement for several days and naturally caused general disorganization.

In any case, the wisdom of holding a trade exhibition—and a new venture at that—during the height of the summer and of the London season is extremely questionable.

The original intention was to hold an exclusively trade exhibition, admission to which would be limited to invitations, but it was subsequently decided that, owing to the participation of the Canadian railways and similar features, the public should be admitted by payment during the afternoons and evenings, and this certainly led some of the exhibitors to expect a much larger attendance of the public than resulted, and for this reason doubtlessly some of the exhibitors neglected to personally circularize firms in their trade, as is customary in trade exhibitions in this country. Upon the other hand it should be emphasized that several of the manufacturers who made comprehensive displays and personally invited prospective customers to call and inspect samples, reported excellent results, and many of them stated that they could have secured very large orders if they had been in a position to fill them.

While there was a certain amount of justification in the complaints made by the exhibitors generally that the exhibition had not been sufficiently advertised, the results of subsequent action taken in this direction was rather to attract persons wishing to view the free displays of Canadian films made by the Canadian Pacific Railway Company than business men wishing to inspect the manufacturers' stalls.

As a matter of fact the management stated that they had issued invitations to some 30,000 business firms, including several thousand names furnished by the Canadian Government Trade Commissioners in this country as known to be interested in Canadian products. The management also reported upon the conclusion of the exhibition that the number of persons who paid for admission at the turnstiles aggregated about 12,000; and while no exact check was kept of the number of visitors presenting complimentary tickets, it was estimated that they approximated between 25,000 and 30,000.

It must also be borne in mind that while the trade exhibitions which are annually held in London and elsewhere are established events, with perfected organizations, the Canadian Industries Exhibition was an entirely new departure, and as such bound to encounter initial difficulties.

A subject of criticism was that the scope of the exhibition was too general, except for propaganda purposes, because the regular series of trade exhibitions referred to above limit themselves to particular branches of trade which appeal to persons engaged in that trade or industry; and it was frequently stated that no particular trade was sufficiently represented at the Canadian Industries Exhibition to repay the ordinary busy buyer for the loss of time involved in a special visit to Islington.

It might be suggested, moreover, that should further exhibitions of this kind be held, the exhibitors should beforehand organize a committee of Canadian representatives to supplement the efforts of the management, which would tend to better co-operation and unification.

To return, however, to the exhibition itself. Although it was a private venture with which the Canadian Government was in no way connected, Sir George Perley, the High Commissioner for Canada, had accepted an invitation to perform the opening ceremony, but owing to other pressing engagements found it impossible to be present upon the postponed date, so the inauguration was kindly undertaken, at short notice, by Sir George McLaren Brown, European manager of the Canadian Pacific Railway Company.

The exhibits, although insufficient to necessitate the utilization of the galleries and outside halls, comfortably filled the whole of the ground floor, and included much that was interesting and attractive.

While, as will be observed from the list of exhibitors which is given later on, several industries, notably heavy iron and steel, and confectionery, were well represented, the display was far from representative of Canadian resources, a notable omission being the pulp, paper and associated industries, with the exception of wall-paper.

It will be noticed, however, that a number of displays were made by the resident agents and distributors in the United Kingdom, several of whom reported being disappointed at the last moment of exhibits which they had confidently expected.

The largest and most comprehensive exhibit of all was made by the Canadian Pacific Railway Company, which also provided the free displays of films already alluded to and rendered every possible support to the management by liberally advertising the exhibition. The Canadian National Railways also made a tasteful display.

It should also be mentioned that the newspapers The Canadian Gazette and Canada both had stalls at the exhibition and indeed did everything in their power to contribute to the success of the undertaking.

In view of the original close connection of the project with the Canadian Mission in London, its successors, the Overseas Branch of the Department of Trade and Commerce, agreed to maintain an office in the exhibition, where an official was in constant attendance. The

ATKINS
METAL CUTTING SAWS

Solve your Metal Cutting problems, easily, quickly and economically, by adopting the products made by

ATKINS

We make Kwik-Kut Power Hack Saw Machines which use practically the full cutting edge of the Hack Saw Blade at each stroke; Metal Cutting Band Saw Machines for general shop work, cutting all classes of metal up to 12 x 14 inches.

Your requirements for Metal Cutting Circular Saws can be supplied promptly and we solicit a trial of our "AAA" Non-Breakable and Power Hack Saw Blades and Frames.

"A Better Saw for Every Use"

E. C. Atkins & Co.

Established 1857

"The Sterling Quality Saw People"

Factory: HAMILTON, ONT

Branch: VANCOUVER, B C.

THE FINEST ON EARTH

If interested tear out this page and place with letters to be answered

three Canadian Trade Commissioners who are at present in the United Kingdom—the Bristol and Liverpool Commissioners being at present in Canada—spent several days at the exhibition, interviewing the exhibitors in the endeavour to supply information about export openings, and to render all possible assistance.

List of Exhibitors

Iron, Steel, Hardware, etc.—Dominion Iron and Steel Co., Ltd., Sydney, N. S.; Steel Company of Canada, Hamilton; Nova Scotia Steel and Coal Co., Ltd., New Glasgow, N. S.; Sheet Metal Products Co., Ltd., Toronto; Dominion Steel Products Co., Ltd., Brantford, Ont.; British Smelting and Refining Co., Ltd., Montreal; Champion Spark Plug Co., of Canada, Ltd.; C. A. Dunham Co., Ltd., Toronto; Gillette Safety Razor Co., of Canada, Ltd.; Hoover Suction Sweeper Co., Ltd., Hamilton; Canada Cycle and Motor Co., Ltd., Weston, Ont.; Machine and Stamping Co., Ltd., Toronto; Maxwells, Ltd., St. Mary's, Ont.; J. H. Connor & Sons, Ltd., Ottawa; Whitman & Barnes Manufacturing Co., St. Catharines, Ont.

Machinery—Spramotor Co., London, Ont.; Massey-Harris, Co., Ltd., Toronto; London Gas Power Co., Ltd., London, Ont.; Chase Tractors Corporation, Ltd., Toronto; Acadia Gas Engines, Ltd., Bridgewater, N. S.

Chocolates and Confectionery—Willard's Chocolates, Ltd., Toronto; Canadian Biscuit and Confectionery Export Co., Ltd., Toronto, exhibiting for: Cowan & Co., Ltd., Toronto; McCormick Mfg. Co., London, Ont.; C. J. Bodley Co., Ltd., Toronto; Wm. Neilson, Ltd., Toronto; Patterson Candy Co., Ltd., Toronto; Maple Tree Producers Association, Ltd., Montreal.

Pianos, etc,—Bell Piano and Organ Co., Ltd., Guelph; Williams Piano Co., Ltd., Oshawa; Sheriock-Manning Piano and Organ Co., Ltd., London; Doherty Piano Co., Ltd., Clinton, Ont.

Furniture, etc.—McLagan Furniture Co., Ltd., Stratford, Ont.; Simmons, Ltd.; Arnprior Cabinet Co., Arnprior, Ont.; Kindel Bed Co., Ltd., Stratford, Ont.

Chemicals, etc.—Shawinigan, Ltd., representing:—Canadian Electric-Products Co., Ltd., and Canada Carbide Co., Ltd.; Canadian Bronze Powder Works, Ltd., Montreal; Palmolive Co., Ltd., Toronto; Channell Chemical Co., Ltd., Toronto.

Wall-paper—Stauntons, Ltd., Toronto; Reg. N. Boxer Co., Ltd., Toronto.

Leather—Breithaupt Leather Co., Ltd., Kitchener, Ont.; C. H. Peters' Sons, Ltd., St. John, N. B.

Miscellaneous — Canadian Polishes, Ltd., Hamilotn; Imperial Varnish and Colour Co., Ltd., Toronto; Canadian Bee Supply and Honey Co., Ltd., Toronto; E. D. Smith & Son, Ltd., Winona, Ont.

United Kingdom Merchants and Distributors handling various miscellaneous lines—John B. Keeble & Co., Ltd., acting for—Meakins & Sons, Ltd.; Stratford Mfg. Co., Ltd.; Schultz Bros. Co.; Canadian Veneering Co.; Springer Lock Mfg. Co.; Gavenite Products, Ltd.; Canadian Woodenware Co.; Megantic Broom Mfg. Co.

Export Associating of Canada, Ltd., representing—A. Ramsay & Son Co.; C. O. Clark & Bro.; Martin-Orme Piano Co.; McClary Mfg. Co.; Eaton & Sons, Ltd.; Windsor Phonograph and Record Co.

British Canadian Export Co., Ltd., representing — The Barnet-Canadian Kitchen Cabinet and other Renfrew industries.

Canada Overseas Trading Co., Ltd. showing British Columbia salmon, timber, also canned fruits, jams, etc.

A. H. Parker & Sons, Ltd., Bristol, acting for—Maritime Fish Corporation; Eastern Canneries, Ltd.; Saskatchewan Co-operative Creameries, Ltd.; Canadian Cereal and Flour Mills Co.

C. H. Dudemore & Co., Ltd., exhibiting models of British Columbia wooden houses; Dominion Machinery Co., Ltd., representing the "Ellot" woodworking machine and a variety of Canadian machinery.; S. D. Simond & Co., Ltd., showing—Maple products, mincemeat, and various canned and preserved goods.

C. H. Baber: Boots and shoes of—Blachford Shoe Mfg. Co., Ltd; Scott-Chamberlain, Ltd.; Getty & Scott; Nursery Shoe Co.

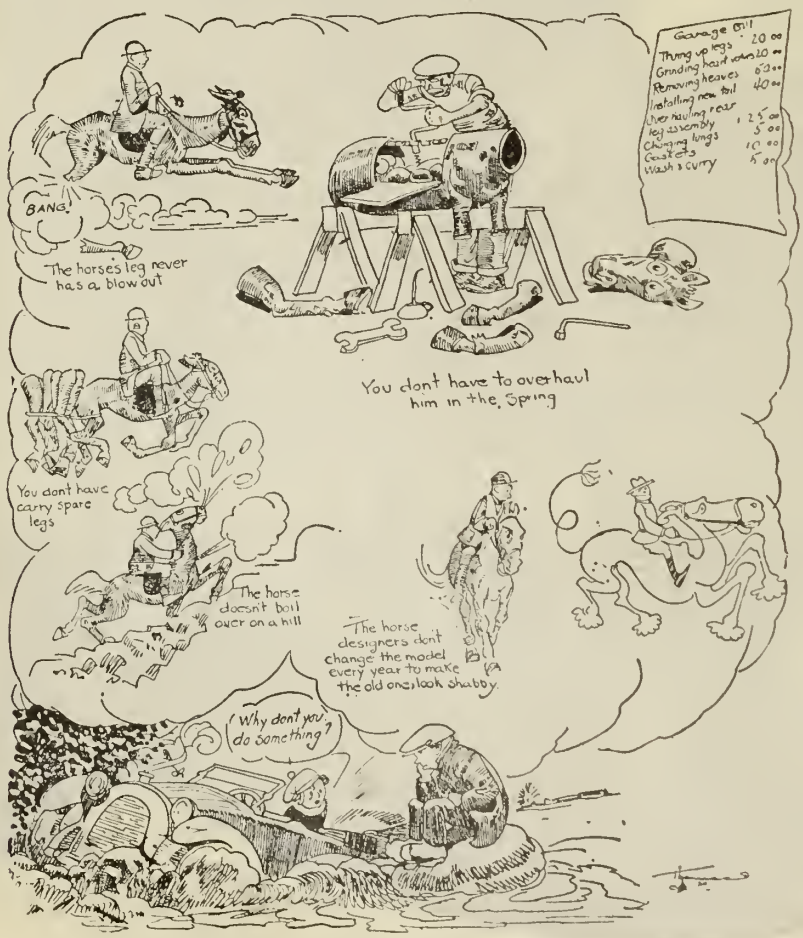
Dominion Industries, Ltd., exhibiting a wide range of Canadian manufactured products.

Sydney Smith: flour, grain and feed products.

Hill, Seddon & Co., representing—Sales, Ltd., H. Levy & Sons, Ltd., Basque Chemical Co., Non-Such Mfg. Co., Satinette Products Mfg., Co., Normandy Tire and Rubber Co., Smalls, Ltd.

T. M. Stevens & Co., showing different grades of British Columbia salmon and fruits.

When a Motorist Loves a Horse


Garage Bill
Thring up legs 20 00
Grinding heart valves 20 00
Removing heaves 60 00
Installing new tail 40 00
Overhauling rear 1 25 00
leg assembly 5 00
Changing lungs 10 00
Gaskets 5 00
Wash & curry
BANG!
The horse's leg never has a blow out
You dont have to overhaul him in the Spring
You dont have carry spare legs
The horse doesn't boil over on a hill
The horse designers dont change the model every year to make the old ones look shabby
Why dont you do something?

NEW MOTOR FUEL NOW USED IN NATAL

Report to Admiralty Says it Has Been Found Possible to Produce It in Large Quantities

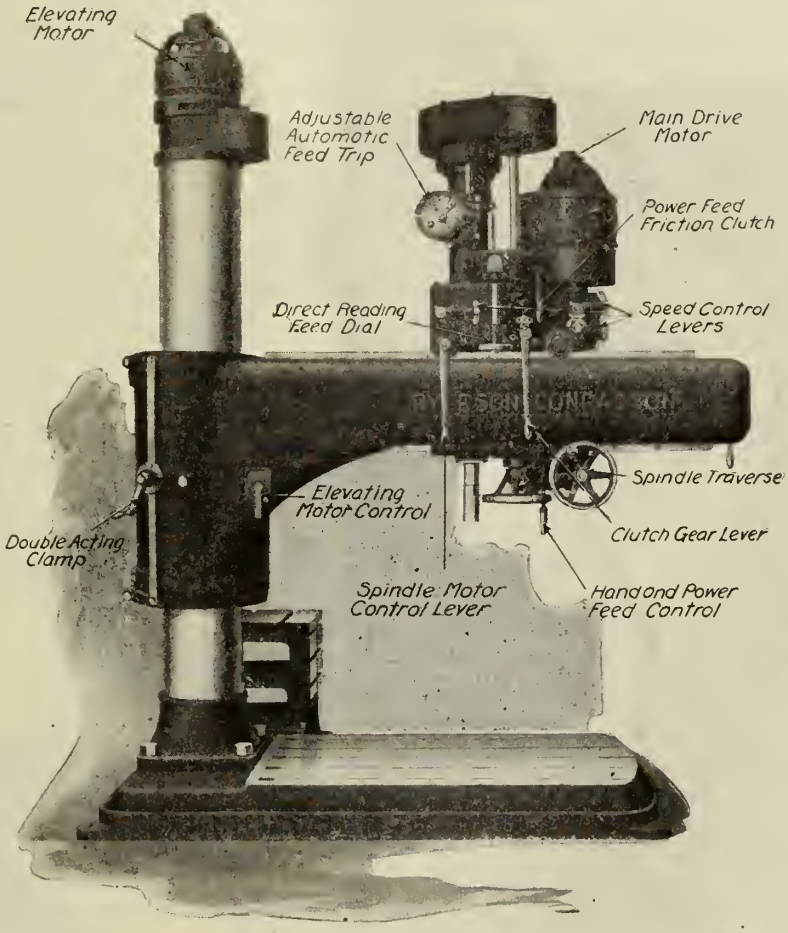
London, July 1.—After a series of trials in motor boats, the British Admiralty has just made a confidential report on the far-reaching possibility of using a new motor fuel—"Natalie"—in naval vessels.

This substitute for gasoline, which has been used successfully three years in Natal, South Africa, the fuel manager of an automobile association said to-day, is a mixture of alcehol and ether and other things, and is made cheaply in South Africa, where there are large tracts of waste vegetation, from which power alcohol can be extracted.

It is manufactured in some places as a by-product of the sugar industry.

The Ryerson-Conradson Four Purpose Radial

U.S. AND FOREIGN PATENTS



Drilling Tapping Boring Reaming

can be performed on this machine with equal efficiency.

Power consumption practically 40% less than that of other radial drills.

All shafts concentrated in head. Splash oiling system.

All bevel gears and friction clutches for tapping eliminated.

Exceptional feed range. Sixteen feeds from .005" to .370".

The new Bulletin No. 4001 describes completely the special features and advanced design of the Ryerson-Conradson Radial. Write for it.

ESTABLISHED 1842 INCORPORATED 1888

JOSEPH T. RYERSON & SON

CHICAGO, ILL., U.S.A.

Canadian Representatives: MACHINERY

GARLOCK-WALKER MACHINERY CO., 32-34 Front Street, TORONTO

MONTREAL WINNIPEG

If interested tear out this page and place with letters to be answered.

MR. A. E. JUHLER HAS RESIGNED AS RUDEL-BELNAP MANAGER

MR. A. E. JUHLER, who for some years has been Toronto manager of the Rudel-Belnap Co., has resigned from that position. Mr. Juhler has a wide connection with the Canadian machine tool field, especially during munition making in this country, coming in contact with a large number of manufacturers. His early training fitted him admirably for a machine tool salesman, and enabled him as well to give valuable advice to his customer. For some years after leaving college Mr. Juhler was with the Bethlehem Steel Corporation, going for them to Europe, where he joined the firm of V. Lowener in Copenhagen, handling machine tools. About 1907 he returned to Canada, and joined the Imperial Oil Co. engineering forces, later taking charge of the Rudel-Belnap Toronto business. Mr. Juhler has not decided definitely on his future course, as he is considering several propositions at present.

Mr. J. H. Ryder, who has been connected with the Toronto office of Rudel-Belnap for some time, will, we understand, succeed Mr. Juhler in the position of Toronto manager.

A. E. JUHLER

CLYDE SHIPBUILDING FEELS THE LACK OF MATERIAL AT PRESENT

THE Clyde shipping output for May is considered very satisfactory, being higher than any other May with two exceptions: May, 1911, and 1907.

For the first time in the history of the Clyde a shipload of 1,500 tons of plates, from Port Talbot, South Wales, had to be reported. If there was a surplus of ship plates available for export, it will then readily be seen that a good many thousand tons could be disposed of easily at a handsome figure.

Engineering departments are very short of material, particularly boiler and ship plates.

There is a feeling that very serious labor troubles may develop during the next two or three months, and result in seriously hampering the industry.

At an exhibition held in Glasgow, Scotland, recently, under the auspices of the Department of Overseas Trade of Great Britain, and the Glasgow Chamber of Commerce and Manufacturers, it was most noticeable that the goods were chiefly of German, United States and Japanese manufacture. This exhibition attracted considerable attention from local manufacturers and merchants, and the exhibits covered the following range of products: electrical smallware and fittings, cycle accessories, leather goods, brushes, toys and games, dyes, soaps, scents, and pomades, stationery requisites, glass bottles, surgical instruments, tools and hardware, woollen underclothing and woollen piece-goods, hosiery, hats and caps, and cotton prints.

Included in the "foreign manufactured" goods there were a few Canadian commodities including two samples of woollen undergarments, two or thee toys, two hand-bags, etc.

One set of samples exhibited should be of particular interest to Canadian firms manufacturing agricultural implements. This set included half-a-dozen hay rakes of various sizes, different from any which are manufactured in Canada at the present time. This rake was made of galvanized iron, and the teeth were hollow. The lower part of the rake was from 13 inches to 20 inches in length, and the teeth were about 3 inches long on the average. One rake, which is 19½ inches wide, had 12 of these hollow iron teeth. This is a German product, and is sold very cheaply on the continent. It is claimed that its lasting qualities are much superior to the ordinary wooden rake, and that it is much lighter than the ordinary Canadian iron rake, and just as durable.

ECHO OF SHELL DAYS

Action brought by the United States of America against Motor Trucks, Limited, for the recovery of certain land and buildings at Brantford which the plaintiff alleges are the rightful property of the United States Government in consequence of a post-armistice agreement, is proceeding at Osgoode Hall before Mr. Justice Kelly. The properties in dispute were obtained by Motor Trucks, Limited, to enable the firm to carry through a contract with the American Government to manufacture 125,000 high-explosive shells, and for the purpose of financing the project the sum of $937,000 was borrowed by the defendant company. But before the manufacture of shells commenced the armistice was signed, the contract was withdrawn, and the parties submitted settlement to the Imperal Munitions Board. On its claim of $2,000,500 Motor Trucks, Limited, was awarded $1,648,000, which sum was paid over in consumation of an agreement by which the company transferred to the United States all properties mentioned in the schedule accompanying it. The action resulted because, the plaintiff claims, description of the company's land and buildings was omitted from the schedule by error. The United States seeks possession of the property on these grounds, while the defendant company claims right of ownership since the schedule did not specifically mention the properties.

Buy From Your Jobber

No Reliable Jobber Will Substitute

MORROW

All there is to say on a Drill

Works at — INGERSOLL, Canada.

If interested tear out this page and place with letters to be answered.

Upon the Health of your employees depend your profit and production

Don't be contented with half-way goodness or make shift drinking arrangements

Throw out the germ-laden Drinking Cup!

Give your men a clean drink

PURO SANITARY DRINKING FOUNTAIN

(MADE IN CANADA)

Allows just the proper amount of cool, clean fresh water to come through the bubbler. No spurting overflowing, no loss. "Puro" regulates itself. "Puro" saves 35% on water bills, too. You can attach it in a few minutes. Tell us how many men, how many departments and we'll tell you how much the cost will be.

Puro Sanitary Drinking Fountain Co.

Canadian Agents:

McKENZIE BROS.

18 St. Alexis St. Montreal, P.Q.

BLACK DIAMOND OVENS

OVENS

Japanning and Varnishing Ovens heated by Gas, Electricity, Steam or Coal. Kernchen Siphonage Ventilators, Bakers' Ovens, trucks, casters, etc. Write for Booklet.

Brantford Oven & Rack Co. Ltd.

Brantford, Canada

BLACK DIAMOND OVENS

Eclipse Interchangeable Counterbores, Core Drills, Connecting Rod Cutters, Countersinks, Inverted Counterbores, Spot Facers, Adjustable Length Holders See first issue of each month.

Eclipse Counterbore Co., Ltd. Walkerville, Ont.

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The old established firm. Patents everywhere. Head office, Royal Bank Bldg., Toronto. Ottawa office, 5 Elgin St. Offices throughout Canada.
Booklet Free.

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In all countries. Ask for our Investor's Advisers which will be sent free.

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Merchants Bank Building, corner St. Catharine St., MONTREAL, Phone Up. 647, and Washington, D.C., U.S.A.

DROP FORGE DIES

Send us your blueprints and specifications. Entrust your requirements to experienced workmen and up-to-date equipment. Have your dies made in Canada. First-class workmanship guaranteed.

THE KIMBER & HILLIER MFG. CO.,
Thorold Road, St. Catharines, Ont.

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PROCURED IN ALL COUNTRIES
Special Attention Given to Patent Litigation
Pamphlet sent free on application.

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TORONTO, CANADA

THE TUBE COMPANY OF CANADA LIMITED

Steel Tubing

for all purposes

Electric and Oxy-Acetylene Welded
Also
Butt Seam Tubing

Hot or cold rolled, in sizes ⅜ to 2 inches outside diameter, from 16 to 22-gauge.

We furnish any shape — Rounds, Squares, Hexagons, Ovals and Special Shapes to customers' specifications.

Expert advice given on all Steel Tubing Problems.

The Tube Company of Canada

233 Dufferin St. TORONTO, ONT

TRADE GOSSIP

Sir Lomer Gouin and Sir Clifford Sifton have both consented to join the board of the British Empire Steel Corporation.

The shareholders of the Dominion Steel Corporation at a special general meeting ratified the proposals to merge their company in the $300,000,000 British Empire Steel Corporation.

The H. B. McCarthy Co., Ltd., of Port Hope, have rented the "Helm Mill" property for 3 years on option from the Board of Trade. This move was necessary on account of steadily expanding business.

To Make Briquettes.—The $400,000 appropriation jointly voted by the Federal and Saskatchewan and Manitoba Governments for the construction and operation of a lignite briquetting plant at Estavan has been increased to $600,000.

Windsor is Buying.—Acting on the advice of the Fuel Controller, the Windsor City Council have placed orders with mine operators in Alberta for large supplies of coal to be shipped immediately. Information gathered shows that this coal can now be transported here as cheaply as the coal from the United States.

Error in Advertisement.—It is regretted that in our issue of July 8th, an error occurred in the advertisement of the Dominion Foundries and Steel Ltd., of Hamilton, Ont., which read Drake Drums instead of Brake Drums in one line of the advertisement. This was detected after a few copies were off the press and was corrected for the rest of the run.

INTERESTING FACTS TO BE FOUND IN THIS WEEK'S ADVERTISING SECTION

How to avoid lost time.

Something that holds to a capacity of 200,000 lbs.

That the present trend toward standardization is constantly increasing.

That supply must equal demand.

Something that should be tried before you make your final decision.

A machine said to be noted for its power and rigidity.

Something that's good.

A few points on grinding worth remembering.

How quality allows you to reach achievement.

How to obtain castings from 5 lbs. to 4 tons.

Dies that produce screws by the million.

A machine with a four-fold purpose.

How to make pistons both large and small.

ARC WELDING EQUIPMENT

Continued from page 99

with various thicknesses of plate, the heavier plate will require the use of the heavier currents.

Approximate speeds of welding sheet metal with the metallic electrode are given in the following table:

Thickness Plate	Speed Feet per hour	Cost per foot
1/16	20	2.12
1/8	16	3.12
1/4	10	7.13
3/8	6.5	12.3
1/2	4.3	19.8
3/4	2.0	41.7
1	1.4	61.3

The above figures are based on average figures for materials and labor.

The carbon electrode can be used for welding and for building up metal in a large number of cases where the metal is not subjected to high strains or where it is under compression only.

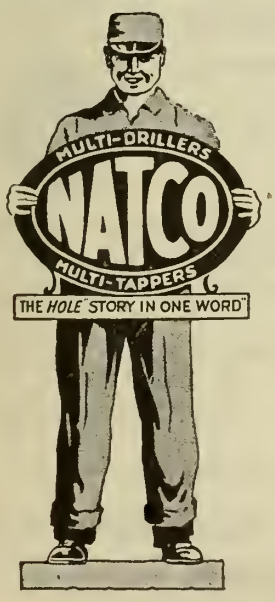
The average current ranges for different types of work are as follows:

Light welding .....150 to 250 amps.
Medium welding .....250 to 350 amps.
Heavy welding and medium cutting .....400 to 600 amps.
Very heavy welding and heavy cutting .....600 to 1,000 amps.

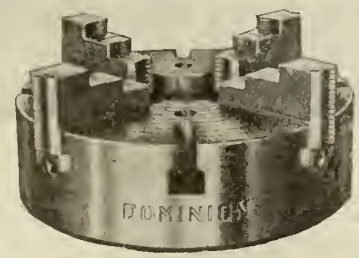
The maximum values of current permissible for the carbon electrodes are as follows:

Diameter of Electrode	Maximum Amperes
1-4 inch	100
1-2 inch	300
3-4 inch	500
1 inch	1,000

Graphite electrodes permit the use of somewhat higher current densities but the higher cost of graphite electrodes is a serious handicap to their use. Lower currents than the above may be used, but higher values will result in undue burning of the electrode.

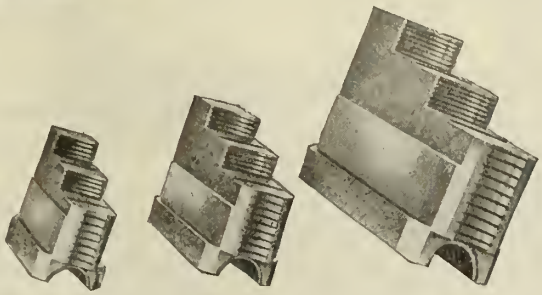


THE
NATIONAL AUTOMATIC TOOL CO.
Richmond, Indiana, U.S.A.



DOMINION CHUCKS

STEEL OR CAST-IRON BODY
BUILT FOR HEAVY DUTY



The Jaws Are Extra Strong

THEY are drop forgings, made of best quality steel, heat-treated and hardened. The threaded portion of jaws form a half nut for the setting-up screws. Have stood the test of heavy duty work in our own shops where accuracy was the only accepted standard.

DOMINION STEEL PRODUCTS CO.
LIMITED
Engineers • Manufacturers
BRANTFORD, CANADA

3

MACGOVERN & COMPANY UNLOAD GRATED POWER MACHINERY

ENGINE TYPE UNITS
25 Cycle

Generator K.W.	Volts	Make	Engine R.P.M.	Cyl. Dimensions	Make
42.5	220	Westinghouse	250	10 x 14	Buckeye.
115	220	Westinghouse	250	14½ x 15	Buckeye.
150	480	Westinghouse	250	14 x 24 x 14	Westinghouse.
250	2200		150	14 x 28 x 30	McIntosh & Seymour.
250	2200	Westinghuose	150	14 x 28 x 30	McIntosh & Seymour.
250	220	Westinghouse	214	15 x 22 x 17	McIntosh.
260	220	Westinghouse		15 x 22 x 17	McIntosh.
300	440	Westinghouse	250		
300	2200		150	15 x 32 x 30	McIntosh & Seymour.
400	2300	Westinghouse	107	18 x 32 x 42	Rice & Sergeant.
400	370	Westinghouse	370	20 x 28 x 36	Hamilton Corliss.
450	550	Westinghouse	125		McIntosh & Seymour.
500	10,000	Westinghouse	125		Buckeye.
650b	100		100	22 x 44 x 48	Westinghouse Corliss.
800	370	Gen. Electric	94	26 x 50 x 48	C. & G.
1000	240	Crocker Wheeler	107	24 x 48 x 42	Hoover Owens.

MacGOVERN & COMPANY, Inc.
285 BEAVER HALL HILL, MONTREAL
Offices: New York, Pittsburgh, Seattle. Plants: Lincoln, N.J., and Linden, N.J.
Buyers and Sellers of New and Used Machinery

BETTS
HEAVY DUTY MACHINE TOOLS
Planers, Engine and Axle Lathes, Slotters, Boring and Turning Mills, Horizontal Boring and Drilling Machines.
BETTS MACHINE CO
408 BLOSSOM ROAD, ROCHESTER, N.Y.

MACHINE TOOLS for Shipbuilders & Iron & Steel Works
BERTRAMS LIMITED
SCIENNES EDINBURGH

Classified Opportunities

HELP WANTED

SALESMAN FOR MACHINE TOOLS SUPplies. Must be a high grade man of engineering knowledge, and good address; for such there are excellent prospects. Address giving full particulars in confidence. Jas. Buckley Co., St. Nicholas Bldg., Montreal. (ctfm)

ONE OF CANADA'S LARGEST AND MOST aggressive manufacturing organizations desires to engage a representative between the ages of twenty-eight and thirty-five, to extend present connections in special lines for the automotive industry; to introduce and develop special lines offering sufficient volume to justify mass production. Mechanical ability desirable, but not imperative. The opportunities are unlimited for one with the necessary executive ability and initiative. Apply with full particulars of age, experience and salary required to Box 698, Canadian Machinery. (c5m)

MACHINE WORK WANTED

MACHINE WORK WANTED FOR LATHES, shapers, milling machine and planer, etc. Hourly or contract basis. Prompt delivery. W. H. Sumbling Machinery Co., Toronto. (ctfm)

AGENCIES WANTED

QUALIFIED ELECTRICAL AND MECHANical sales engineer. Technical graduate having travelled and made connections in South America, France, Belgium, India, China, would like to represent Canadian manufacturing and export house. Box 694, Canadian Machinery.

FOR SALE

CLEARANCE LINE—GENUINE "SLOCOMBE" Drills are offered at a sacrifice, sizes "C," "E," "F," and "G." Wholesalers and dealers will find it of interest to communicate their requirements to Box No. 692, Canadian Machinery. (ctfm)

BARGAIN FOR IMMEDIATE PURCHASER

Two 24" x 12', practically new, "Whitcomb-Blaisdell" Quick Changer Gear Engine Lathes. Double Back Geared, Heavy Duty. New Lathes would be no better and are worth $2500; but to immediate purchaser we offer these Lathes at $1600 each, subject to prior sale. Williams & Wilson, Limited, 84 Inspector Street, Montreal. (c5m)

USED MACHINES FOR SALE

5—3 x 36 Jones & Lamson Geared Flat Turret Lathes.
2—2 x 24 Jones & Lamson Geared Flat Turret Lathes.
1—18" x 8' Mueller Lathe.
1—17" x 8' LeBlond Lathe with taper attachment.
1—38" Boring Mill.
2—20" Excelsior Drills.

CHARLES P. ARCHIBALD & CO.
Machinery & Supplies
285 BEAVER HALL HILL, MONTREAL

FOR SALE

FOR SALE—DEFIANCE AUTOMATIC HANDLE polishing machine, slightly used, good as new. Vancouver Handle Co., Vancouver, B.C. (c6m)

PATTERNS

TORONTO PATTERN WORKS, 65 JARVIS Street, Toronto. Patterns in wood and metal for all kinds of machinery. (ctfm)

BRANTFORD PATTERN WORKS ARE PREpared to make up patterns of any kind—including marine works—to sketches, blue prints or sample castings. Prompt, efficient service. Bell 'Phone 631; Machine 'Phone 733. Brantford Pattern Works, 49 George St., Brantford, Ont. (ctfm)

Reserve Space at Once!

Our next Export Number August 5th.

CANADIAN MACHINERY

MACHINERY FOR SALE

BARGAIN PRICES

Planer—25" x 25" x 7' Putnam. Good condition.
Oliver Tool Room Lathe—16" x 7'—Q.C.G., taper and relieving attachments with pan—like new.
Punch and Shear—Single-end punch and shear. Copy ¾" through ¾", 15" throat—John Bertram and Sons—like new.
Gap Lathe—24" x 48" x 22' bed—John Bertram & Sons.
Full line of other lathes, including C.M.C., Giddings & Lewis, South Bend, Milwaukee, Barker 18" x 8' beds—condition equal to new.
Morton Draw-cut Shaper—24" heavy duty.
C.M.C.—26" x 12', Q.C. Lathe—like new.
20" x 8' C.M.C.—like new.
Air Compressors—1—8" x 8" Chicago pneumatic; 1—8" x 8" Fairbanks-Morse.
Oil Furnaces—4' x 8' (new).
Drill Press—Speed drill, swing 14".
Bolt Threader—Wells Bros., 1½" capacity.
The above machines are on exhibition in our new showrooms.

307 St. James St., Montreal

Phone Main 2286

Standard Equipment & Tool Works

We Buy Complete Plant Outright

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SPECIALISTS

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Duntley Dayton Pneumatic Tools.
Daniel's P.P.P. Packing.
Ebonite Packing.
Pump Valves.
International High Pressure Sheet Packing.
International Red Rubber Packing.
Plastic Metallic Packing for Piston Rods and Valve Stems.
Paxton & Mitchell Locomotive Rod Packing.
Rapid Hose Coupler, for all Hose Connections.

Write or Write Your Requirements

International Machinery and Supply Company, Limited

421 St. James St., Montreal

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

Classified Opportunities

GOULD & EBERHARDT SHAPER

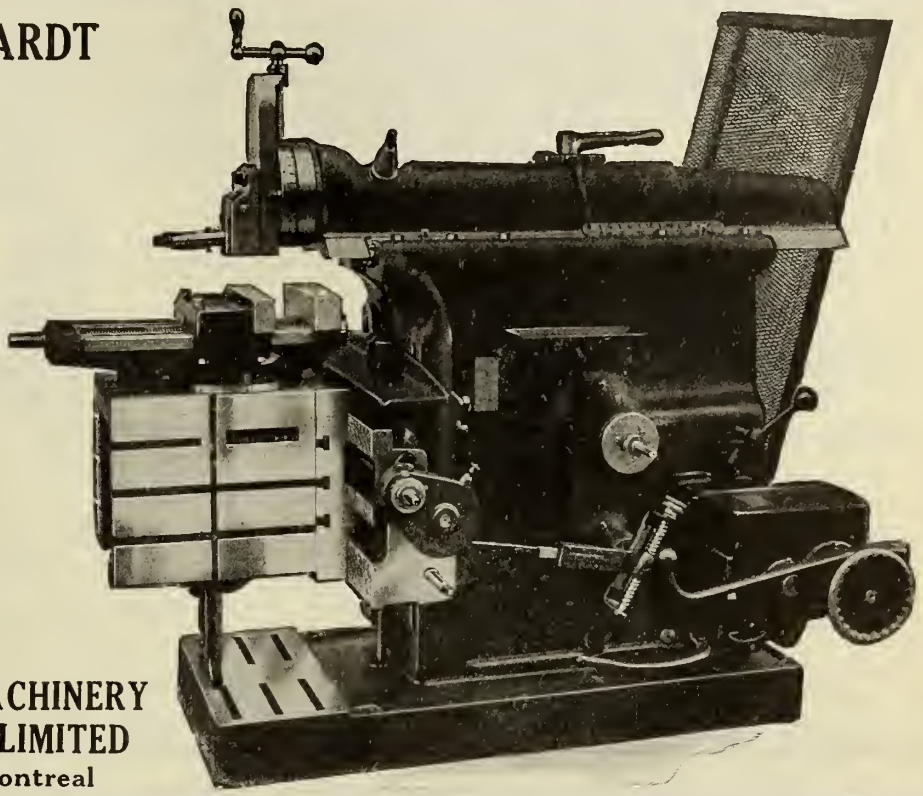
To purchase a well seasoned shaper means lasting satisfaction.

To have a shaper regularly furnished with single pulley drive, gear box and adjustable belt guard means power, convenience and shop efficiency.

Regular sizes 16″ to 32″.

Over 14,000 shipped to date.

Write for Bulletin and Prices.



THE A. R. WILLIAMS MACHINERY & SUPPLY COMPANY, LIMITED
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PARTIAL LIST OF TOOLS

2—60″ Bullard Vertical Boring Mills
1—60″ Niles Vertical Boring Mill
No. 4—B. & S. Plain Miller
1—36″ x 36″ x 8′ Gray Planer, two heads
No. 3—Cincinnati Universal Miller
5—No. 0 Steptoe Hand Millers
13″ x 5′ 6″ New Carroll-Jamieson Quick-Change Lathe
14″ x 6′ New Carroll-Jamieson Quick-Change Lathe
15″ x 6′ New Sidney D.B.G. Quick-Change Lathe, swing 17″
15″ x 8′ New Sidney D.B.G. Quick-Change Lathe, swing 17″
17″ x 8′ New National Quick-Change Lathe
3—17″ x 8′ New Sidney D.B.G. Quick-Change Lathe, swing 19″
17″ x 10′ New Sidney D.B.G. Quick-Change Lathe, swing 19″
18″ x 24″ New Rahn Larmon Lathe, D.B.G. Quick-Change
19″ x 10′ New Sidney D.B.G. Quick-Change Lathe, swing 21″
9—19″ x 8′ New Sidney D.B.G. Quick-Change Lathe, swing 21″
25″ x 14′ New Sidney D.B.C. Quick-Change Lathe, swing 27″
33″ x 14′ Putnam, arranged for Motor Drive
6′ Western Radial Drill
5′ Bickford Single Pulley Drive Radial
100-lb. New Little Giant Hammer
50-lb. New Little Giant Belt Hammer
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30-ton Watson & Stillman Hydraulic Press

FRANK TOOMEY INC.
27 North Third Street PHILADELPHIA, PA.

DROP FORGINGS

ONE of the largest and best equipped forge plants anywhere is at your call for drop forgings of any kind, particularly in large quantities.

Dominion Forge & Stamping Company, Limited
Walkerville, Ont.
Toronto Office: Excelsior Life Bldg.

Free Tool Grinding Chart

Grind your cutting tools in exactly the right way to get best results—and you save time. That's obvious. It is precisely that that this Tool Grinding Chart enables you to do.

It has been adopted as standard by many firms that found it a long way better than guess work.

CANADIAN MACHINERY would like to see this Chart in every shop in the Dominion. Mail the coupon below for your copy to-day.

Shows at a glance Correct Clearance and Rake Angles for Cutting Tools

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CANADIAN MACHINERY,
153 University Avenue, Toronto.

Please send $\frac{me}{us}$ free, one of your tool grinding charts.

Signed .....

Firm Name .....

St. Address .....

City .....

Prov. .....

NOVO-SUPERIOR

HIGH SPEED STEEL
INTRA STEEL GIBRALTAR STEEL
Tool Steel for Every Purpose
Swedish Lancashire Iron

Twist Drills, Taps, Hack Saw Blades, Milling Cutter Files, Etc., Music Wire for Springs, Steel Balls. Cold Rolled Tool Steel in Strips and Sheets Circular Saws, Machine Knives.

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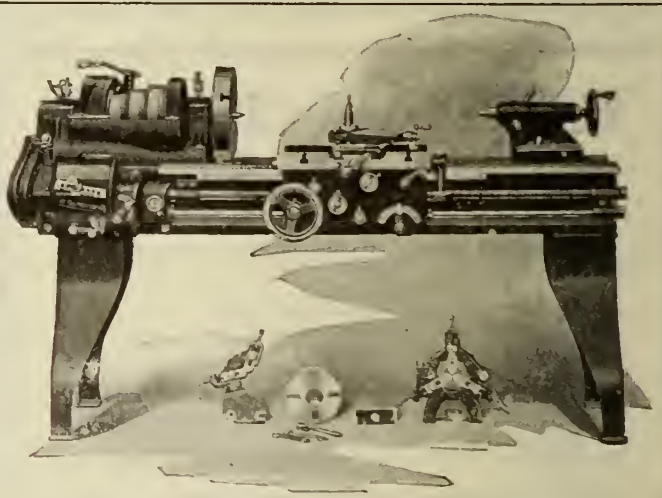
LIMITED
332 St. James Street, Montreal

Sole Agents for
JONAS & COLVER, LIMITED
Novo and Continental Steel Works, Sheffield, Eng
H. BOKER & CO., Inc
New York, N.Y.



Extreme Precision

The "Economy" 14-inch Swing Double Back Geared Quick Change Engine Lathe though small in size is of sufficient weight and power to handle the rapid production of the modern manufacturing plant. Its high grade and extreme accuracy make it particularly adapted to the tool room. Made in 14", 18" and 22" swing.

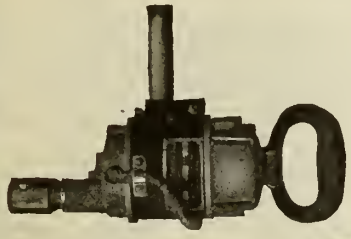
Have us send you full particulars of this small, heavy duty machine without delay.

Rockford Lathe and Drill Co.
ROCKFORD, ILLINOIS, U.S.A.

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

U. S. Electric Drills and Grinders

Save Time, Labor and Money



They can be attached to any lamp socket.

For drilling in metal they are superior to any other kind of portable drill. Cost 50% less to run than air drills.

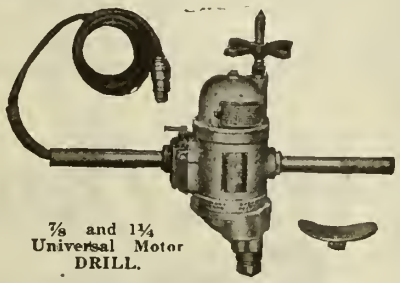
3 SIZES

3-16 in., W.G.T., 6 lbs.
¼ in., W.G.T. 9 lbs.
⅜ in., W.G.T. 12 lbs.

All motors wound for 110 or 220 volts.

Direct or alternating current.

Try a few of our Electric Drills and Grinders and you'll send us an order for more. Our guarantee protects you.



⅞ and 1¼ Universal Motor DRILL.

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The Canadian Fairbanks-Morse Co., Limited

Montreal, St. John, N.B., Toronto, Winnipeg, Calgary, Vancouver

THE UNITED STATES ELECTRICAL TOOL CO.

CINCINNATI, OHIO

ALL STEEL

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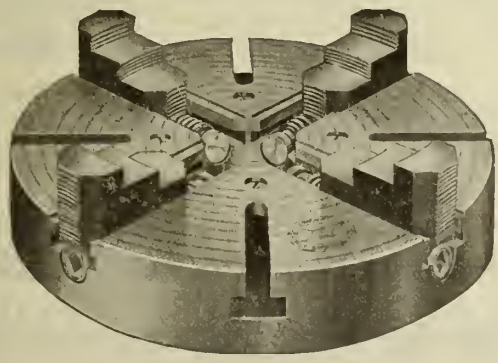

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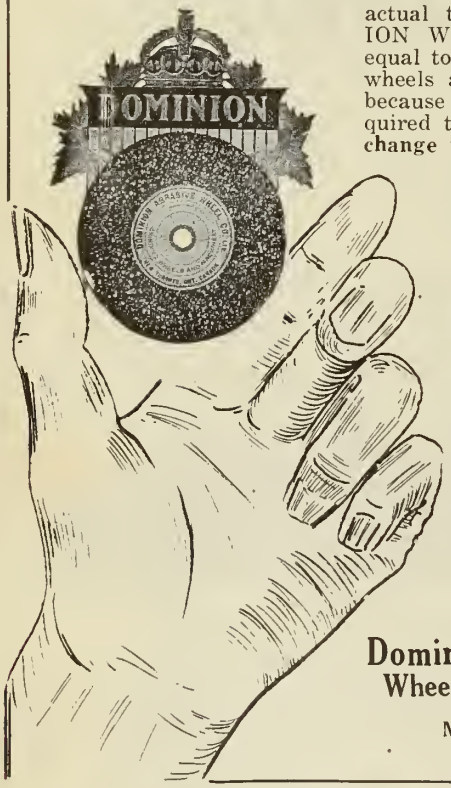

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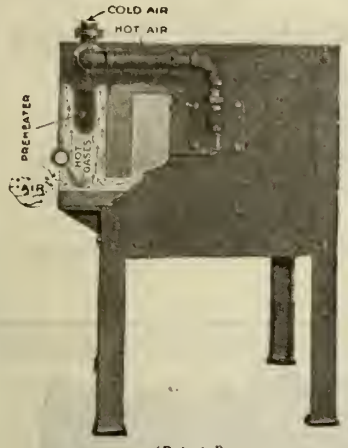

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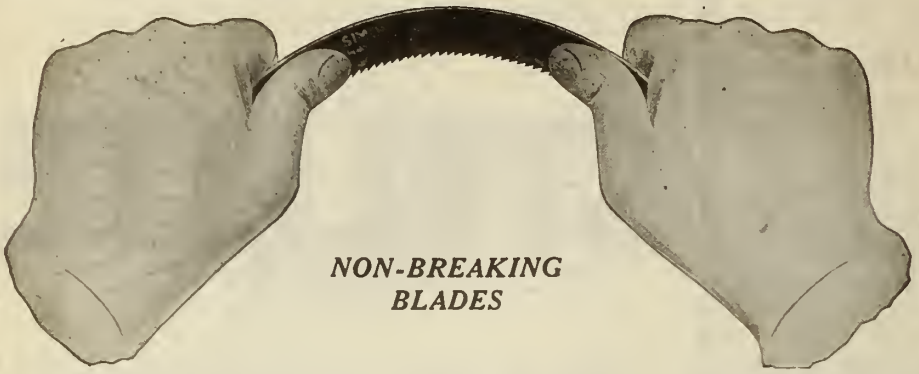

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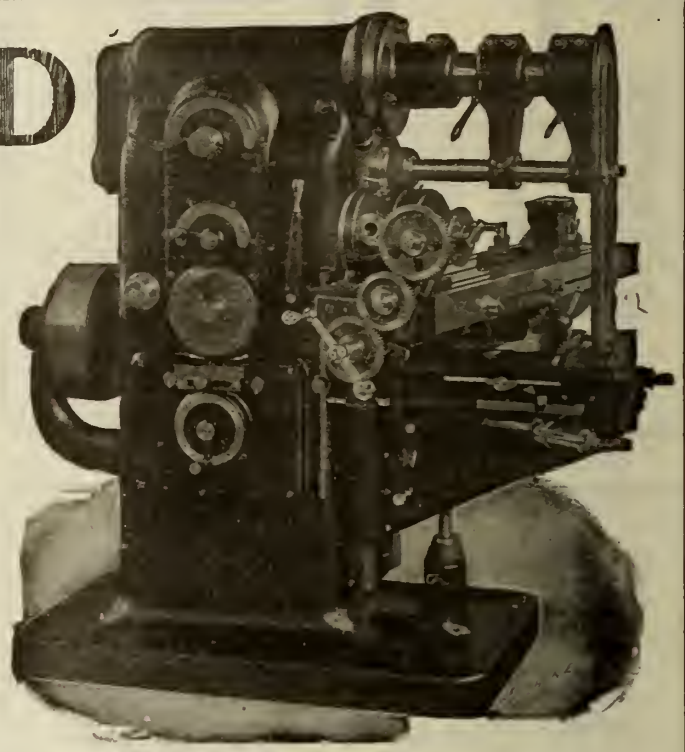

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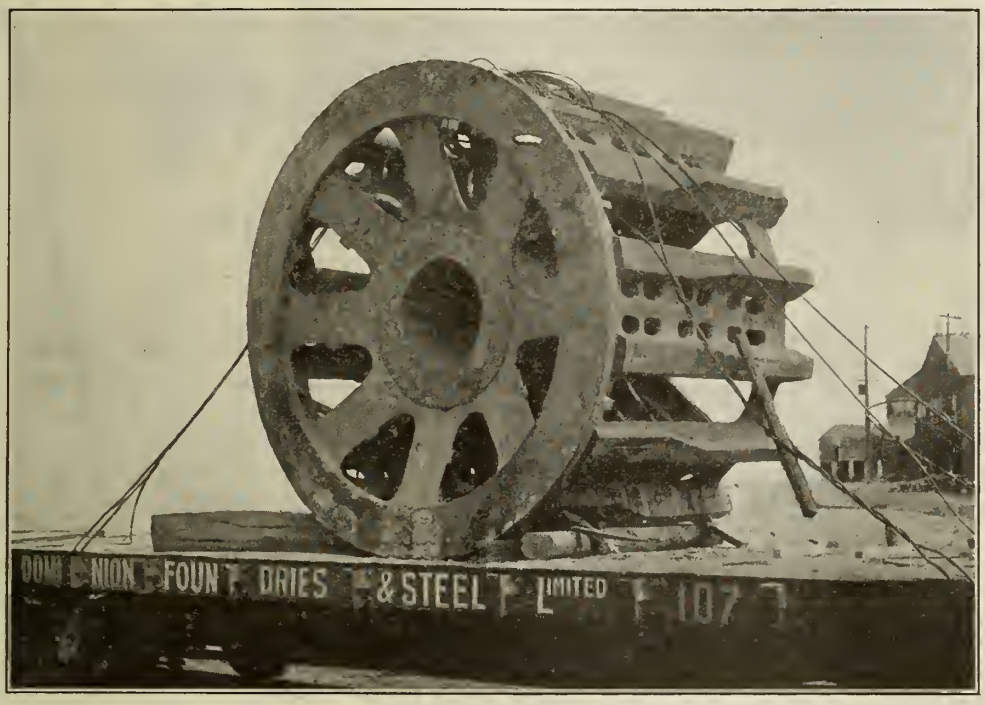

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Other Points of Interest in This Number:

STORIES

The Little Warrior .....Pelham Grenville Wodehouse
The Parts Men Play .....Arthur Beverley Baxter
The Taming of Pickles .....C. W. Stephens
Jeff Comes Home .....Alan C. Shore
The Worst of Brains .....Nan Moulton

ARTICLES

Pegging the Dollar at Par .....Agnes C. Laut
Saving a Newspaper .....J. L. Rutledge
A Galaxy of Maritime Portraits .....L. R. Joseph
The Wartime Premier Retires .....

Review of Reviews

Here are a few of the gripping informative articles to be found in this department:

"Royalty Has Gone to Work"
"Germany and Her Debt"
"The Truth About Coal Shortage"
"Uncle Sam's Huge Pay Roll"
"Natives of a Strange Island"
"70,000 Criminals in England"
"Duluth to Liverpool in One Bottom"
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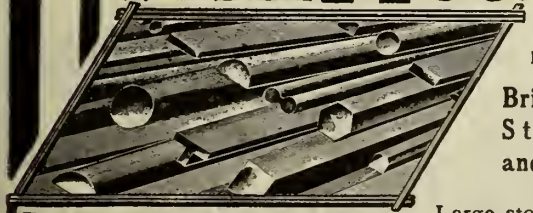

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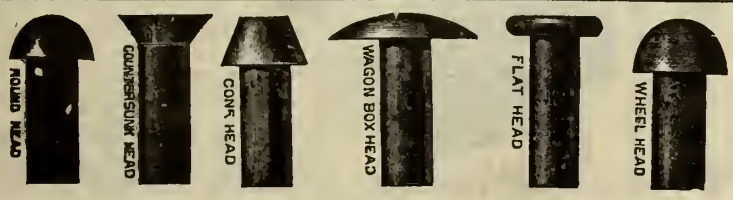

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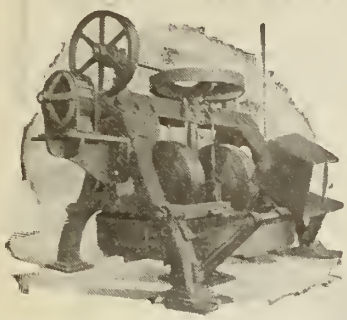

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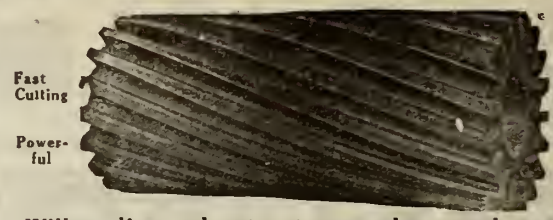

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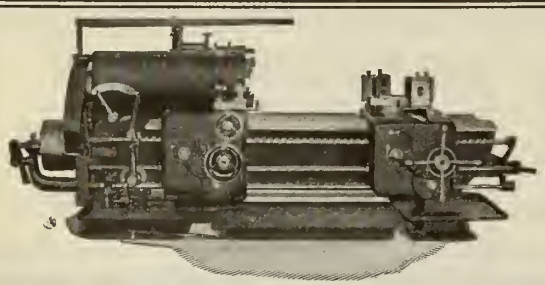

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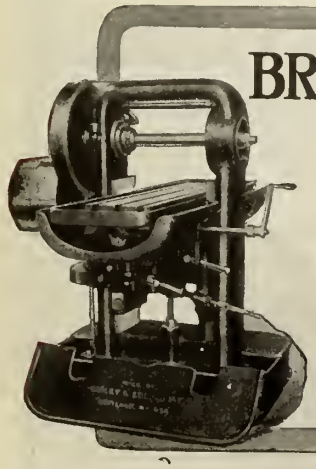

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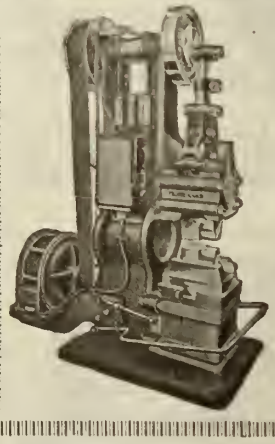

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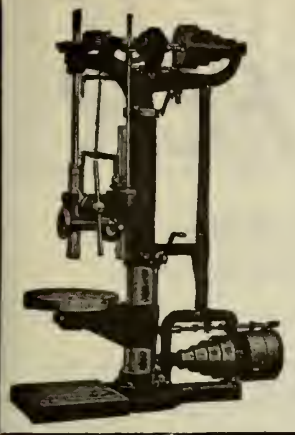

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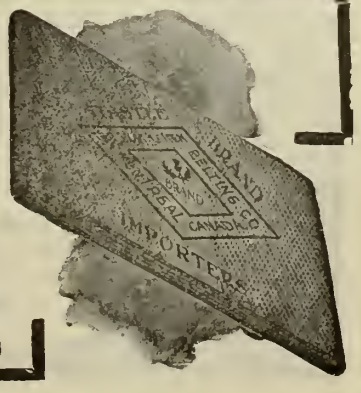

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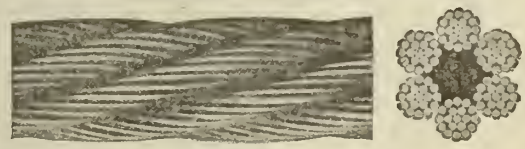

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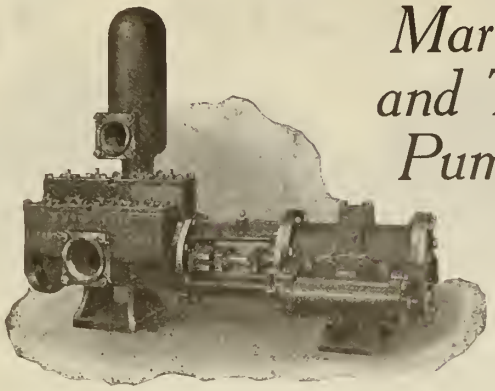

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Gardner & Son, Robt., Montreal.
Hull Iron & Steel Foundries, Ltd., Hull
International Malleable Iron Co., Guelph
Kennedy & Sons, Ltd., Wm., Owen Sound.
Katie Foundry, Ltd., Galt, Ont.
Hamilton Co., Wm., Peterboro.
McFarlane Engineering Ltd., G. W., Paris, Ont.

CASTINGS, PLUMBERS'
Katie Foundry, Galt, Ont.

CASTINGS, NICHROME
Can. Driver-Harris Co., Ltd., Walkerville

CASTINGS, HARDWARE
Katie Foundry, Galt, Ont.

CASTINGS, STEEL CHROME AND MANGANESE STEEL
Thos. Davidson Mfg. Co., Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Hull Iron & Steel Foundries, Ltd., Hull.
Kennedy & Sons, Ltd, Owen Sound.

CASTINGS, MALLEABLE
International Malleable Iron Co., Guelph

CASTINGS, NICKEL STEEL
Hull Iron & Steel Foundries, Ltd., Hull.

CEMENT MACHINERY
Can. Fairbanks-Morse Co., Ltd., Montreal.
Gardner, Robt., & Son, Montreal.

CEMENT HANDLING MACHINERY
Can. Link-Belt Co,, Toronto, Ont.

CEMENT TOOLS
Atkins & Co., E. C., Hamilton, Ont.

CENTERING MACHINES
Victoria Foundry Co., Ottawa, Ont.

CENTRE REAMERS
Bertram & Sons Co., John, Dundas.
Butterfield & Co., Inc., Rock Island, Que.
Gardner, Robt. & Son, Montreal.
Hurlburt, Rogers Mch. Co., South Sudbury, Mass.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co., of Canada, Galt, Ont.

CHAIN, WELDED COIL
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

CHAIN BLOCKS
Aikenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Ford Chain Block & Mfg. Co., Phila., Pa.
Garlock-Walker Machy. Co., Toronto.
Lyman Tube & Supply Co., Montreal, Que.
Morris Crane & HoistCo., Herbert, Niagara Falls, Ont.
Oliver Engineering Co., Montreal.
Rice Lewis & Son, Toronto, Ont.
Jones & Glassco, Montreal, Que.

CHAINS, AGRICULTURAL
Canadian Link-Belt Co., Ltd., Toronto, Ont.
Morse Chain Co., Ithaca, New York.
Renold of Canada Ltd., Montreal.

CHAINS, AUTOMOBILE ENGINE
Can. Link-Belt Co., Ltd., Toronto, Ont.
Morse Chain Co., Ithaca, New York.
Renold of Canada Ltd., Montreal.

CHAINS, BICYCLE, DRIVE AND BLOCK
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold of Canada Ltd., Montreal.

CHAINS, FOR ELEVATORS AND CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Petrie, Ltd., H. W., Toronto.
Renold of Canada Ltd., Montreal.
Williams Mchy Co., A. R., Toronto, Ont.

CHAIN, MALLEABLE, DETACHABLE AND RIVETED
Can. Link-Belt Co., Toronto, Ont.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

CHAINS, POWER TRANSMISSION
Canadian Link-Belt Co., Ltd., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, New York.
Glasgow, N.S.
Renold of Canada Ltd., Montreal.

CHAINS, SPROCKET WHEEL
Can. Link-Belt Co., Ltd., Toronto, Ont.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.

CHAIN DRIVES
Can. Link-Belt Co., Toronto, Ont.
Coventry Chain Co., Coventry, England.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold of Canada Ltd., Montreal.

CHASERS
National Acme Co., Cleveland, Ohio.
Taylor, J. A. M., 318 Stair Bldg., Toronto, Ont.

CHEMISTS
Toronto Testing Lab'tory, Ltd., Toronto

CHUCKS, AERO, AUTOMATIC
Garvin Machine Co., New York.

CHUCKS, CENTERING
Hoggson & Pettis Mfg. Co., New Haven Conn.

CHUCKS, COLLET, AIR
Elliott & Whitehall Mach. & Tool Co. Galt, Ont.
Smalley-General Co., Inc., Bay City, Mich.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

CHUCKS, DRILL, LATHE AND UNIVERSAL
Aikenhead Hardware Co., Toronto, Ont.
Bertram & Sons Co., John, Dundas.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Ltd., Brantford.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Mach'y Co., Toronto.
Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Chicago, Ill.
Herbert Ltd., Alfred, Toronto, Ont.
Jacobs Mfg. Co., Hartford, Conn.
Ker & Goodwin Machine Co., Ltd.,
Knight Metal Products, Toronto.
Modern Tool Co., Erie, Pa.
Rice Lewis & Son, Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

CHUCKS, DRILL, AUTOMATIC AND KEYLESS
Aikenhead Hardware Co., Toronto, Ont
Can. Blower & Forge Co., Kitchener.
McCrosky Tool Corp., Meadville, Pa., U. S. A.

CHUCKS, FRICTION AND TAP
Victor Tool Co., Waynesboro, Pa.

CHUCKS, MAGNETIC
Heald Machine Co., Worcester, Mass.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co, Ltd., A. R., Montreal

CHUCKS, RING WHEEL
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.

CHUCKS, WHEEL, CAR
Hoggson & Pettis Mfg. Co., New Haven, Conn.

CHUCKING MACHINES
Barber Mchy. Co., Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Garvin Machine Co., New York.
Gisholt Machine Co., Madison, Wis.
National Acme Co., Windsor, Vt.
Niles-Bement-Pond Co., New York.
Rockolson Machine & Tool Co., Toronto.
Warner & Swasey Co., Cleveland, O.
Wood Turret Mach. Co., Brazil, Ind.
Williams Mchy Co., A. R., Toronto, Ont.

CIRCULATING SYSTEMS FOR LUBRICATING OIL
Bowser Co., Ltd., S. F., Toronto, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

CLAY FIRE
Elk Fire Brick Co., Can., Ltd., Hamilton, Ont.

CLEANERS, METER, WASTE, GENERAL
Oakley Chemical Co., New York, N.Y.

CLEANING COMPOUND
Oakley Chemical Co., New York.

CLOCK SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

CLOCKS, WATCHMAN, PORTABLE
Gisholt Machine Co., Madison, Wis.

CLOSETS
Crane, Ltd., Montreal, Que.

CLUTCHES, CHAIN
Wright Mfg. Co., Lisbon, Ohio.

CLUTCHES, FRICTION AND PULLEY
Bernard Industrial Co., A., Fortierville, Q
Can. Link-Belt Co., Toronto, Ont.
Carlyle Johnson Mach. Co., Manchester Conn.
Positive Clutch & Pulley Wks., Aurora Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.

COAL CRUSHERS
Canadian Link-Belt Co., Ltd., Toronto, Ont.
Canadian Mead-Morrison Co., Limited, Montreal, Que.

COAL HANDLING MACHINERY
Brown Hoisting Machinery Co., Cleveland, Ohio.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Can. Link-Belt Co., Toronto, Ont.
Canadian Mead-Morrison Co., Limited, Montreal, Que.
Dominion Bridge Co., Montreal, Que.
MacGovern & Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont
Nova Scotia Steel & Coal Co., New

COLD ROLLED STRIP, ALL METAL
COLLARS, SHAFTING
Can. Driver-Harris Co., Ltd., Walkerville
Williams & Co., J. H., Brooklyn, N.Y

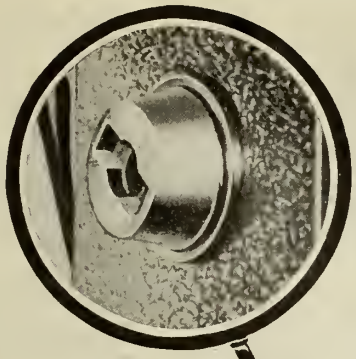
COLLECTORS, PNEUMATIC
Can. Blower & Forge Co., Kitchener
Sturtevant Co., B. F., Galt, Ont.

COLLETS
Becker Milling Machine Co., Boston.

COMPOSITION INGOT
Canada Metal Co., Toronto, Ont.

COMPOUNDS, CUTTING AND GRINDING, DRAWING, STAMPING
Oakley Chemical Co., New York, N.Y.

COMPRESSORS, AIR
Atkins & Co., E. C., Hamilton, Ont.
Can. Ingersoll-Rand Co., Sherbrooke.
Cleveland Pneumatic Tool Co., Toronto.
Curtis Pneumatic Machy. Co., St. Louis
Elliott & Whitehall, Galt, Ont.
Garlock-Walker Machy. Co., Toronto
Holden Co., Ltd., Montreal, Que.
MacGovern & Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto.

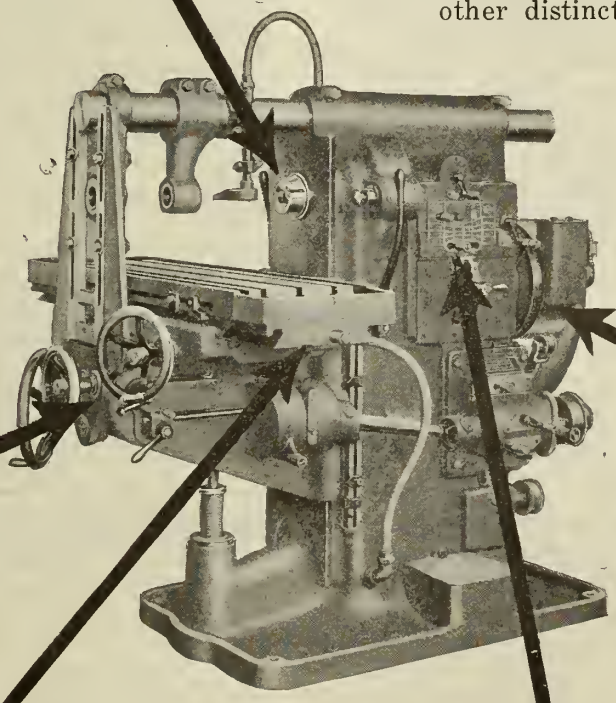


The Taper Nose Spindle

Another Reason for Brown & Sharpe Milling Machines

The simplicity and fewness of parts is particularly noteworthy—No plates, screws or loose parts are used and when arbor, collet or cutter is in place it is essentially as firm as though a part of the spindle.

It will pay you to know about the details of the Taper Nose Spindle and the many other distinct features described in our New Milling Machine Book.



Knee of Rigid Design
Heavy sections — interior transverse ribs—long and wide bearing surfaces overcome vibrations and sagging.

Large Driving Pulley
Large diameter, wide face—runs on ball bearings — has cast iron pulley guard.

Reinforced Ribs
Wide bearings extend from outside nearly to the centre —reinforced ribs resist buckling tendencies.

Direct Reading Index Plate
There are no combinations of figures to puzzle out, the proper positions of the levers are pictorially shown.

BROWN & SHARPE MFG. CO.

PROVIDENCE, R.I., U.S.A.

If interested tear out this page and place with letters to be answered.

Superior Machinery Co., London, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

CONDENSERS

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
MacGovern & Co., Montreal, Que.
Smalley-General Co., Inc., Bay City, Mich.

CONDUITS

Northern Electric Co., Ltd., Montreal Que

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Canada Found'a & Forgings, Ltd., Welland, Ont.

CONNECTING ROD CUTTERS INTERCHANGEABLE

Eclipse Counterbore Co., Ltd., Walkerville, Ont.

CONTRACTORS' HOISTS

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Ford-Smith Machine Co., Hamilton, Ont
Globe Engineering Co., Hamilton, Ont.
Homer & Wilson, Hamilton, Ont.
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Victoria Foundry Co., Ottawa.

CONTROLLERS, MAGNETIC BRAKES, ELEC. WINCHES, MONO RAIL HOISTS

Volta Mfg. Co., Welland, Ont.

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CONTROLLING INSTRUMENTS

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Niles-Bement-Pond Co., New York.
Can. Blower & Forge Co., Kitchener.

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Brown's Copper and Brass Rolling Mills, New Toronto.

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COUNTERBORES AND COUNTERSINKS

Aikenhead Hardware Co., Toronto, Ont.
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Eclipse Counterbore Co., Ltd., Walkerville.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
McCrosky Tool Corp., Meadville, Pa., U. S. A.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.

COUNTERSINKS, INTERCHANGEABLE

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COUNTERBORES, INVERTED, INTERCHANGEABLE

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Brown & Sharpe Mfg. Co., Providence, R.I.
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Baird Machine Co., Bridgeport, Conn.
Ford-Smith Machine Co., Hamilton, Ont.
Foster Machine Co., Elkhart, Ind.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co, Ltd., A. R., Montreal
Williams Mchy Co., A. R., Toronto, Ont.

COUPLINGS, FRICTION

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Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

COUPLINGS, RAPID HOSE

Int. Machinery & Supply Co., Ltd., Montreal, Que.

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Garlock-Walker Machinery Co., Toronto.

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Hanna & Co., M. A., Cleveland, O.

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Cleveland Pneumatic Tool Co., of Canada, Toronto.

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Gardner, Robt. & Son, Montreal.
Independent Pneumatic Tool Co., Chicago

CRANES, LOCOMOTIVE

Can. Link-Belt Co., Toronto, Ont.
Northern Crane Works, Walkerville.

ELECTRIC

Volta Manufacturing Co., Welland, Ont.

CUPS, OIL

Can. Winkley Co., Ltd., Windsor, Ont.

COVERS, OIL HOLE

Can. Winkley Co., Ltd., Windsor, Ont.

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Brown Hoisting Machinery Co., Cleveland, Ohio.
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Canadian Mead-Morrison Co., Limited, Montreal, Que.
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Northern Crane Works, Walkerville.

CRANE RUNWAYS

MacKinnon Steel Co., Sherbrooke, Que.

CRANES, JIB

Brown Hoisting Machinery Co., Cleveland, Ohio.

CRANES, LOCOMOTIVE

Brown Hoisting Machinery Co., Cleveland, Ohio.
Holden Co., Ltd., Montreal, Que.

CRANES, GOLIATH, PNEUMATIC AND PORTABLE

Brown Hoisting Machinery Co., Cleveland, Ohio.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Morris Crane and Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Petrie, Ltd., H. W., Toronto.

CRANES, PILLAR

Brown Hoisting Machinery Co., Cleveland, Ohio.

CRANES, TRAVELLING, ELECTRIC AND HAND POWER

Brown Hoisting Machinery Co., Cleveland, Ohio.
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Curtis Pneumatic Machy. Co., St. Louis.
Dominion Bridge Co., Montreal.
Hepburn, John T., Ltd., Toronto.
Lyman Tube & Supply Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Niles-Bement-Pond Co., New York.
Northern Crane Works, Walkerville.
Oliver Engineering Co., Montreal.

CRANK SHAFTS

Canada Found'a & Forgings Ltd., Welland
Williams & Co., J. H., Brooklyn, N.Y.

CRANES, PORTABLE

Aikenhead Hardware Co., Toronto, Ont.
Brown Hoisting Machinery Co., Cleveland, Ohio.
Can. Link-Belt Co., Toronto.
Lyman Tube & Supply Co., Montreal, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Rice Lewis & Son, Toronto, Ont.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

CRIMPS, LEATHER

Graton & Knight Mfg. Co., Worcester, Mass.

CRUSHERS

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Elec. Steel & Metals, Welland, Ont.

CUPOLAS

Can. Blower & Forge Co., Kitchener.
Northern Crane Works, Walkerville.

CURB PUMPS FOR OIL, GASOLINE

Bowser Co., Ltd., S. F., Toronto, Ont.

CURRENT TRANSFORMERS

Volta Manufacturing Co., Welland, Ont.

CUT-OFF COUPLINGS, FRICTION

Petrie, Ltd., H. W., Toronto.

CUTTERS, BOLT

See Bolt Cutters.

CUTTERS, GEARS

Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Fellows Gear Shaper Co., Springfield, Vt.

CUTTERS, FLUE

Cleveland Pneumatic Tool Co., Toronto.

CUTTER HEADS

Oliver Machinery Co. Grand Rapids, Mich

CUTTERS, PIPE (See Pipe Cutters)

CUTTERS, MILLING

Becker Milling Mach. Co., Boston, Mass.
Butterfield & Co., Rock Island, Que.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Cleveland Twist Drill Co., Cleveland.
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garvin Machine Co., New York.
Illinois Tool Works, Chicago, Ill.
Ingersoll Mchy. Co., Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Toronto, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Whitney Mfg. Co., Hartford, Conn.
Wilt Twist Drill Co., Walkerville, Ont.

CUTTER RELIEVING MACHINES

Cleveland Milling Machine Co., Cleveland.

CUTTING-OFF MACHINES

Armstrong Bros., Tool Co., Chicago.
Atkins & Co., E. C., Hamilton, Ont.
Bertram & Sons Co., John, Dundas.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Foss Mchy & S'ply Co., Geo. F., Montreal
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield, Mass
Hurlburt, Rogers Machy. Co., South Sudbury, Mass.
Kennedy & Sons, Wm., Owen Sound.
Lyman Tube & Supply Co., Montreal, Que.
Niles-Bement-Pond Co., New York, N.Y.
Prest-O-Lite Co., Inc., Toronto, Ont.
Petrie, Ltd., H. W., Toronto.
Tabor Mfg. Co., Philadelphia, Pa.
Wells Bros. of Can., Galt Ont.
Williams Tool Corp. of Can. Ltd., Brantford, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

CUTTING COMPOUND AND CUTTING OIL

Cataract Refining Co., Ltd., Toronto.
Swan & Finch, Inc., New York.

CUTTING OIL, RECLAIMING SYSTEM

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Smalley General Co., Inc., Bay City, Mich

CYLINDERS, AUTOMATIC REBORING JIGS AND REAMERS

Kelley Reamer Co., Cleveland, O.

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B. F. Sturtevant Co, Galt, Ont.

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Aikenhead Hardware Co., Toronto, Ont.
Dominion Bridge Co., Montreal.
Hepburn Co., Ltd., J. T., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

DERRICK HOISTS

Canadian Mead-Morrison Co., Limited, Montreal, Que.

DIAMOND (BORTZ)

Furniss, Clarke & Co., Montreal, Que.

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Can. Desmond-Stephan Mfg. Co., Hamilton
Ford-Smith Machine Co., Hamilton, Ont.
Furniss, Clarke & Co., Montreal, Que.
Joyce-Koebel Co., Inc., New York City.
Wheel Trueing Tool Co., Detroit.
Petrie, Ltd., H. W., Toronto.

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Joyce Koebel Co., Inc., New York, N.Y.
Wheel Trueing Tool Co., Detroit.

DIAMONDS, BLACK AND ROUGH

Joyce, Koebel & Co., Inc., New York.
Wheel Trueing Tool Co., Windsor, Ont.

DIE CASTINGS

Fisher Motor Co., Ltd., Orillia, Ont.
Tallman Brass & Metals Ltd., Hamilton, Ont.

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Greenfield Tap & Die Corp., Greenfield Mass.
Wells Bros. of Can., Galt, Ont.
Petrie, Ltd., H. W., Toronto.

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A. B. Jardine & Co., Ltd., Hespeler, Ont.
Wells Brothers Co., of Canada, Galt.

DIES AND DIE STOCKS

Ackworthie Ltd., J., Birmingham, Eng.
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Rock Island, Que.
Brown, Boggs Co., Hamilton, Ont.
Crescent Mchc. Co., Ltd., Montreal, P.Q.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardner, Robt. & Son, Montreal.
Herbert Ltd., Alfred, Toronto, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Jones & Lamson, Springfield, Vt.
Landis Machine Co., Waynesboro, Pa.
Marshall, Son & Bunney, Toronto.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Acme Co., Cleveland, Ohio.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Rickert-Shafer Co., Erie, Pa.
Stoll Co., Inc., D. H., Buffalo, N.Y.
Wells Brothers of Canada, Galt, Ont.
Williams Mchy Co. A. R., Toronto, Ont.

DIES, HAMMERED

Kimber & Hillier Mfg., Co., St. Catharines, Ont.

DIES, DROP FORGE.

Kimber & Hillier Mfg., Co., St. Catharines, Ont.

DIES, METAL STAMPING

Ackworthie Ltd., J., Birmingham, Eng.
Crescent Mchc. Co., Ltd., Montreal, P.Q.
Elliott & Whitehall, Galt, Ont.

DIES, PIPE THREADING

Ackworthie Ltd., J., Birmingham, Eng.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Crescent Mchc. Co., Ltd., Montreal, P.Q.
Landis Machine Co., Waynesboro, Pa.

DIES, THREADING

Ackworthie Ltd., J., Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Crescent Machine Co., Ltd., Montreal.
Greenfield Tap & Die Corp., Greenfield Mass.
Wells Bros. of Can., Galt, Ont.

DIE SINKERS

Ackworthie Ltd., J., Birmingham, Eng.
Becker Milling Machine Co., Boston
Garvin Machine Co., New York.
Kimber & Hillier Mfg., Co., St. Catharines, Ont.
Pratt & Whitney Co., Dundas, Ont.
Walcott Lathe Co., Jackson, Mich

DIES FOR MACHINES

Ackworthie Ltd., J., Birmingham, Eng.
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Rock Island, Que.
Firth & Sons, Thos., Montreal, Que.
Landis Machine Co., Waynesboro, Pa.
Wells Brothers Co. of Canada, Galt.

DIE HEADS

Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Canada, Galt, Ont.

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Geometric Tool Co., New Haven.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Wells Brothers Co. of Can., Galt, Ont.
Petrie, Ltd., H. W., Toronto.

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Marshall, Son & Bunney, Toronto.
Firth & Sons, Thos., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.

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Ackworthie Ltd., J., Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Wells Bros. Co. of Can., Galt, Ont.

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Ackworthie Ltd., J., Birmingham, Eng.
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Brown, Boggs & Co., Hamilton, Canada
Globe Engineering Co., Hamilton, Ont.
Stoll Co., D. H., Buffalo, N.Y.

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Ackworthie Ltd., J., Birmingham, Eng.
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
National-Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros., Co., of Can., Galt, Ont

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Swedish Steel & Importing Co., Montreal

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Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machinery Co., Toronto
Garvin Machine Co., New York.
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Foss Mchy. & S'ply Co., G. F., Montreal
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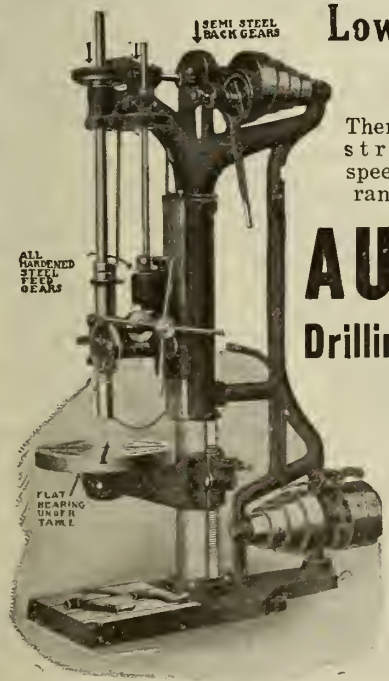

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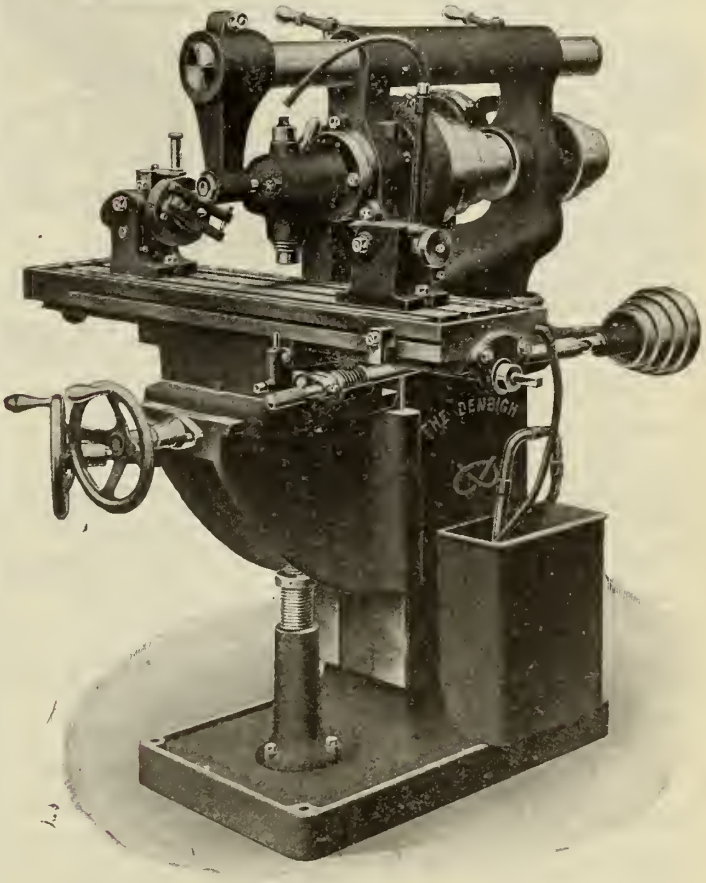

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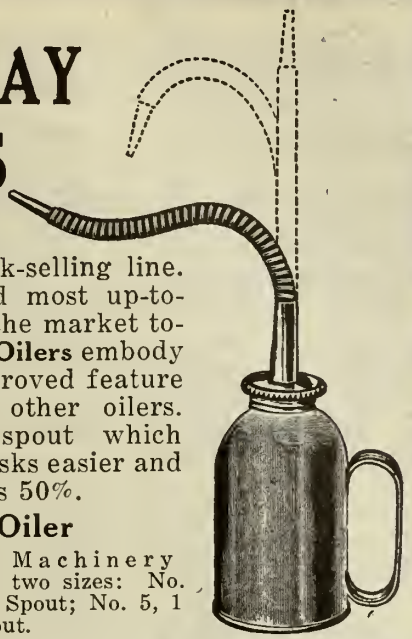

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Dickow, Fred. C., Chicago, Ill.
Ford-Smith Machine Co., Hamilton, Ont.
Garvin Machine Co., New York.
Petrie, Ltd., H. W., Toronto.

INDICATING INSTRUMENTS
Taylor Instrument Co., Rochester, N.Y.

INDICATING SCALES
Can. Kron Scale Co., Montreal.

INDUSTRIAL SITES
City of St. Johns, Quebec.

INGOTS, BRASS, BRONZE, GUN METAL, PHOSPHOR
Thomas Moore & Son, Montreal.

INGOTS, FORGING AND ROLLING
Electric Steel & Metals Co., Welland.

INSULATING COMPOUNDS
Robertson Co., Ltd., H. H., Sarnia, Ont.

INSTRUMENTS, ENGINEERING
Consolidated Optical Co., Toronto.

IRON ORE
Hanna & Co., M. A., Cleveland, O.

IRON, WROUGHT, ROLLED, PIG
Swedish Steel & Impt. Co., Ltd., Montreal

JACKS
Aikenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal, Que. Engineering Co.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Norton, A. O., Coaticook, Que.
Rice Lewis & Son, Toronto, Ont.
Petrie, Ltd., H. W., Toronto.

JACKS, PIT AND TRACK
Canadian Fairbanks-Morse Co., Montreal
Lyman Tube & Supply Co., Montreal, Que.
Northern Crane Works, Walkerville.

JAWS, FACE PLATE
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Ltd., Brantford.
Skinner Chuck Co., New Britain, Conn.

JIGS, TOOLS, ETC.
Ackworthie Ltd., J., Birmingham, Eng.
Brown Engineering Corp., Toronto.
Crescent Mach. Co., Ltd., Montreal, P.Q.
Elliott & Whitehall Mach. & Tool Co., Galt.
Gishout Machine Co., Madison, Wis.
Globe Engineering Co., Ltd., Hamilton.
Homer & Wilson, Hamilton, Ont.
Jones & Lamson, Springfield, Vt.
Toronto Tool Co., Toronto, Ont.

JOURNAL WEDGES
Canada Foundries & Forgings, Welland.
Dominion Foundries & Steel Ltd., Hamilton, Ont.

KEY SEATERS
Garlock-Walker Machy. Co., Toronto, Ont.
Garvin Machine Co., New York.
Morton Mfg. Co., Muskegon Heights, M.
Petrie, Ltd., H. W., Toronto.
Williams Machy. Co., A. R., Toronto.

KEYS, MACHINE
Whitney Mfg. Co., Hartford, Conn.
Williams & Co., J. H., Brooklyn, N.Y.

KILNS
Can. Blower & Forge Co., Kitchener, Ont.
General Combustion Co., Ltd., Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
Sturtevant Co., B. F., Galt, Ont.

KNIVES, MACHINE
Atkins & Co., E. C., Hamilton, Ont.

LABELS AND TAGS
Matthews & Co., Jas. H., Pittsburgh, Pa.

LABORATORIES, INSPECTION AND TESTING (see Chemists)

LADLES, FOUNDRY
Northern Crane Works, Walkerville.

LACING MACHINES
Clipper Belt Lacer Co., Grand Rapids, M.

LAG SCREW GIMLET POINTERS
National Machy. Co., Tiffin, Ohio.

LATH
Robertson Ltd., H. H., Sarnia, Ont.

LATHES, CHUCKING
Acme Machine Tool Co., Cincinnati, Ohio.
Petrie, Ltd., H. W., Toronto.
Wood Turret Machine Co., Brazil, Ind.

LATHE CHUCKS (See Chucks)

LATHE DOGS AND ATTACHMENTS
Armstrong Bros. Tool Co., Chicago.
Hendey Machine Co., Torrington, Conn.
Williams & Co., J. H., Brooklyn, N.Y.

LATHES, AUTOMATIC AND SEMI-AUTOMATIC
Gisholt Machine Co., Madison, Wis.
Wood Turret Machine Co., Brazil, Ind.

LATHES, AXLE
Barber Mchy. Co., Ltd., Toronto, Ont.
Betts Mach. Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.

LATHES, BORING
Barber Mchy. Co., Ltd., Toronto, Ont.
Bridgeford Mach. Tool Works, Rochester.
Canada Machinery Corp., Galt, Ont.
Lodge & Shipley, Cincinnati, O.
Petrie, Ltd., H. W., Toronto.

LATHES, PRECISION, BENCH
W. F. & John Barnes Co., Rockford.
J. G. Blount & Co., Everett, Mass.
Canadian Fairbanks-Morse Co., Montreal.
Geo. F. Foss Machy. & Supply Co., Montreal.
Garlock-Walker Machinery Co., Toronto.
Hardinge Bros., Chicago, Ill.
Petrie, Ltd., H. W., Toronto.
Pratt & Whitney Co., Dundas, Ont.
Seneca Falls Mfg Co., Seneca Falls, N.Y.
Strelinger Co., C. A., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

LATHES, BRASS
Ackworthie Ltd., J., Birmingham, Eng.
Acme Machine Tool Co., Cincinnati, Ohio.
Hardinge Bros., Chicago, Ill.
Wood Turret Machine Co., Brazil, Ind.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

LATHES, ENGINE
Acme Machine Tool Co., Cincinnati, O.
Barber Mchy. Co., Ltd., Toronto, Ont.
John Bertram & Sons, Co., Dundas.
Canada Machy. Corp., Galt, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cisco Machine Tool Co., Cincinnati, O.
G. F. Foss, Mchy. & S'ply Co., Montreal
Garlock-Walker Machinery Co. Toronto.
Garvin Machine Co., New York.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Kennedy & Sons, Wm., Owen Sound, Ont.
Lehman Mach. Co., St. Louis, Mo.
R. McDougall Co., Galt.
Niles-Bement-Pond Co., New York.
Perfect Machine Co., Galt, Ont.
Rae Mach. Tool Co., Hamilton.
Smalley-General Co., Inc., Bay City, Mich.
Standard Equipment & Tool Wks. Montreal, P.Q.
Seneca Falls Mfg. Co., Seneca Falls, N.Y.
Sidney Tool Co., Sidney, Ohio.
Strelinger Co., C. A., Windsor, Ont.
Walcott Lathe Co., Jackson, Mich.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
Rae Mach. Tool Co., Hamilton.
A. R. Williams Machy. Co., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

LATHES, FOOT POWER
Seneca Falls Mfg. Co., Seneca Falls, N.Y

LATHES, HORIZONTAL
Intern'l. Mchy. Supplies Ltd., Montreal.
Wood Turret Machine Co., Brazil, Ind.

LATHES, JOURNAL TRUEING
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.

LATHE MANDRELS, HARDENED AND GROUND
Elliott & Whitehall, Galt, Ont.

LATHES, PATTERNMAKERS'
J. G. Blount Co., Everett, Mass.
Can. Machinery Corp., Galt.
Wood Turret Machine Co., Brazil, Ind.
G. F. Foss Mchy. & S'ply Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.

LATHES, POLISHING
Ackworthie Ltd., J., Birmingham, Eng.
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

LATHES, SCREW CUTTING
Barber Mchy. Co., Ltd., Toronto, Ont.
Bertram & Sons Co., John, Dundas, Ont.
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Cisco Machine Tool Co., Cincinnati, O.
Foss Mchy. & Sply Co., G. F., Montreal
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Hepburn Ltd., John T., Toronto, Ont.
Lehman Machine Co., St. Louis, Mo.
Niles-Bement-Pond Co, New York.
Rae Mach. Tool Co., Hamilton.
Seneca Falls Mfg. Co., Seneca Falls, N.Y.
Strelinger Co., C. A., Windsor, Ont.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
Williams Machy. Co., A. R., Toronto.
Wood Turret Machine Co., Brazil, Ind.

LATHES, SPINNING
Bliss Co., E. W., Brooklyn, N.Y.

LATHES, TOOL ROOM
Barber Mchy. Co., Ltd., Toronto, Ont.
Cisco Machine & Tool Co., Cincinnati, O
Canada Machinery Corporation, Galt, Ont.
Knight Metal Products, Toronto.
Lehman Machine Co., St. Louis, Mo.
Rae Mach. Tool Co., Hamilton.
Seneca Falls Mfg. Co., Seneca Falls, N.Y.

LATHES, QUICK CHANGE
Lehman Machine Co., St. Louis, Mo.

LATHE SAWS
Atkins & Co., E. C., Hamilton, Ont.

LATHES, TURRET
Acme Machine Tool Co., Cincinnati, Ohio
Hardinge Bros., Chicago, Ill.
Herbert Ltd., Alfred, Toronto, Ont.

LEAD, PIG AND BAR
British Smelting & Refining Co., Ltd., Montreal, Que.

LEAD BURNING OUTFITS
Turner Brass Works, Sycamore, Ill.

LEATHER STRAPPING
Graton & Knight Mfg. Co., Worcester, M.

LENSES FOR GOGGLES
Standard Optical Co., Geneva, N.Y.

LEVELS
Hughes, Owens Co., Ltd., Montreal, Que.

LIDS, SCREW TOP AND HINGE
Can. Winkley Co., Ltd., Windsor, Ont.

LINK BELTING
See Belting, Chain.

LIFT TRUCKS
Can. Kron Scale Co., Montreal.

LINOLEUM MILL MACHINERY
Bertrams, Ltd., Edinburgh, Scotland.

LOCKERS, STEEL WARDROBE AND STEEL MATERIAL
Canada Wire & Iron Gds. Co., Hamilton
Dennis Wire & Iron Works, London, Ont

LUBRICANTS
Cataract Refining & Mfg. Co., Toronto.
Swan & Finch, Inc., New York.

LUBRICANTS, CUTTING AND GRINDING, DRAWING, STAMPING
Oakley Chemical Co., New York, N.Y.

LUBRICATING, OIL FILTERING AND CIRCULATING SYSTEMS
Bowser Co., Ltd., S. F., Toronto, Ont.

LUBRICATORS
Trabern Pump Co., Rockford, Ill.

LUMBERMEN'S TOOLS
Thos. Pink Co., Ltd., Pembroke, Ont.

MACHINE COUNTER WEIGHTS
Katie Foundry, Galt, Ont.

MACHINE TOOLS
Barber Mach. Co., F. F., Toronto, Ont.
Knight Metal Products, Toronto.

Special Interest to Manufacturers

DEPARTMENT OF INSURANCE
OTTAWA

Canadian Foamite Firefoam, Limited

On Thursday, June 10th, I was invited by your representative, Mr. E. C. Gunn, to supervise a series of tests of your Foamite Firefoam Extinguisher at No. 4 Fire Station, Ottawa. The tests arranged and carried out were as follows:—

Test No. 1 A wooden wall, 12′ x 12′ of 1″ lumber, was erected and a large quantity of wood shavings, excelsior, broken packing cases and other inflamable rubbish was piled against it. The whole pile, together with the wooden wall, was then soaked with 5 gallons of gasoline and ignited. The fire was permitted to burn until the entire mass was in flames that shot some 20 feet into the air. At a given signal, and when the fire was at its height, one 5 gallon cylinder of Foamite was discharged upon the burning mass, with the result that the fire was totally extinguished in 40 seconds. The most notable features of this test was the manner in which the wooden wall, when coated with Firefoam, was completely insulated from the flames that impinged against it.

Test No. 2 A quantity of excelsior, broken packing cases and miscellaneous rubbish was piled within an enclosure measuring approximately 10′ x 10′ in an attempt to simulate as nearly as possible the conditions that frequently obtain in basements and cellars. The entire pile was soaked with gasoline, which was allowed to evaporate, the gasoline vapour being confined by the enclosure. Upon ignition, a miniature explosion took place and the entire mass instantly took fire. After being permitted to burn for 2 minutes, one 5 gallon Firefoam Extinguisher was discharged and the fire completely extinguished in 30 seconds.

Test No. 3 An open metal tub, 2′ 6″ in diameter, containing 7 gallons of gasoline was placed in the centre of a wooden floor constructed of 1″ boards laid on 2″ x 4″ scantlings. The floor was deluged with gasoline and ignited. When the entire floor and tub of gasoline were in flames, spray from a 5 gallon Firefoam Extinguisher was discharged into the tub and in 10 seconds it completely extinguished the burning gasoline and prevented its re-ignition from the flaming floor surrounding it. The floor itself was extinguished in 5 seconds by spray from the same extinguisher.

Note Comparative tests made at the same time upon a similar gasoline soaked floor of like area gave the following results:—
(a) Ordinary 1 quart Tetra-Chloride Extinguisher. The liquid from this Extinguisher slightly subdued the flames in the small area touched by the stream, but proved entirely inadequate to deal with a fire spread over so large an area. It was demonstrated that in fighting quickly-spreading fire 1 quart of liquid has little or no effect.
(b) Ordinary 2½ gallon Soda and Acid Extinguisher. This extinguisher was discharged upon a burning floor of the same area as that used in the other tests, and while it extinguished the flames it only did so by repeated applications, owing to the rekindling of the gasoline vapour by the hot charred floor.

(Signed) J. GROVE SMITH
Dominion Fire Commissioner.

CANADIAN FOAMITE FIREFOAM, Limited

MONTREAL 604 Southam Bldg.
TORONTO 208 Stair Bldg.
Head Office HAMILTON, ONT.
OTTAWA 63 Sparks Street
VANCOUVER 801 Standard Bank Bldg.
CALGARY 307 8th Avenue West
MOOSE JAW 23 High Street West
SYDNEY, N.s. 2 Buckley Bldg.

If interested, tear out this page and keep with letters to be answered.

MACHINERY DEALERS

Archibald & Co., Chas. P., Montreal.
Barber Mchy. Co., Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Elliott & Whitehall, Galt, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Williams Machy. Co., A. R., Toronto.

MACHINERY GUARDS (See Guards)

MACHINERY SUPPLIES

Crescent Machine Co., Ltd., Montreal.
Globe Engineering Wks., Hamilton, Ont.
Knight Metal Products, Toronto.

MACHINERY, SPECIAL

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Crescent Machine Co., Ltd., Montreal, Que.
McClean Machine & Tool Co., Ltd., Hamilton, Ont.

MACHINISTS' TOOLS

Atkins & Co., E. C., Hamilton, Ont.
Brown & Sharpe Mfg. Co., Providence, R. I.

MAGNETIC BRAKES FOR ELECTRIC MOTORS

Volta Mfg. Co., Welland, Ont.

MANDRELS

Butterfield & Co., Inc., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Jardine & Co., A. B., Hespeler, Ont.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
McCrosky Tool Corp., Meadville, Pa., U. S. A.
Pratt & Whitney Co., Dundas, Ont.

MARKING DEVICES

Matthews & Co., Jas. H., Pittsburgh, Pa.

MARKING MACHINERY

Brown, Boggs Co., Hamilton, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Perrin, Wm. R., Toronto.
Petrie, Ltd., H. W., Toronto.

MATERIALS, HANDLING PLANTS

Canadian Mead-Morrison Co., Limited, Montreal, Que.

MATS, RUBBER MATTING

Quaker City Rubber Co., Philadelphia, Pa
International Mchy. Sply., Ltd., Montreal

MEASURING MACHINES

Pratt & Whitney Co., Dundas, Ont.

MEASURES, REGISTERING

Bowser Co., Ltd., S. F., Toronto, Ont.

MEASURING TAPES AND RULES

Chesterman & Co., Jas., Sheffield, Eng.

MERCHANTS, IRON AND STEEL

Samuel Osborne (Can.), Ltd., Montreal.

METALLURGISTS

See Chemists.

METAL CLEANERS

Oakley Chemical Co., New York, N.Y.

METAL CUTTING MACHINES

Atkins & Co., E. C., Hamilton, Ont.
Lyman Tube & Supply Co., Montreal, Que.

METAL SAWS

See Saws.

METAL, ANTI-FRICTION

Thos. Moore & Son, Montreal.

METAL SAWS, POWER

E. C. Atkins & Co., Inc., Indianapolis.
Hoefer Mfg. Co., Freeport, Ill.
Lyman Tube & Supply Co., Montreal, Que.

METALS

British Smelting & Refining Co., Ltd., Montreal, Que.
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.
Canada Metal Co., Toronto, Ont.
Deloro Smelting & Refining Co., Ltd, Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.

METAL, STAMPINGS, SMALL

Can. Winkley Co., Ltd., Windsor, Ont.

METERS, OIL, GASOLINE, KEROSENE, ETC.

Bowser Co., Ltd., S. F., Toronto, Ont.
General Combustion Co., Ltd., Montreal, Que.

MICROMETERS

Taylor, J. A. M., 318 Stair Bldg., Toronto.
Petrie, Ltd., H. W., Toronto.

MILLS, BRACE AND TUBE

Elec. Steel & Metals, Welland, Ont.

MILL SPECIALTIES

Atkins & Co., E. C., Hamilton, Ont.

MILLS, SAND

Frost Mfg. Co., Chicago, Ill.

MILL MACHINERY

Alexander Fleck, Ltd., Ottawa.
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

MILLING ARBORS

Ackworthie Ltd., J., Birmingham, Eng.
Barber Mchy. Co., Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Kearney & Trecker Co., Milwaukee Wis.

MILLING ATTACHMENTS

Ackworthie Ltd., J., Birmingham, Eng.
Barber Mchy. Co., Ltd., Toronto, Ont.
Becker Milling Machine Co., Boston, Mass.
Bertram & Sons Co., John, Dundas, Ont.
Brown & Sharpe Mfg. Co., Providence.
Canada Machinery Corp., Galt, Ont.
Cincinnati Milling Machine Co., Cincinnati
Ford-Smith Mach. Co., Hamilton, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Hardinge Bros., Inc., Chicago, Ill.
Hendey Mach. Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Taft-Peirce Mfg. Co., Woonsocket, R.I.

MILLING MACHINES, AUTOMATIC

Bilton Mach. Tool Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Betts Machine Co., Rochester, N.Y.
Petrie, Ltd., H. W., Toronto.
Standard Equipment & Tool Wks., Montreal, P.Q.

MILLING CUTTERS

Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Milling Machine Co., Cleveland.
Deloro Smelting & Refining Co., Ltd, Toronto, Ont.
Herbert, Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Marshall, Son & Bunney, Toronto.
Petrie, Ltd., H. W., Toronto.
Wilt Twist Drill Co., Walkerville, Ont.

MILLING MACHINES, HAND

Bristol Machine Tool Co., Bristol, Conn.

MILLING MACHINES, THREAD

Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Inc., Chicago, Ill.
Gray Ball Bearing Co., Ltd., Toronto.
United States Mach. Tool Co., Cincinnati.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Smalley Gen. Co., Inc., Bay City, U.S.A.
Standard Equipment & Tool Wks., Montreal, P.Q.

MILLING MACHINES, HORIZONTAL AND VERTICAL

Barber Mchy. Co., Ltd., Toronto, Ont.
Becker Milling Machine Co., Boston, Mass
Bristol Machine Tool Co., Bristol, Conn.
Brown & Sharpe Mfg. Co., Providence.
Bertram & Sons Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Cochrane-Bly Co., Rochester, N.Y., U.S.A.
Ford-Smith Mach. Co., Hamilton, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Knight Metal Products, Toronto.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Rockford Milling Mach. Co., Rockford, Ill
United States Mach. Tool Co., Cincinnati.
Whitney Mfg. Co., Hartford, Conn.
Williams Machy. Co., A. R., Toronto.

MILLING MACHINES, PLAIN, BENCH AND UNIVERSAL

Barber Mchy. Co., Ltd., Toronto, Ont.
Becker Milling Machine Co, Boston, Mass.
Bilton Mach. Tool Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence.
Canada Machinery Corp., Galt, Ont.
Cleveland Milling Machine Co., Cleveland.
Cincinnati Milling Machine Co., Cincinnati
Ford-Smith Mach. Co., Hamilton, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Garvin Machine Co., New York.
National Machy. Co., Tiffin, Ohio.
Gooley & Eduud, Inc., Cortland, N.Y.
Hardinge Bros., Inc., Chicago, Ill.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Knight Metal Products, Toronto.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Standard Equipment & Tool Wks., Montreal, P.Q.

MILLING MACHINES, PROFILE

Barber Mchy. Co., Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

MILLING TOOLS

Aikenhead Hardware Co., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence.
Ford-Smith Mach. Co., Hamilton, Ont.
Geometric Tool Co., New Haven, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
Rice Lewis & Son, Toronto, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

MINE CARS

Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Dominion Bridge Co., Montreal, Que.
Elec. Steel & Metals, Welland, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.

MINING MACHINERY

Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Elec. Steel & Metals, Welland, Ont.
Holden Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto.
Williams Machy. Co., A. R., Toronto.
Williams Mchy Co., A. R., Toronto, Ont

MIXERS, SAND

Frost Mfg. Co., Chicago, Ill.

MORTISING CHAINS

Renold of Canada Ltd., Montreal.

MORTISING MACHINES

Canada Machinery Corp., Galt, Ont.
Ford-Smith Mach. Co., Hamilton, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal
Hardinge Bros., Inc., Chicago, Ill.
Hendey Mach. Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Taft-Peirce Mfg. Co., Woonsocket, R.I.

MILLING MACHINES, AUTOMATIC

Bilton Mach. Tool Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Betts Machine Co., Rochester, N.Y.
Petrie, Ltd., H. W., Toronto.
Standard Equipment & Tool Wks., Montreal, P.Q.

MILLING CUTTERS

Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Milling Machine Co., Cleveland.
Deloro Smelting & Refining Co., Ltd, Toronto, Ont.
Herbert, Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Marshall, Son & Bunney, Toronto.
Petrie, Ltd., H. W., Toronto.
Wilt Twist Drill Co., Walkerville, Ont.

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United States Mach. Tool Co., Cincinnati.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Smalley Gen. Co., Inc., Bay City, U.S.A.
Standard Equipment & Tool Wks., Montreal, P.Q.

MILLING MACHINES, HORIZONTAL AND VERTICAL

Barber Mchy. Co., Ltd., Toronto, Ont.
Becker Milling Machine Co., Boston, Mass
Bristol Machine Tool Co., Bristol, Conn.
Brown & Sharpe Mfg. Co., Providence.
Bertram & Sons Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Cochrane-Bly Co., Rochester, N.Y., U.S.A.
Ford-Smith Mach. Co., Hamilton, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Knight Metal Products, Toronto.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Rockford Milling Mach. Co., Rockford, Ill
United States Mach. Tool Co., Cincinnati.
Whitney Mfg. Co., Hartford, Conn.
Williams Machy. Co., A. R., Toronto.

MILLING MACHINES, PLAIN, BENCH AND UNIVERSAL

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Cincinnati Milling Machine Co., Cincinnati
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Garvin Machine Co., New York.
National Machy. Co., Tiffin, Ohio.
Gooley & Eduud, Inc., Cortland, N.Y.
Hardinge Bros., Inc., Chicago, Ill.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Knight Metal Products, Toronto.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Standard Equipment & Tool Wks., Montreal, P.Q.

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Garlock-Walker Machy. Co., Toronto, Ont.
Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

MILLING TOOLS

Aikenhead Hardware Co., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence.
Ford-Smith Mach. Co., Hamilton, Ont.
Geometric Tool Co., New Haven, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
Rice Lewis & Son, Toronto, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

MINE CARS

Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Dominion Bridge Co., Montreal, Que.
Elec. Steel & Metals, Welland, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.

MINING MACHINERY

Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Elec. Steel & Metals, Welland, Ont.
Holden Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto.
Williams Machy. Co., A. R., Toronto.
Williams Mchy Co., A. R., Toronto, Ont

MIXERS, SAND

Frost Mfg. Co., Chicago, Ill.

MORTISING CHAINS

Renold of Canada Ltd., Montreal.

MORTISING MACHINES

Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.
Gray Ball Bearing Co., Ltd., Toronto.

MOTORS, ELECTRIC

Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
Lincoln Electric Co. of Canada, Ltd., Toronto, Ont.
MacGovern & Co., Montreal, Que.
Northern Elec. Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto.
Sturtevant Co., B. F., Galt, Ont.
U. S. Ordnance, Toronto, Ont.
Volta Mfg. Co., Welland, Ont.
Williams Mach'y Co., A. R., Toronto.

MOTOR SPRINGS

The Dunbar Brothers Co., Bristol, Conn.

MOTORCYCLE FRAME AND FORK

The Dunbar Brothers Co., Bristol, Conn.

MOTORS, PNEUMATIC

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto.
Holden Co., Ltd., Montreal, Que.

MOULDS, RUBBER

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

MULTIPLE INDEX CENTRES

Garvin Machine Co., New York.
Graton & Knight Mfg. Co., Worcester, M.

MULTI-DRILLING, MULTI-BORING, MULTI-TAPPING MACHINERY

Nat. Automatic Tool Co., Richmond, Ind.

MUNICIPALITIES

City of St. John, Quebec.

NAIL SETS

Morrow Screw & Nut Co., J., Ingersoll, Ont

NAME PLATES, BRONZE, ETCHED AND STAMPED

Matthews & Co., Jas. H., Pittsburgh, Pa.
Turner Brass Works, Sycamore, Ill.

NICHROME CASTINGS

Can. Driver-Harris Co., Ltd., Walkerville.

NICKEL

Pilot Steel & Tool Co., Montreal, Que.

NICKEL STEEL

See Steel.

NICKEL SILVER—SHEETS, ROLLS, PLATES and RODS

Brown's Copper and Brass Rolling Mills, New Toronto.

NIPPLE THREADING MACHINES

Landis Machine Co., Waynesboro, Pa.
Williams Tool Corp. of Can. Ltd., Brantford, Ont.

NITROGEN

Carter Welding Co., Toronto, Ont.

NUTS, STEEL, CASTELLATED AND COLD PRESSED

Galt Machine Screw Co., Ltd., Galt, Ont.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Williams & Co., J. H., Brooklyn, N.Y.

NUTS, SEMI-FINISH AND FINISHED

Galt Machine Screw Co., Galt, Ont.
National-Acme Co., Cleveland, Ohio.
Wilkinson & Kompass, Hamilton.

NUT LOCKS

Edw. W. Rotinson Co., Ltd., Montreal.

NUT BURRING AND NUT MACHINES (HOT)

National Machy. Co., Tiffin, Ohio.

NUT FACING AND BOLT SHAVING MACHINES

Garvin Machine Co., New York.
National Machinery Co., Tiffin, Ohio.
Petrie, Ltd., H. W., Toronto.
Victor Tool Co., Waynesboro, Pa.

NUT TAPPERS

Bertram & Sons Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
Jardine & Co., A. B., Hespeler.
Landis Machine Co., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
Petrie, Ltd., H. W., Toronto.
Williams Tool Corp. of Can. Ltd., Brantford, Ont.

OILERS

All-Way Oiler Mfg. Co., Toronto, Ont.

OIL SEPARATORS

Can. Fairbanks-Morse Co., Montreal.

OIL STONES

Aikenhead Hardware Co., Toronto, Ont.
Carborundum Co., Niagara Falls, N.Y.
Norton Co., Worcester, Mass.
Rice Lewis & Son, Toronto, Ont.

OIL STONE GRINDERS

Oliver Machy. Co., Grand Rapids, Mich.

OIL STORAGE SYSTEMS

Bowser Co., Ltd., S. F., Toronto, Ont.
St. Lawrence Welding Co., Ltd., Montreal.

OPENING DIE HEADS

Greenfield Tap & Die Corp, Greenfield.
Wells Bros. of Canada, Galt, Ont.

OPTICAL SUPPLIES

Consolidated Optical Co., Toronto, Ont.

ORE HANDLING EQUIPMENT

Brown Hoisting Machinery Co., Cleveland, Ohio.
Canadian Link-Belt Co., Ltd., Toronto, Ont.
Canadian Mead-Morrison Co., Limited, Montreal, Que.

OSCILLATING VALVE GRINDERS (PNEUMATIC)

Cleveland Pneumatic Tool Co. of Canada, Toronto.

OVENS FOR BAKING, BLUING, DRYING, ENAMELING, JAPANNING AND LACQUERING

Brantford Oven & Rack Co., Brantford

OVEN TRUCKS, STEEL

Brantford Oven & Rack Co., Brantford.
MacKinnon Steel Co., Sherbrooke, Que.

OVENS FOR DRYING, TEMPER AND OXYGEN, ELECTROLYTIC CELLS UNDER TRUCKS

Welding & Supplies Co., Montreal, Que.
Brantford Oven & Rack Co., Brantford.

OXY-ACETYLENE WELDING AND CUTTING AND OUTFITS

Carter Welding Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
L'Air Liquide Society, Toronto, Ont.
Prest-o-Lite Co., Inc. Toronto, Ont.
Davis-Bournonville Co., Toronto, Ont.

OXYGEN

Carter Welding Co., Ltd., Toronto, Ont.
Dominion Oxygen Co., Ltd., Toronto, Ont.
Nat. Electro Products Ltd., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.

OXYGEN PLANTS (ELECTROLYTIC)

Davis-Bournonville Co., Toronto, Ont.

PACKINGS, ASBESTOS

Cleveland Wire Spring Co., Cleveland.

PACKING, ROD AND SHEET

Dunlop Tire & Rubber Goods Co., Ltd. Toronto.
Goodyear Tire & Rubber Co., Can., Ltd. Toronto
Gutta Percha & Rubber, Ltd., Toronto.
International Mach. Sply., Ltd., Montreal
Petrie, Ltd., H. W., Toronto.
Quaker City Rubber Co., Philadelphia, Pa

PANS, WET AND DRY

Frost Mfg. Co., Chicago, Ill.

PAPER MILL CONVEYORS AND DRIVES

Bertrams, Ltd., Edinburgh, Scotland.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Gutta Percha & Rubber, Ltd., Toronto.
MacKinnon Steel Co., Sherbrooke, Que.

PARTITIONS, WIRE

See Guards

PAPER MILL MACHINERY

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Machinery Co., Toronto.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

PATTERN SHOP EQUIPMENT

Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Oliver Machy. Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto.

PATTERN MAKERS' LATHES

See Lathes.

PATENT SOLICITORS

Bedden, Hanbury A., Montreal.
Fetherstonhaugh & Co., Ottawa.
Marion & Marion, Montreal.
Ridout & Maybee, Toronto.

PECK CARRIERS FOR POWER PLANTS

Can. Link-Belt Co., Toronto, Ont.

PENSTOCKS

William Hamilton Co., Peterboro, Ont.

PERFORATED METALS AND ORNAMENTAL IRON GOODS

Canada Wire & Iron Goods Co., Hamilton

PHOSPHOR TIN, COPPER AND BRONZE

British Smelting & Refining Co., Ltd., Montreal, Que.

PHOTOSTATS

Commercial Camera Co., Providence, R.I.

PIG IRON

Hanna & Co., M. A., Cleveland, O.
Steel Co. of Canada, Ltd., Hamilton, Ont.

PINS, TAPER

Morrow Screw & Nut Co., J., Ingersoll, Ont

PINS, BELT-LACING

Clipper Belt Lacer Co., Grand Rapids.

PIPE, BLACK & GALVANIZED

Crane, Ltd., Montreal, Que.

PIPE FITTINGS, MALLEABLE AND CAST IRON

International Malleable Iron Co., Guelph.

PIPE CUTTING AND THREADING MACHINES

Barber Mchy. Co., Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Curtis & Curtis Co., Bridgeport, Conn.
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
MacDougall Co., R., Galt.
Petrie, Ltd., H. W., Toronto.
Wells Bros. Co. of Canada, Galt, Ont.
Williams Tool Co., Erie, Pa.
Williams Machy. Co., A. R., Toronto.
Williams Tool Corp. of Can. Ltd., Brantford, Ont.

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PIPE RIVETED STEEL

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PIERCING

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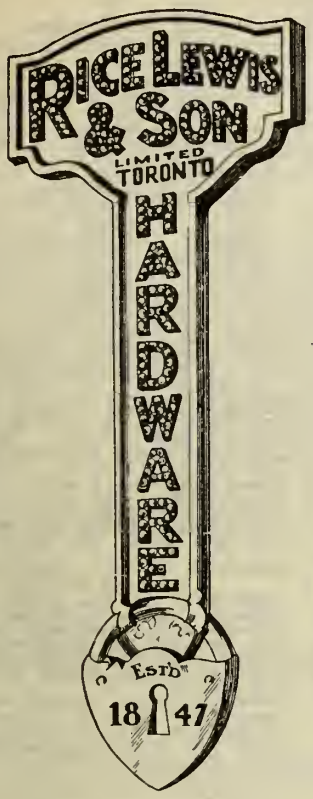
Curtis & Curtis Co., Bridgeport, Conn.
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. Co. of Canada, Galt, Ont.
Williams Tool Corp. of Can. Ltd., Brantford, Ont.



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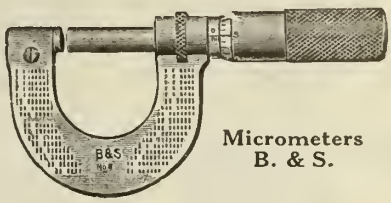
Certain makes of tools give greater service in some shops than in others. Of course you want to secure those which have proven most efficient under **your** conditions. The large, complete stocks of machine shop and construction supplies available at Rice Lewis & Son, Limited, enable you to select just the makes you desire.



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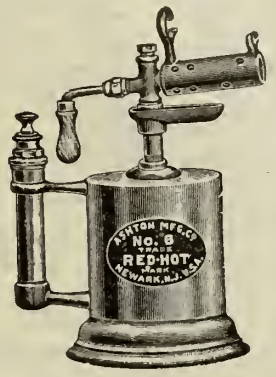

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The Rice Lewis line includes Pipe Vises and pipe Wrenches, Micrometers, Torches, Set Screws, Cap Screws, Machine Screws, High Speed and Carbon Drills, Files and machinists' tools of every description.

We also carry large stocks of Bar Iron, Sheet Iron (black and galvanized), Machine Steel, Cast Steel, High Speed Steel, Cold Rolled Steel, etc., on which we shall be pleased to quote prices and deliveries.

RICE LEWIS & SON, LTD.

Established 1894

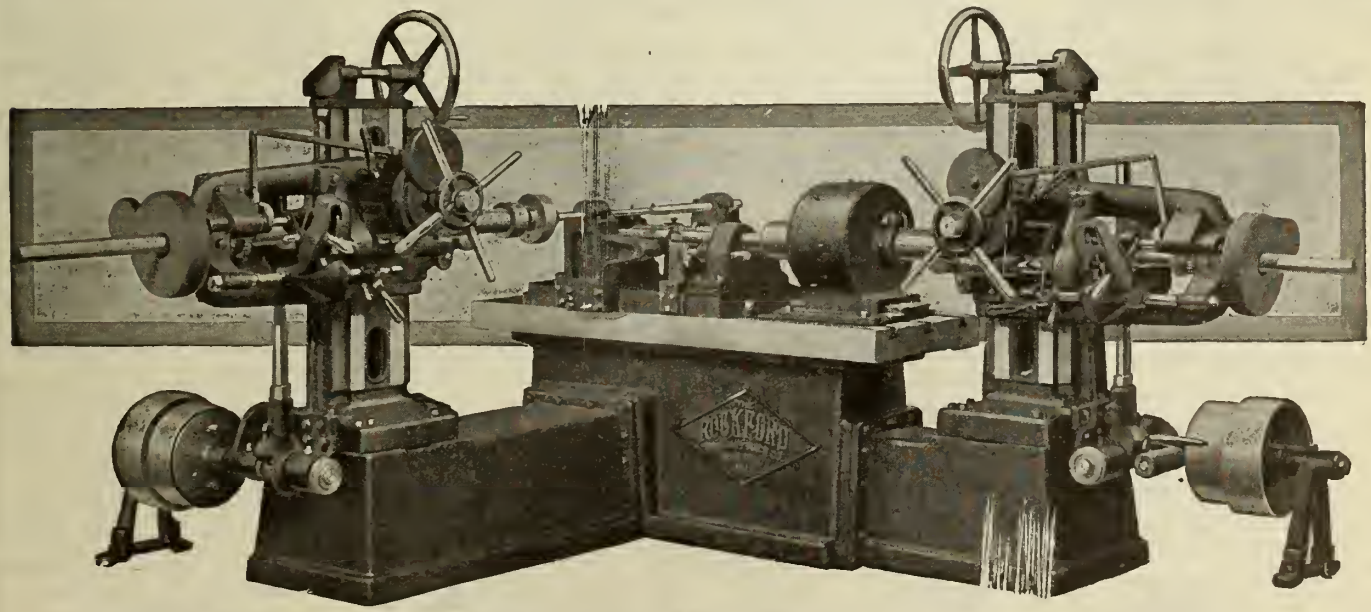
19 Victoria St., Toronto, Ont.

Rockford Horizontal Boring Machine

For Automobile Manufacture

This tool is unusually rapid and accurate in the boring of crank cases, transmission cases and rear axles. Has two heads at right angles to each other. Spindles bore longitudinal and cross holes in work simultaneously.

Send us blue prints of your boring work and we will give you figures on the "Rockford's" ability on it.



THE ROCKFORD DRILLING MACHINE CO., ROCKFORD, Ill.

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FOREIGN REPRESENTATIVES:—Burton Griffiths, London. Buck & Hickman, London E., England. R. S. Stokvis & Zonen, Inc., France, Belgium, Holland, Russia. Allied Machinery Co., 51 Chambers St., New York City, South Africa, China, Italy, Brazil, Portugal, Balkan States, Casamitjana Hermanos, Barcelona, Spain.

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Ackworthie Ltd., J., Birmingham, Eng.
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PIPE CUTTERS AND REAMERS
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PIPE STOCKS AND THREADERS
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PIPE TAPS AND VISES
Ackworthie Ltd., J., Birmingham, Eng.
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PIPE WRENCHES
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

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National Acme Co., Windsor, Vt.

PLANER BOLTS
Atkins & Co., E. C., Hamilton, Ont.
Morrow Screw & Nut Co., J., Ingersoll, Ont

PLANER JACKS
Armstrong Bros. Tool Co., Chicago.

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Betts Machine Co., Rochester, N.Y.
Barber Mchy. Co., Ltd., Toronto, Ont.
Bertram & Sons Co., John, Dundas.
Oliver Machy. Co., Grand Rapids, Mich.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal
Gardner & Son, Robt., Montreal.
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Herbert Ltd., Alfred, Toronto, Ont.
Muskegon Mtg. Co., Muskegon Heights, Mich
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
Standard Equipment & Tool Wks., Montreal.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.

PLANING AND SHAPING MACHINERY
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Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Niles-Bement-Pond Co., New York.
Ohio Mach. Tool Co., Kenton, Ohio.
Perrin, Ltd., William, Toronto.
Williams Mchy Co. Ltd., A. R., Montreal

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Lynd-Farquhar Co., Boston.
Petrie, Ltd., H. W., Toronto.

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Quickwork Co., St. Marys, Ohio.

PLANING MILL EXHAUSTERS
Can. Blower & Forge Co., Kitchener, Ont.
MacGovern & Co., Montreal, Que.
Niles-Bement-Pond Co., New York.
Sturtevant Co., B. F., Galt, Ont.

PLATES, Q.M., SHEARED AND CHEQUERED
Peckovers, Ltd., Toronto, Ont.

PLATING, PLANTS & SUPPLIES
Can. Hanson Van Winkle Co., Ltd., Toronto, Ont.

PLIERS
Aikenhead Hardware Co., Toronto.
Can. Billings & Spencer, Ltd., Welland.
Bice Lewis & Son, Toronto, Ont.

PNEUMATIC CYLINDERS
Holden Co., Ltd., Montreal, Que.

PNEUMATIC EQUIPMENT
Strelinger Co., C. A., Windsor, Ont.

PNEUMATIC TOOLS
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland P'matic Tool Co., Can., Toronto.
Curtis Pneumatic Machy. Co., St. Louis.
Garlock-Walker Machy. Co., Toronto.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool Co., Chicago.
Int. Mach. & Supply Co., Ltd., Montreal.

POWER CRANES, HAND
MacKinnon Steel Co., Sherbrooke, Que.

POLISHING MACHINES
Ackworthie Ltd., J., Birmingham, Eng.
Brown & Sharpe Mfg. Co., Providence, R.I.
Ford-Smith Machine Co., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto.

POLISHING PLATES
Greenfield Tap & Die Corp., Greenfield.
Petrie, Ltd., H. W., Toronto.
Wells Bros. of Canada, Galt, Ont.

POLISHING PAPER
H. H. Barton & Son Co., Philadelphia.

POTS AND KETTLES, CAST STEEL
Elec. Steel & Metals, Welland, Ont.

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Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

PORTABLE MACHINERY
Haskins & Co., R. C., Chicago, Ill.

POWER TRANSMISSION MCHY.
Canadian Link-Belt Co., Ltd., Toronto, Hamilton Co., Ltd., Wm., Peterborough, Ont.
Petrie, Ltd., H. W., Toronto.

PRECISION MACHINES
Herbert Ltd., Alfred, Toronto, Ont.

PRESSED STEEL PARTS
Ackworthie Ltd., J., Birmingham, Eng.
Gray Ball Bearing Co., Ltd., Toronto.

PRESSERS, ARBOR
Atlas Press Co., Kalamazoo, Mich.
Metalwood Mfg. Co., Detroit, Mich.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
Lourie Manufacturing Co., Springfield, Ill.

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Atlas Press Co., Kalamazoo, Mich.
Bliss Co., E. W., Brooklyn, N.Y.
Dom. Steel Products Co., Ltd., Brantford
Eastern Production Co., Detroit, Mich.
Metalwood Mfg. Co., Detroit, Mich
Petrie, Ltd., H. W., Toronto.
Toledo Machine & Tool Co., Toledo.
Stoll Co., D. H., Buffalo, N.Y.
Williams Mchy Co., Ltd., A. R., Montreal

PRESSES, CAM, TOGGLE, EYELET
Baird Machine Co., Bridgeport, Conn.
Bliss Co., E. W., Brooklyn N.Y.
Toledo Machine & Tool Co., Toledo.
Stoll Co., D. H., Buffalo, N.Y.

PRESSES, FILTER
Perrin, Ltd., William R., Toronto.
Smalley-General Co., Inc., Bay City, Mich.

PRESSES, PNEUMATIC
Dom. Steel Products Co., Ltd., Brantford.
Eastern Production Co., Detroit, Mich.
Metalwood Mfg. Co., Detroit, Mich.
Toledo Machine & Tool Co., Toledo.

PRESSES, DROP AND FORGING
Barber Mchy. Co., Ltd., Toronto, Ont.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs Co, Ltd., Hamilton.
Can. Fairbanks-Morse Co., Montreal.
Niles-Bement-Pond Co., New York.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co, Toledo.

PRESSES, HYDRAULIC
Barber Mchy. Co., Ltd., Toronto, Ont.
Bertram & Sons Co., John, Dundas.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Dom. Steel Products Co., Ltd., Brantford.
Eastern Production Co., Detroit, Mich.
Lourie Manufacturing Co., Springfield, Ill.
Metalwood Mfg. Co., Detroit, Mich.
Niles-Bement-Pond Co., New York.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.
Toledo Machine & Tool Co., Toledo.
Stoll Co., Inc., D. H., Buffalo, N.Y.
Williams Machy. Co., A. R., Toronto.

PRESSES, HYDRAULIC, HORIZONTAL
Eastern Production Co., Detroit, Mich.

PRESSES, HYDRAULIC, VERTICAL
Eastern Production Co., Detroit, Mich.

PRESSES, HYDRO-PNEUMATIC
Eastern Production Co., Detroit, Mich.

PRESSES, BALING
Perrin, Ltd., William R., Toronto.

PRESSES, POWER
Baird Machine Co., Bridgeport, Conn.
Barber Mchy. Co., Ltd., Toronto, Ont.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machinery Co., Toronto.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo.
Williams Machy. Co., A. R., Toronto.

PRESSES, SPRING FOOT
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Ont.
Toledo Machine & Tool Co., Toledo.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., Ltd., A. R., Montreal

PRESSES, SCREW
Barnes & Co., W. F. & Jno., Rockford, Ill
Bliss Co., E. W., Brooklyn, N.Y.
Manhattan Machine & Tool Co., Grand Rapids, Mich.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.

PRESSES, TIRE
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,

PRESSES, TRIMMING
Bliss Co., E. W., Brooklyn, N.Y.
Canada Machinery Corp., Galt, Ont.
Petrie, Ltd., H. W., Toronto.
Stoll Co., D. H. Buffalo, N.Y.

PROFILING MACHINES
Herbert Ltd., Alfred, Toronto, Ont.

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American Pulley Co., Philadelphia.
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Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke.
Diamond State Fibre Co., Bridgeport, Pa.
Ford-Smith Machine Co., Hamilton, Ont.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Kennedy & Sons, Ltd., W., Owen Sound.
Positive Clutch & Pulley Works Ltd., Toronto.
Petrie, Ltd., H. W., Toronto.

PULLEYS, STEEL SASH, STEEL BELT
American Pulley Co., Philadelphia Pa.

PULLEYS, FRICTION, CLUTCH
American Pulley Co., Philadelphia, Pa.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., A., Fortierville, Q.
Can. Link-Belt Co., Toronto, Ont.
Carlyle Johnson Mch. Co., Manchester, Ct.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Jones & Glasco, Montreal.
Positive Clutch & Pulley Works, Toronto.
Petrie, Ltd., H. W., Toronto.

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Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Hamilton Co., Ltd., Wm., Peterborough, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

PUMPS, AIR LIFT
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Holden Co., Ltd., Montreal, Que.

PUMPS, BOILER FEED
Can. Ingersoll-Rand Co., Ltd. Sherbrooke,

PUMPS, CENTRIFUGAL
Bowser Co., Ltd., S. F., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Ingersoll-Rand Co., Montreal, Que.
Darling Bros., Ltd., Montreal, Que.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

PUMPS, FUEL OIL
Bowser Co., Ltd., S. F., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Darling Bros., Ltd., Montreal, Que.
Trabern Pump Co., Rockford, Ill.

PUMPS, GEARED
Darling Bros., Ltd., Montreal, Que.
Globe Engineering Co., Hamilton, Ont.

PUMPS, HIGH PRESSURE
Perrin, Ltd., William R., Toronto.

PUMPS, HYDRAULIC
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Clarke & Co., Furniss, Montreal, Que.
Garlock-Walker Machinery Co., Toronto.
Darling Bros., Ltd., Montreal, Que.
Elec. Steel & Metals, Welland, Ont.
Metalwood Mfg. Co., Detroit, Mich.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

PUMPS, LUBRICATING, OIL STORAGE
Bowser Co., Ltd., S. F., Toronto, Ont.

PUMPS, RETURN AIR
Can. Ingersoll-Rand Co. Ltd., Sherbrooke,

PUMPS, SPECIAL
Elec. Steel & Metals, Welland, Ont.

PUMPS, RUBBER CEMENT
Bowser Co., Ltd., S. F., Toronto, Ont.

PUMPS, KEROSENE, OIL, SELF-MEASURING
Bowser Co., Ltd., S. F., Toronto, Ont.

PUMPS, LUBRICANT, OIL, WATER
Darling Bros., Ltd., Montreal, Que.
Trabern Pump Co., Rockford, Ill.

PUMPS — ROTARY
General Combustion Co., Ltd., Montreal, Que.

PUMP LEATHERS
Graton & Knight Mfg. Co., Worcester.

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Atkins & Co., Ltd., Wm., Sheffield, Eng.
E. W. Bliss Co, Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Can.
Can. Blower & Forge Co., Kitchener, Ont.
Crescent Mach. Co., Ltd., Montreal, P.Q.
Can. Fairbanks-Morse Co., Montreal.
Elliott & Whitehall Machine and Tool Co., Galt, Ont.
Gardner & Son, Robert, Montreal
A. B. Jardine & Co., Hespeler, Ont.
Marshall, Son & Blunney, Toronto.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, O.
Williams Mchy Co., A. R., Toronto, Ont.

PUNCHES, POWER
John Bertram & Sons Co., Dundas, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd, Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machinery Co., Toronto.
A. B. Jardine & Co., Hespeler, Ont.
Long & Allstatter, Hamilton, Ohio.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
D. H. Stoll Co., Buffalo, N.Y.
Williams Mchy Co., A. R., Toronto, Ont.

PUNCHING MACHINES, HORIZONTAL
Bertrams, Ltd., Edinburgh, Scotland.
Bertrams & Sons, John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co. Ltd., Hamilton, Ont.
Garlock-Walker Mach'y. Co., Toronto.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

PUNCHES, HAND
Niles-Bement-Pond Co., New York.

PYROMETERS
Bristol Co., Waterbury, Conn.
Shore Instrument & Mfg. Co., New York
Taylor Instrument Co., Rochester, N.Y.

QUARTERING MACHINES
Bertram & Sons, John, Dundas, Ont
Canadian Mead-Morrison Co., Limited, Montreal, Que.
Niles-Bement-Pond Co., New York.

QUARRY HOISTS
Canadian Mead-Morrison Co., Limited, Montreal, Que.

RAIL BENDERS
Algoma Steel Corp., Sault Ste. Marie, O.

RAILROAD TOOLS
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machinery Co., Toronto.
Holden Co., Ltd., Montreal, Que.
Niles-Bement-Pond Co., New York.
Petrie Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

RASPS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall, Son & Bunney, Toronto.

RAWHIDE PINIONS (See Gears)

REAMERS
Butterfield & Co., Inc., Rock Island, Que.

REAMERS, ADJUSTABLE
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Elliott & Whitehall Machine and Tool Co., Galt, Ont.
Greenfield Tap & Die Corp., Greenfield.
Ingersoll Machy. Co., Ingersoll, Ont.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
McCrosky Tool Corp., Meadville, Pa., U. S. A.
Plewes, Ltd., Winnipeg, Man.
Pratt & Whitney Co., Dundas, Ont.
The Kelly Reamer Co., Cleveland, O.
J. A. M. Taylor, 115 Stair Bldg., Toronto.
Wells Bros. of Can., Galt, Ont

REAMERS, BRIDGE, EXPANDING AND HIGH SPEED
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Aikenhead Hardware Co., Toronto.
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Elliott & Whitehall Machine and Tool Co., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Lyman Tube & Supply Co., Montreal, Que
Marshall, son & Bunney, Toronto.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Morse Twist Drill & Mch. Co., New Bedford, Mass.
McCrosky Tool Corp., Meadville, Pa., U. S. A.
Samuel Osborne, Ltd., Montreal, P.Q.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

REAMERS, STEEL TAPER AND SELF-FEEDING
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

REAMERS, CHUCKING
Ackworthie Ltd., J., Birmingham, Eng.
Atkins & Co., Ltd., Wm., Sheffield, Eng
Butterfield & Co., Inc., Rock Island, Que
Elliott & Whitehall Machine and Tool Co., Galt, Ont.
Greenfield Tap & Die Corp., Greenfield.
Ingersoll Machy. Co., Ingersoll, Ont.
Marshall, Son & Bunney, Toronto.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wells Bros. of Canada, Galt, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

REAMERS, HAND
Ackworthie Ltd., J., Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Elliott & Whitehall, Galt, Ont.
Greenfield Tap & Die Corp., Greenfield
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wells Bros. of Can., Galt, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

REAMERS, PIN
Ackworthie Ltd., J., Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield.
Morrow Screw & Nut Co., John, Ingersoll.
Wells Bros. of Can., Galt, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

REAMER FLUTING MACHINES
Garvin Machine Co., New York.

REAMING MACHINES, PNEUMATIC
Cleveland Pneumatic Co. of Can., Toronto
Garlock-Walker Machinery Co. Toronto.
Holden Co., Ltd., Montreal, Que.

RECORDING INTRUMENTS
Bristol Co., Waterbury, Conn.
Gisholt Machine Co., Madison, Wis.
Taylor Instrument Co., Rochester, N.Y.

REELS, WIRE AND TEXTILE MFG.
American Pulley Co., Philadelphia, Pa.

REGULATORS, AUTOMATIC
Electric Steels & Metals, Ltd., Welland.

REGULATORS, PRESSURE, TEMPERATURE
Can. Fairbanks-Morse Co., Montreal.
Taylor Instrument Co., Rochester, N.Y.

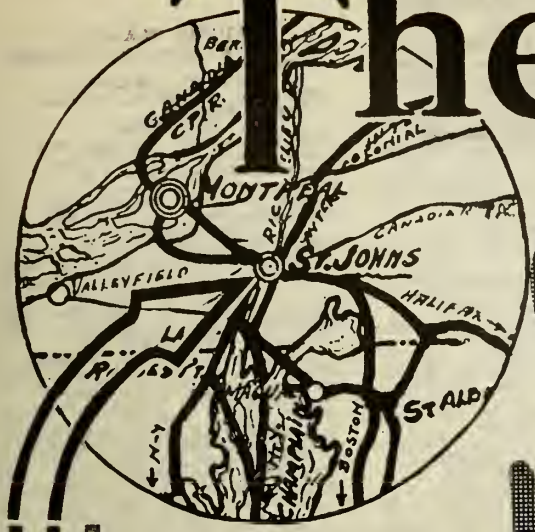
REPAIR WORK — SAWS
Atkins & Co., E. C., Hamilton, Ont.

REPAIR WORK, ALL KINDS
Elec. Steel & Metals, Welland, Ont.

RIVETS.
Aikenhead Hardware Co., Toronto, Ont.
Parmenter & Bulloch Co., Gananoque.
Bice, Lewis & Son, Toronto.
Steel Co. of Canada, Ltd., Hamilton.

RIVET HEATERS
Chicago Flexible Shaft Co., Chicago, Ill.

The City of ST. JOHNS Quebec



Merits your careful investigation as a location for your new factory

Located on the Richelieu River, which is a link in the chain of canals from New York to the St. Lawrence, St. Johns enjoys the advantages of a direct water route to the Eastern seaboard of the United States and the Great Lakes.

Seven railroads, including Canada's two great transcontinental lines, run through the city and are inter-connected in the St. Johns yards by a terminal switching company at very low rates.

St. Johns is known as the cheapest labour market in Canada. Skilled and unskilled labour is plentiful and labour troubles are unknown. Cheap electric power is developed at Chambly, eleven miles north-east of the city and the excellent railway connections assure a satisfactory coal supply.

Already an industrial centre, St. Johns is rapidly expanding and now offers extraordinary inducements to encourage the establishment of new industries, such as fifteen years' exemption from taxes, period subject to extension; all public improvements required; a bonus of 5% on your pay-roll for five years. If you desire it, the city will advance this to you, to be applied to the purchase or erection of any building suitable to your purpose.

For more specific information write

The Secretary of the City Council

St. Johns, Quebec, Canada

If interested tear out this page and place with letters to be answered.

RIVETERS, PNEUMATIC, HYDRAULIC, HAMMER, COMPRESSION
Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Montreal.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.

RIVETING MACHINES, ELASTIC, ROTARY BLOW
Grant Mfg. & Machine Co., Bridgeport.
High-Speed Hammer Co., Rochester.
Petrie, Ltd., H. W., Toronto.
F. B. Shuster Co., New Haven, Conn.
Strelinger Co., C. A., Windsor, Ont.

ROAD BUILDING EQUIPMENT
Can. Ingersoll-Rand Co., Ltd., Sherbrooke.
Holden Co., Ltd., Montreal, Que.

ROAD-MAKING MACHINERY
G. F. Foss Mchy & Sply. Co., Montreal.

RODS, ROPE AND SPRING
Page Steel & Wire Co., Adrian, Mich.

RODS, PURE NICKEL, MONEL METAL, NICHROME
Can. Driver-Harris Co., Ltd., Walkerville.

ROLLER CHAINS
Can. Link-Belt Co., Toronto.
Jones & Glasco, Montreal.
Lyman Tube & Supply Co., Montreal, Que.

ROLLS, BENDING, STRAIGHTENING
John Bertram & Sons Co., Dundas.
Brown, Boggs Co., Ltd., Hamilton.
Can. Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machinery Co., Toronto.
Niles-Bement-Pond Co., New York.
Petrie Ltd., H. W., Toronto.
Toledo Machine & Tool Co., Toledo, O.

ROLLS CRUSHING
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

ROLLS AND TABLES
Dominion Foundries & Steel Ltd., Hamilton, Ont.
Rice Steel & Metals, Welland, Ont.

ROOFING
H. H. Robertson, Ltd., Sarnia, Ont.

ROPE, GALX, MONEL METAL, BRONZE, TILLER AND SASH CORD
Can. Driver-Harris Co., Ltd., Walkerville.

ROTARY SHEARS
The Quickwork Co., St. Mary's, Ohio.

ROLLER CHAINS
Renold of Canada Ltd., Montreal.

ROLLING MACHINES, SHEET METAL
Manhattan Machine & Tool Co., Grand Rapids, Mich.

ROLLING MILL MACHINERY
Dom. Steel Products Co., Ltd., Brantford.
Mesta Machine Co., Pittsburgh, Pa.

ROLL LATHES
Mesta Machine Co., Pittsburgh, Pa.

ROLLS, BENDING, STRAIGHTENING
Manhattan Machine & Tool Co., Grand Rapids, Mich.

ROLLS, CRUSHING
Can. Link-Belt Co., Toronto.

ROOF COOLERS
Electric Steels & Metals, Ltd., Welland

RUBBER MOULDS AND CORES
Elliott & Whitehall, Galt, Ont.

RUBBER MILL DRIVES
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Dom. Steel Products Co., Ltd., Brantford.
Can. Link-Belt Co., Toronto.

RUBBER MILL MACHINERY
Bertrams Ltd., Edinburgh, Scotland.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Dom. Steel Products Co., Ltd., Brantford.

RUBBER MOULDS & CORES
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

RUBBER PRODUCTS, MECHANICAL
Dunlop Tire & Rubber Goods Co., Ltd., Montreal.

RUBBING BRICKS
Dominion Abrasive Co., Mimico, Ont.

RULES
Brown & Sharpe Mfg. Co., Providence.
James Chesterman & Co., Ltd., Sheffield
Rice, Lewis & Son, Toronto.
L. S. Starrett Co., Athol, Mass.

RULES, STEEL, STRAIGHT, AND FOLDING
Lufkin Rule Co. of Can., Windsor.

RULES, BOXWOOD, FOLDING
Lufkin Rule Co. of Can., Windsor.

RULES, BOARD AND LONG
Lufkin Rule Co. of Can., Windsor.

RUST PREVENTATIVES
Oakley Chemical Co., New York, N.Y.

SAW MILL CONVEYORS
Can. Link-Belt Co., Toronto.
Petrie, Ltd., H. W., Toronto.

SAND MILLS
Frost Mfg. Co., Chicago, Ill.

SAND-BLAST EQUIPMENT

SAND BLAST SUPPLIES AND ACCESSORIES
Pangborn Corporation, Hagerstown, Md.

SAND BLAST ABRASIVES
Pangborn Corporation, Hagerstown, Md.

SAND MIXING MACHINERY
Frost Mfg. Co., Chicago, Ill.

SANITARY DRINKING FOUNTAINS
Penn Sanitary Drinking Fountain Co., Haydenville.

SANDING MACHINES
Canada Machinery Corp., Galt.

SAW MILL MACHINERY
Can. Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt.
Rogers Gardner & Son, Montreal.
Curtis Pneumatic Machy Co., St. Louis
Hamilton Co., Ltd., Wm., Peterborough, Ont.
A. R. Williams Machy. Co., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

SASH SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

SAWS FOR EVERY USE
Atkins & Co., E. C., Hamilton, Ont.

SAWS, CIRCULAR METAL
Atkins & Co., E. C., Hamilton, Ont.
Cochrane-Bly Co., Rochester, N.Y., U.S.A.
Wm. Atkins & Co., Ltd., Sheffield, Eng.
Marshal, Son & Bunney, Toronto.
Plewes Ltd., Winnipeg, Man.
Simonds Mfg. Co., Fitchburgh, Mass.
Tabor Mfg. Co., Philadelphia, Pa.

SAWS, HACK (See Hack Saws)

SAW GUARDS
Ackworthie Ltd., J., Birmingham, Eng.
Atkins & Co., E. C., Hamilton, Ont.

SAWING MACHINES, CIRCULAR, FOR COLD METAL
Cochrane-Bly Co., Rochester, N.Y., U.S.A.

SAWS, METAL, HACK AND BAND
Atkins & Co., E. C., Hamilton, Ont.

SAWS, SILVER STEEL
E. C. Atkins & Co., Inc., Indianapolis.

SAW SHARPENERS
Cochrane-Bly Co., Rochester, N.Y., U.S.A.
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Can., Galt, Ont.

SAWS, SLITTING
J. A. M. Taylor, Stair Bldg., Toronto.
Atkins & Co., E. C., Hamilton, Ont.
Elliott & Whitehall Machine and Tool Co., Galt, Ont.

SAWS — HIGH-SPEED FRICTION
Atkins & Co., E. C., Hamilton, Ont.

SAWS — PATTERN SHOP
Atkins & Co., E. C., Hamilton, Ont.

SAWS — SWING
Atkins & Co., E. C., Hamilton, Ont.

SCALES
Can. Kron Scale Co., Montreal, P.Q.

SCALES, MECHANICS'
Lufkin Rule Co. of Can., Windsor.

SCLEROSCOPES
Shore Instrument & Mfg. Co., New York.

SCREENING MACHINERY
Can. Link-Belt Co., Toronto.

SCREW EXTRACTORS
Cleveland Twist Drill Co., Cleveland.

SCREW MACHINES, HAND, AUTOMATIC
Barber Mchy. Co., Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Ltd., Toronto
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield.
A. B. Jardine & Co., Hespeler.
National Acme Co, Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto.
Pratt & Whitney Co., Dundas, Ont.
Warner & Swasey Co., Cleveland, O.
Wells Bros. of Can., Galt, Ont.
Wood Turret Mach. Co., Brazil, Ind.

SCREWS, MACHINE, SET, CAP AND SPECIAL
Galt Machine Screw Co., Galt.
John Morrow Screw & Nut Co., Ingersoll.
National Acme Co., Montreal.
Rice Lewis & Son, Toronto.
Steel Co. of Canada, Ltd., Hamilton.
Wilkinson & Kompass, Hamilton.

SCREW COLLARS
Galt Machine Screw Co., Ltd., Galt, Ont.
John Morrow Screw & Nut Co., Ingersoll.

SCREW MACHINES, PLAIN WIRE FEED
Barber Mchy. Co., Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.

SCREW PLATES
Ackworthie Ltd., J., Birmingham, Eng.
Butterfield & Co., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield.
A. B. Jardine & Co., Hespeler.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto.
J. A. M. Taylor, Stair Bldg., Toronto.
Wells Bros. of Can., Galt.
Wilkinson & Kompass, Hamilton.

SCREWS, SAFETY SET
Galt Machine Screw Co., Ltd., Galt, Ont.

SCREW SLOTTERS
Butterfield & Co., Inc., Rock Island, Que.
Garvin Machine Co., New York.
National Acme Co., Cleveland, O.
Pratt & Whitney Co., Dundas, Ont.

SEPARATORS, MOISTENERS AND OIL FOR COMPRESSED AIR
Pangborn Corporation, Hagerstown, Md.

SELF-OPENING DIES
See Dies.

SEPARATORS, SAND
Pangborn Corporation, Hagerstown, Md.

SET SCREWS, SAFETY
Aikenhead Hardware Co., Toronto.
Bristol Co., Waterbury, Conn.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wilkinson & Kompass, Hamilton.

SHANKS, STRAIGHT AND TAPER
Jacobs Mfg. Co., Hartford, Conn.

SHAPERS
Barber Mchy. Co., Ltd., Toronto, Ont.
John Bertram & Sons Co., Dundas.
Can. Fairbanks-Morse Co., Montreal.
Canadian Machinery Corp., Galt.
Cochrane-Bly Co., Rochester, N.Y., U.S.A.
Geo. F. Foss Mchy. & Sply. Co., Montreal
Robt. Gardner & Son, Montreal.
Garlock-Walker Mach'y. Co., Toronto.
Herbert, Ltd., Alfred, Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Milwaukee Shaper Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto.
Rae Mach. Tool Co., Hamilton.
Strelinger Co., C. A., Windsor, Ont.
Standard Equipment & Tool Wks., Montreal.
Walcott Lathe Co., Jackson, Mich.
Williams Mchy Co., A. R., Toronto, Ont.

SHAPERS, GEAR
Fellows Gear & Shaper Co., Springfield, V.
Knigh Metal Products, Toronto.

SHAFTING
Algoma Steel Corp., Sault Ste. Marie, O.
Can. Fairbanks-Morse Co., Montreal.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machy. Co., Ltd., Toronto
Jones & Glasco, Montreal.
Niles-Bement-Pond Co., New York.
Can. Drawn Steel Co., Hamilton.
Peckovers, Ltd., Toronto, Ont.
Petrie, Ltd., H. W., Toronto.
Pratt & Whitney Co., Dundas.
Rice, Lewis & Son, Toronto.
A. R. Williams Machy. Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

SHARPENING STONES
Norton Co, Worcester, Mass.
Rice, Lewis & Son, Toronto.

SHEARING MACHINES, ANGLE IRON, BAR AND GATE
John Bertram & Sons Co., Dundas.
Bertrams Ltd., Edinburgh, Scotland.
Canada Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machy. Co., Ltd., Toronto
A. B. Jardine & Co., Hespeler, Ont.
Long & Allstatter Co., Hamilton, Ohio.
Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co. Toledo, O.

SHEARS, POWER
John Bertram & Sons Co., Dundas.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co, Ltd., Hamilton.
Can Blower & Forge Co, Kitchener.
Canada Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machy. Co., Ltd., Toronto
Long & Allstatter, Hamilton, Ohio.
A. B. Jardine & Co., Hespeler, Ont.
National Machy. Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
H. D. Stoll Co., Inc., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, O.
Williams, White & Co., Moline, Ill.
Williams Mchy Co., A. R., Toronto, Ont.

SHEARS, ROTARY
The Quickwork Co., St. Mary's, Ohio.

SHEARS, PNEUMATIC
Toledo Machine & Tool Co., Toledo, Ohio

SHEARS, PLATE CUTTING, SLITTING
Dom. Steel Products Co., Ltd., Brantford.
Quickwork Co., St. Mary's, Ohio.

SHEARS, SPLITTING
Dom. Steel Products Co., Ltd., Brantford.

SHEARS, IRREGULAR AND CIRCLE CUTTING
The Quickwork Co., St. Mary's, Ohio.
D. H. Stoll Co., Inc. Buffalo, N.Y.

SHEARS, SERPENTINE
The Quickwork Co., St. Mary's, Ohio.

SHEARS, SQUARING
Brown, Boggs & Co., Hamilton, Ont.
D. H. Stoll Co., Inc. Buffalo, N.Y.

SHEET METAL WORKING MACHINERY
D. H. Stoll Co., Inc. Buffalo, N.Y.

SHEET METAL WORKING TOOLS
Baird Machine Co., Bridgeport, Conn.
Barber Mchy. Co., Ltd., Toronto, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton.
Peck, Stow & Wilcox Co., Southington, C.
Petrie, Ltd., H. W., Toronto.
D. H. Stoll Co., Inc. Buffalo, N.Y.

SHEETS, CRUCIBLE, CAST
British Smelting & Refining Co., Ltd., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal

SHEETS, BLACK AUTO AND GALVANIZED
Peckovers, Ltd., Toronto, Ont.

SHEETS, NICKEL RESIST. ALLOY
Can. Driver-Harris Co., Ltd. Walkerville.

SHELVING, STEEL
Dennis Wire & Iron Works, London.

SHIPYARD MACHINERY, SHOP FURNITURE
Dennis Wire & Iron Works, London.

SIDE TOOLS
Armstrong Bros. Tool Co., Chicago.
J. H. Williams & Co., Brooklyn, N.Y.

SILENT CHAINS
Can. Link-Belt Co., Toronto, Ont.
Jones & Glasco Montreal.
Renold of Canada Ltd., Montreal.

SLEDGES
Aikenhead Hardware Co., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.
Wilkinson & Kompass, Hamilton, Ont

SLEDGES, CAST IRON
Katie Foundry, Galt, Ont.

SLICING CLAMPS
Peck, Stow & Wilcox Co., Southington, Conn.

SLINGS, CHAINS
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

SLOTTERS
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
Herbert, Ltd., Alfred, Toronto, Ont.
National-Acme Co., Cleveland, Ohio.
Niles-Bement-Pond Co., New York.

SMOKESTACKS
William Hamilton Co., Peterboro, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

SNIPS, TINNERS AND SHEET METAL WORKERS
Kearney & Trecker Co., Milwaukee, Wis.
J. Morrow Screw & Nut Co., Ingersoll, Ont.

SOCKETS
Brown & Sharpe Mfg. Co., Providence.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
Keystone Mfg. Co., Buffalo, N.Y.
Modern Tool Co., Erie, Pa.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.

SOIL PIPE FITTINGS, CAST IRON
Katie Foundry, Galt, Ont.

SOLDERING IRONS
Aikenhead Hardware Co., Toronto, Ont.
Brown, Boggs & Co., Hamilton, Ont.
Frent-O-Lite Co., Inc., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.

SOLDER
British Smelting & Refining Co., Ltd., Montreal, Que.
Aikenhead Hardware Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.
Tallman Brass & Metal Co., Hamilton.

SPELTER
British Smelting & Refining Co., Ltd., Montreal, Que.

SPEED REDUCING GEARS
Can. Link-Belt Co., Toronto, Ont.
Jones & Glasco, Montreal.

SPRINGS, MACHINERY
Barnes, Wallace Co., Bristol, Conn.
Can. Steel Foundries, Ltd., Montreal.
Cleveland Wire Spring Co., Cleveland.
Dunbar Bros. Co., Bristol, Conn.
Garlock-Walker Machinery Co., Toronto.

SPECIAL MACHINERY
Baird Machine Co., Bridgeport, Conn.
Barber Mchy. Co., Ltd., Toronto, Ont.
Bertram, John, & Sons Co., Dundas.
Bliss, E. W. Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada.
Brown Engineering Corp., Toronto, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Hobe Engineering Co., Ltd., Hamilton.
Hamilton Co., Ltd., Wm., Peterborough, A. B. Jardine & Co., Hespeler, Ont.
Ker & Goodwin Machine Co., Ltd., Brantford, Ont.
McCrosky Tool Corp., Meadville, Pa., U. S. A.
National-Acme Co., Cleveland, Ohio.
Mesta Machine Co., Pittsburgh, Pa.
Rae Mach. Tool Co., Hamilton.
Stoll Co., D. H., Buffalo, N.Y.
Victoria Foundry Co., Ottawa, Ont.
William R. Perrin, Ltd., Toronto.
Williams Tool Corp. of Can. Ltd., Brantford, Ont.

SPECIAL TOOLS, MACHINERY
Crescent Machine Co., Ltd., Montreal, Que.
McClean Machine & Tool Co., Ltd., Hamilton, Ont.
Hoggson & Pettis Mfg. Co., New Haven, Conn.

SPOT FACERS, INTERCHANGEABLE
Eclipse Counterbore Co., Ltd., Walkerville, Ont.

SPRING COILING AND WINDING MACHINERY
Baird Machine Co., Bridgeport, Conn.
Garvin Machine Co., New York.

SPRING MAKING MACHINERY (AUTOMATIC)
Baird Machine Co., Bridgeport, Conn.

SPRINGS, SPIRAL, TOOL
The Dunbar Bros. Co., Bristol, Conn.

SPRINGS STEEL
Barnes Co., Wallace, Bristol, Conn.

SPROCKETS, COMPENSATING
Morse Chain Co., Ithaca, New York.

SPROCKETS, SPRING
Morse Chain Co., Ithaca, New York.

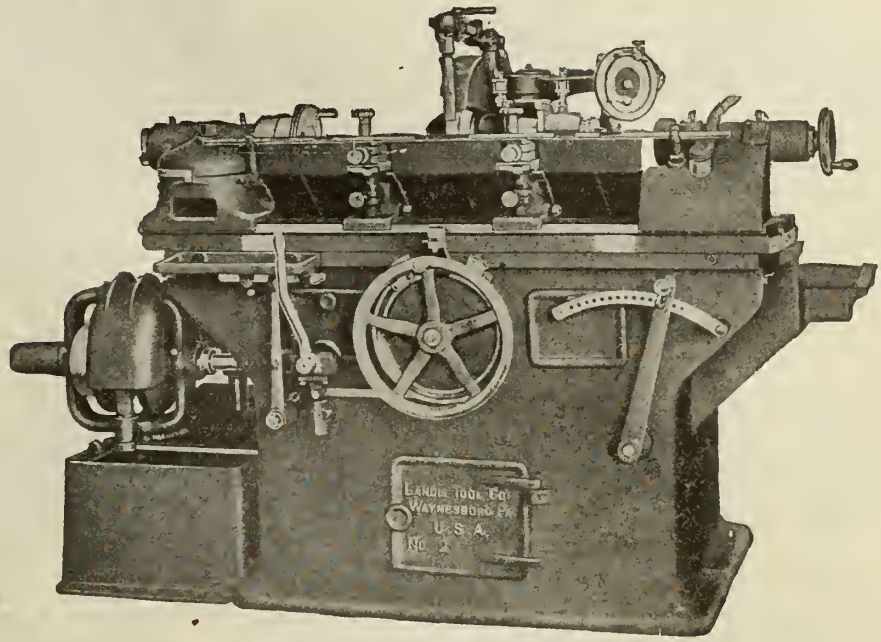
SPROCKETS, CHAIN
Can Link-Belt Co., Toronto, Ont.
Grant Gear Works, Boston, Mass.
Jones & Glasco, Montreal.
Lyman Tube & Supply Co., Montreal, Que
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia.
Renold of Canada Ltd., Montreal.

SPRINGS FOR TOYS AND ELECTRIC DEVICES
The Dunbar Bros. Co., Bristol, Conn.

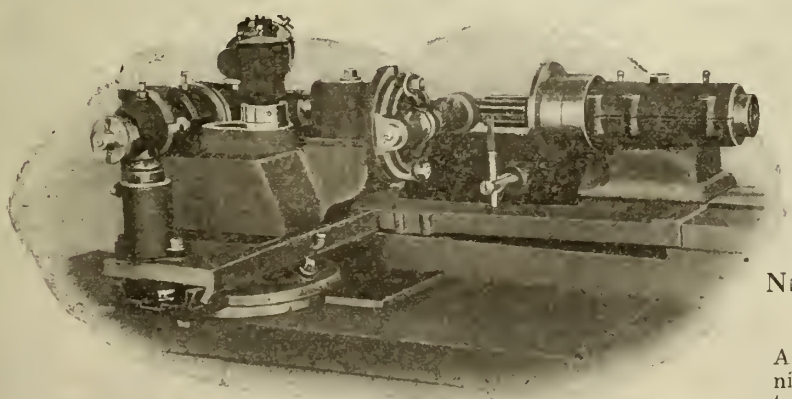
SPROCKET WHEELS, CAST
Can. Link Belt Co., Toronto, Ont.
Lyman Tube & Supply Co., Ltd., Montreal

LANDIS

The Productive Landis Universal



Unless your Tool Room is equipped with machines to handle the varied and difficult jobs, your Tool Room cannot compete. The application of the Landis Universal Grinding Machines is practically unlimited, combining as they do, both an external and internal grinding machine. Besides, they are economical, and increased efficiency can be obtained by the use of the magnetic chuck, side mill grinding attachment, gear cutter grinding attachment, etc. (See sketch herewith).



Backing-off Straight Reamer

LANDIS
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WAYNESBORO, PA.

New York Office: 50 Church Street

CANADIAN AGENTS:

A. R. Williams Machinery Co., Toronto, Winnipeg, Vancouver; Williams & Wilson, Montreal.

If interested, tear out this page and keep with letters to be answered

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SANDERS
Oliver Mach. Co., Grand Rapids, Mich.

SAW BENCHES
Oliver Mach. Co., Grand Rapids, Mich.

SAW GUARDS
Oliver Mach. Co., Grand Rapids, Mich.

SAWING MACHINES
Herbert Ltd., Alfred, Toronto, Ont.

SAWS SWING
Oliver Mach. Co., Grand Rapids, Mich.

SMALL TOOLS
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Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield, Mass.
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Canada Machinery Corp., Galt, Ont.
Matthews, Jas. H & Co., Hartford, Conn.

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STEAM TURBINES
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Sturtevant Co., B. F., Galt, Ont.

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Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.

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Firth & Sons, Thos., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.
Latrobe Electric Steel Co., Latrobe, Pa.
Lincoln Electric Co. of Canada, Ltd., Toronto, Ont.
Marshall, Son & Bunney, Toronto.
Peckovers, Ltd., Toronto, Ont.
Samuel Osborne (Can.), Ltd., Montreal.
Vanadium-Alloys Steel Co., Pittsburgh.

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United Alloys Steel Corp., Canton, Ohio.

STEEL CHROME VANADIUM
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Norton, Ralph B., Agent, Montreal.
Atkins & Co., Ltd., Wm. Sheffield, Eng.
Marshall, Son & Bunney, Toronto
United Alloys Steel Corp., Canton, Ohio.

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Kayser-Ellison & Co., Ltd., Montreal.
Lyman Tube & Supply Co., Ltd., Montreal
Norton, Ralph B., Agent, Montreal.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall, Son & Bunney, Toronto
United Alloys Steel Corp., Canton, Ohio.

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Dom. Iron & Steel, Sydney, N.S.
Jollette Steel Co., Montreal, Que.
Kennedy & Sons, Wm., Owen Sound.
Electric Steel & Metals Co., Welland.
Nova Scotia Steel & Coal Co., Windsor.
Swedish Crucible Steel Co., Windsor.

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STEEL, COLD ROLLED
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Can. Drawn Steel Co., Hamilton, Ont.
Kayser-Ellison & Co., Ltd., Montreal.
Rice Lewis & Son, Toronto, Ont.
Swedish Steel & Importing Co. Ltd., Montreal.
Union Drawn Steel Co., Hamilton, Ont.

STEEL, ELECTRIC FURNACE
United Alloys Steel Corp., Canton, Ohio.

STEEL FJAB
Lincoln Electric Co., of Canada, Ltd., Toronto, Ont.

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Atkins & Co., Ltd., Wm., Sheffield, Eng.
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Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal
United Alloys Steel Corp., Canton, Ohio.

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Baines & David, Toronto.
Wm. Atkins & Co., Sheffield, Eng.
Can. Fairbanks-Morse Co., Montreal
Deloro Smelting & Refining Co., Ltd. Toronto, Ont.
H. A. Drury Co., Ltd., Montreal.
Firth & Sons, Thos., Montreal, Que.
Illingworth Steel Co., J., New York.
Kayser Ellison & Co., Sheffield, Eng.
Latrobe Electric Steel Co., Latrobe, Pa.
Marshall, Son & Bunney, Toronto, Ont.
Osborne, Samuel, Montreal, P.Q.
Plewes, Ltd. Winnipeg, Man.
Pilot Steel & Tool Co., Montreal, Que.
Ralph B. Norton, Montreal, Que.
Rice Lewis & Son, Toronto, Ont.
Swedish Steel & Importing Co., Ltd., Montreal.
Vanadium-Alloys Steel Co., Pittsburgh.

STEEL, CHROME, MANGANESE
Jollette Steel Co., Montreal, Que.

STEEL, OPEN HEARTH
Illingworth Steel Co., John, New York
United Alloys Steel Corp., Canton, Ohio.

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Kayser-Ellison & Co., Ltd., Montreal
Lincoln Electric Co. of Canada, Ltd., Toronto, Ont.

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United Alloys Steel Corp., Canton, Ohio.

STEEL, SPRING AND REINFORCING
Peckovers, Ltd., Toronto, Ont.
United Alloys Steel Corp., Canton, Ohio.

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Algoma Steel Corp., Sault Ste. Marie
Dom. Iron & Steel Co., Sydney, N.S.
MacKinnon Steel Co., Sherbrooke, Que.
Peckovers, Ltd., Toronto, Ont.

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Armstrong, Whitworth of Can., Montreal
Atkins & Co., Wm., Sheffield, Eng.
Baines & David, Toronto.
Can. Fairbanks-Morse Co., Montreal.
Drury Co., H. A., Montreal, Que.
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Firth & Sons, Thos., Montreal, Que.
Hawkridge Bros. Co., Boston, Mass.
Kayser-Ellison & Co., Ltd., Montreal.
Lincoln Electric Co., of Canada, Ltd., Toronto, Ont.
Lyman Tube & Supply Co., Ltd., Montreal
Marshall, Son & Bunney, Toronto, Ont.
Latrobe Electric Steel Co., Latrobe, Pa.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son Toronto, Ont.
Vanadium-Alloys Steel Co., Pittsburgh.

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Armstrong, Whitworth of Can., Montreal.
Dominion Foundries & Steel Ltd., Hamilton, Ont.
Drury, H. A., Co., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.
Vanadium-Alloys Steel Co., Pittsburgh.
Wells Bros. of Can., Galt, Ont.

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Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros., of Can., Galt, Ont.

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Rice Lewis & Son, Toronto, Ont.
Wells Bros., Co., of Canada, Galt, Ont.

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Bertrams, Ltd., Edinburgh, Scotland.

STRAND
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Page Steel & Wire Co., Adrian, Mich.

SURFACE PLATES
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STRUCTURAL STEEL WORKS
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SWITCHBOARDS
Northern Electric Co., Ltd., Montreal Que

SWITCHES, RAILWAY
Can. Steel Foundries, Ltd., Montreal.

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Economy Drawing Table Co., Adrian, Mich.

TABLES, SAND-BLAST
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Dom. Forge & Stamping Co., Walkerville.
MacKinnon Steel Co., Sherbrooke, Que.
Marshall, Son & Bunney, Toronto.

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Can. Hanson Van Winkle Co., Ltd.,

TANKS, LUBRICATING, OIL STORAGE
Bowser Co., Ltd., S. F., Toronto, Ont.
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TANKS, PNEUMATIC AND CLOSET
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Dominion Bridge Co., Montreal, Quebec.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
MacGovern & Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Toronto Iron Works, Ltd, Toronto.

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Toronto Iron Works, Ltd., Toronto.

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Can. John Wood Mfg. Co., Ltd., Toronto
Can. Hanson Van Winkle Co., Ltd.,
Lincoln Electric Co. of Canada, Ltd., Toronto, Ont.

TANKS
Can. Ingersoll-Rand Co., Ltd., Sherbrooke
Elec. Steel & Metals, Welland, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
William Hamilton Co., Peterboro, Ont.

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Galt Machine Screw Co., Ltd., Galt, Ont.

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Rice Lewis & Son, Toronto, Ont.

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Garvin Machine Co., New York.
The Geometric Tool Co., New Haven.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchy Machine & Tool Co., Detroit.
Niles-Bement-Pond Co., New York.
Rickert-Shafer Co., Erie, Pa.
National-Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto.
L. S. Starrett Co., Athol, Mass.
Whitney Mfg. Co., Hartford, Conn.
Williams Tool Corp. of Can. Ltd., Brantford, Ont.

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Geometric Tool Co., New Haven.
Ingersoll Mach. Co., Ingersoll, Ont.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Pilot Steel & Tool Co., Montreal, Que.
Victor Tool Co., Waynesboro, Pa.

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Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

TAPS, MACHINE RELIEVED
Butterfield & Co., Inc., Rock Island, Que
Greenfield Tap & Die Corp., Greenfield Mass.
Wells Bros. of Can. Galt, Ont.

TAPS, MACHINE SCREW
Butterfield & Co., Inc., Rock Island, Que
Greenfield Tap & Die Corp., Greenfield Mass
Wells Bros. of Can., Galt, Ont.

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Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Inc., Rock Island, Que
Greenfield Tap & Die Corp., Greenfield
Ingersoll Mach. Co., Ingersoll, Ont.
Marshall, Son & Bunney, Toronto.
Wells Bros. of Can., Galt, Ont.

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Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

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Can. Fairbanks-Morse Co., Montreal,
Cleveland Twist Drill Co., Cleveland.
Foss Mchy. & Sply. Co., G. F., Montreal.
Geometric Tool Co., New Haven.
Greenfield Tap & Die Corp., Greenfield.
Ingersoll Mach. Co., Ingersoll, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Morse Twist Drill & Mchy. Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Rice Lewis & Son, Toronto, Ont.
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Taylor, J. A. M., 318 Stair Bldg., Toronto.
Wells Bros. of Canada, Galt, Ont.

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Taylor Instrument Co., Rochester, N.Y.

THERMOMETERS, RECORDING AND INDEX
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Garlock-Walker Mach. Co., Ltd., Toronto.
Geometric Tool Co., New Haven.
Jardine & Co., Ltd., A. B., Hespeler.
Landis Machine Co., Waynesboro, Pa.
National-Acme Co., Cleveland, Ohio.
National Machy. Co., Tiffin, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Wells Bros. Co. of Canada, Galt., Ont.

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Greenfield Tap & Die Corp., Greenfield
Landis Machine Co., Waynesboro, Pa.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. of Canada, Galt, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

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Petrie, Ltd., H. W., Toronto.
Wells Bros. Co. of Canada, Galt., Ont.

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Smalley-General Co., Bay City, Mich.

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See Screws.
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Petrie, Ltd., H. W., Toronto.

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Perrin, Ltd., William R., Toronto.
West Tire Setter Co., Rochester, N.Y.

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Armstrong Bros. Tool Co., Chicago.
Cleveland Twist Drill Co., Cleveland.
Deloro Smelting & Refining Co., Ltd. Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

TOOL MAKERS
Samuel Osborne (Can.), Ltd., Montreal

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Williams & Co., J. H., Brooklyn, N.Y.

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Rice Lewis & Son Toronto, Ont.

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Petrie, Ltd., H. W., Toronto.

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Williams Machy. Co., A. R., Toronto.
U. S. Electrical Tool Co., Cincinnati, O.

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Deloro Smelting & Refining Co., Ltd. Toronto, Ont.

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Gisholt Machine Co., Madison, Wis.
Williams & Co., J. H., Brooklyn, N.Y.

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TOOLS, SHOP
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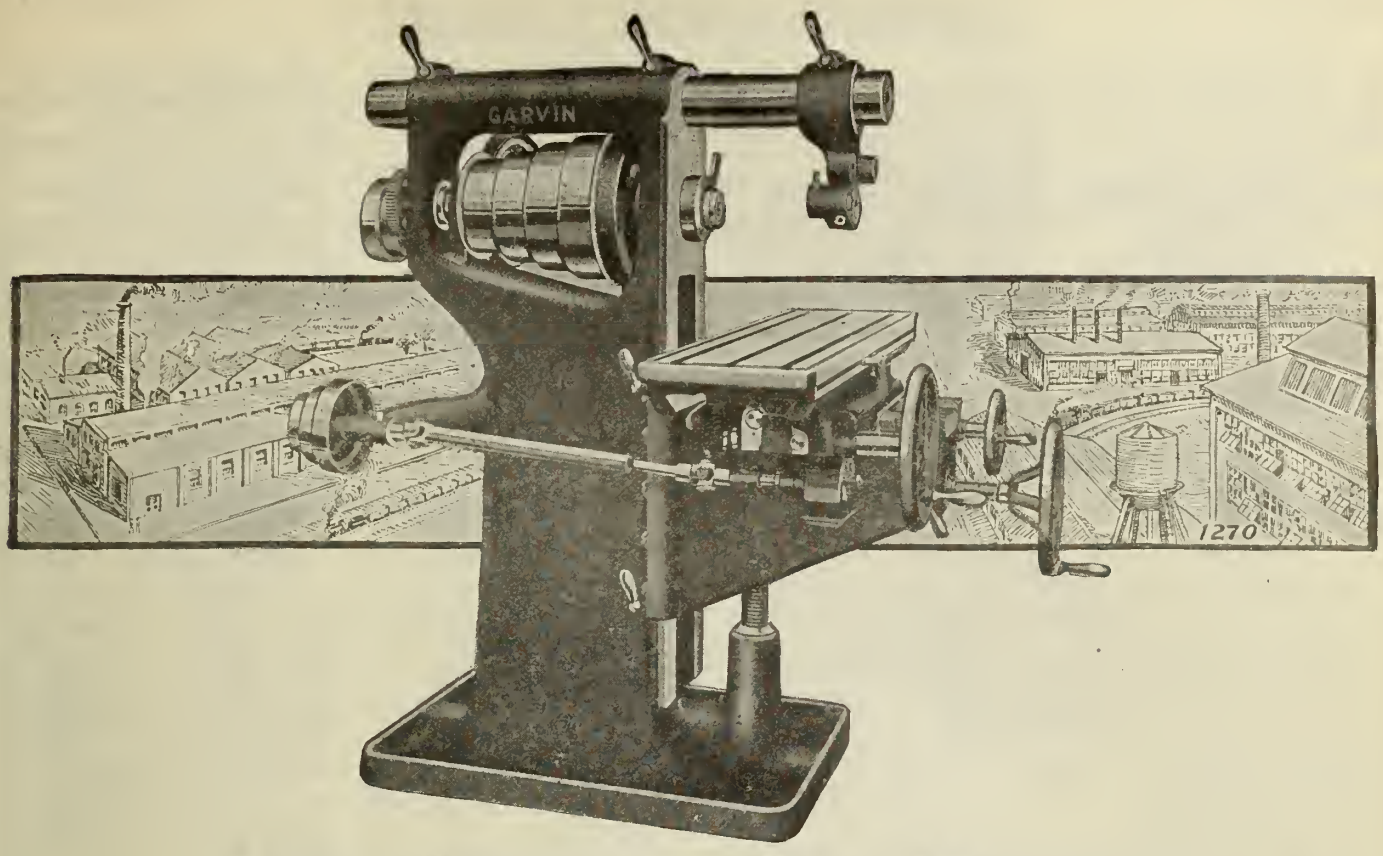

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GARVIN

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Northern Crane Works, Walkerville.

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Northern Electric Co., Ltd., Montreal.

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Kennedy & Sons, Wm., Owen Sound, Ont.
Morse Chain Co., Ithaca, N.Y.
Petrie, Ltd., H. W., Toronto.
Renold of Canada Ltd., Montreal.
Williams Machinery Co., A. R., Toronto.

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MacKinnon Steel Co., Sherbrooke, Que.
Northern Crane Works, Walkerville.
Tallman Brass & Metal Co., Hamilton.

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Lyman Tube & Supply Co., Ltd., Montreal
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

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Chapman Double Ball Rearing, Toronto.
Cowan Truck Co., Holyoke, Mass.
Holyoke Truck Co., Holyoke, Mass.
MacKinnon Steel Co., Sherbrooke, Que.
Rice Lewis & Son, Toronto, Ont.

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Cowan Truck Co., Holyoke, Mass.
Good Engineering Co., Toronto, Ont.

TRUCKS, FLOOR
Cowan Truck Co., Holyoke, Mass.
Holyoke Truck Co., Holyoke, Mass.

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Can. Kron Scale Co., Montreal, P.Q.
Cowan Truck Co., Holyoke, Mass.

TRUCKS, LUMBER AND KILN
Holyoke Truck Co., Holyoke, Mass.
Swedish Steel & Importing Co., Montreal.
Northern Crane Works, Walkerville.

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Cowan Truck Co., Holyoke, Mass.
Holyoke Truck Co., Holyoke, Mass.

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Tube Co. of Can., Ltd., Toronto, Ont.

TUBE PROUCTS
Tube Co. of Can., Ltd., Toronto, Ont.

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Standard Tube & Fence Co., Woodstock.
Tallman Brass & Metal Co., Hamilton.

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Lyman Tube & Supply Co., Montreal, Que.

TUBING, SEAMLESS STEEL
Tube Co. of Can., Ltd., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.

TUBING, WELDED STEEL
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Tube Co. of Can., Ltd., Toronto, Ont.

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Garlock-Walker Machinery Co., Toronto.
Greenfield Tap & Die Corp., Greenfield.
Hardinge Bros., Chicago, Ill.
Oliver Mchy. Co., Grand Rapids, Mich.
Pratt & Whitney, Hartford, Conn.
Petrie, Ltd., H. W., Toronto.
Steinle Turret Mach. Co., Madison, Wis.
Warner & Swasey Co., The, Cleveland, O.

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Garvin Machine Co., New York.
Holden Co., Ltd., Montreal, Que.
MacGovern & Co., Montreal, Que.
Warner & Swasey, Cleveland, O.

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Canada Fdrs. & Forg. Ltd., Welland.
Morrow Screw & Nut Co., Ingersoll, Ont.
Rice Lewis & Son, Toronto, Ont.

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Can. Link-Belt Co., Toronto, Ont.
Dom. Bridge Co., Ltd., Montreal, P.Q
Elec. Steel & Metals, Welland, Ont.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

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Butterfield & Co., Inc., Rock Island, Que

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Ford-Smith Machine Co., Hamilton, Ont
Garlock-Walker Machinery Co., Toronto.
Jardine & Co., A. B., Hespeler, Ont.
National Machy. Co., Tiffin, O.
Canada Machinery Corp., Galt, Ont.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Williams Machy. Co., A. R., Toronto.

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Holden Co., Ltd., Montreal, Que.

VALVE LEATHERS
Graton & Knight Mfg. Co., Montreal.

VALVES, MIXING
Crane, Ltd., Montreal, Que.

VALVES (IRON) STANDARD AND EXTRA HEAVY
Crane, Ltd., Montreal, Que.

VALVE GRINDERS (PNEUMATIC)
Cleveland Pneumatic Tool Co., Toronto.

VALVES, HYDRAULIC
Metalwood Mfg. Co., Detroit, Mich.

VALVES, RUBBER PUMP
International Mach. Spls., Ltd., Montreal
Quaker City Rubber Co., Philadelphia

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Petrie, Ltd., H. W., Toronto.
Sturtevant Co., B. F., Galt, Ont.
Williams Machy. Co., A. R., Toronto.

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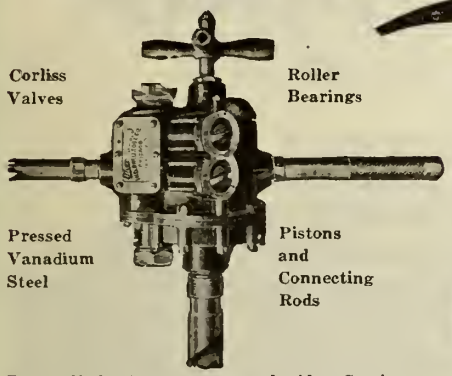

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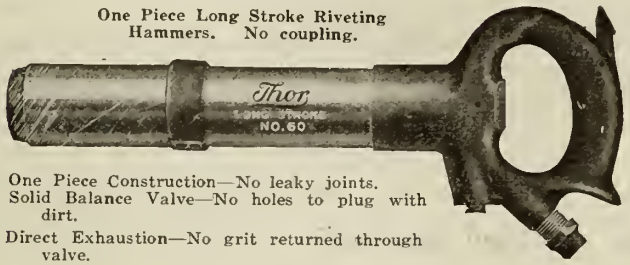

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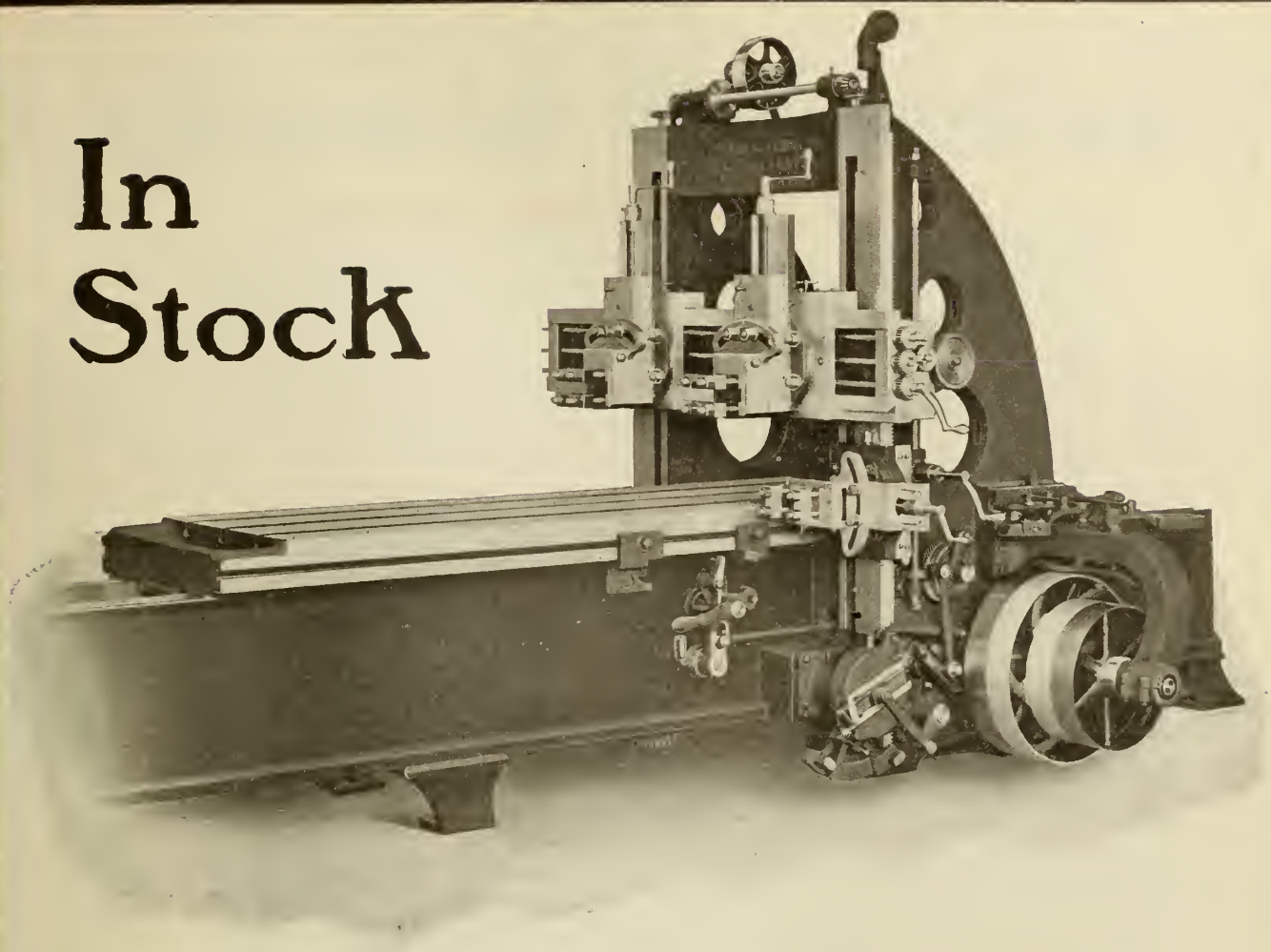

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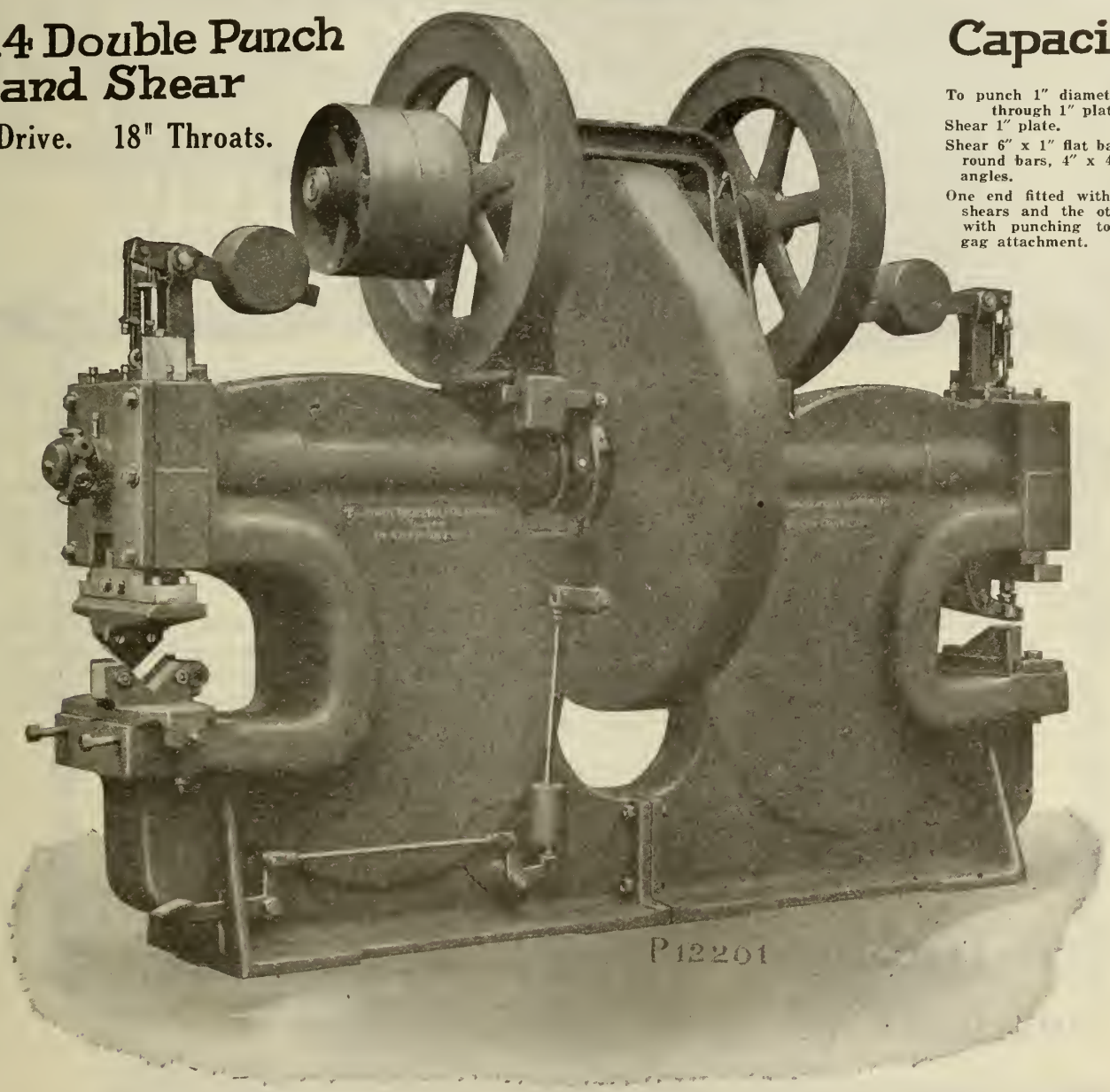

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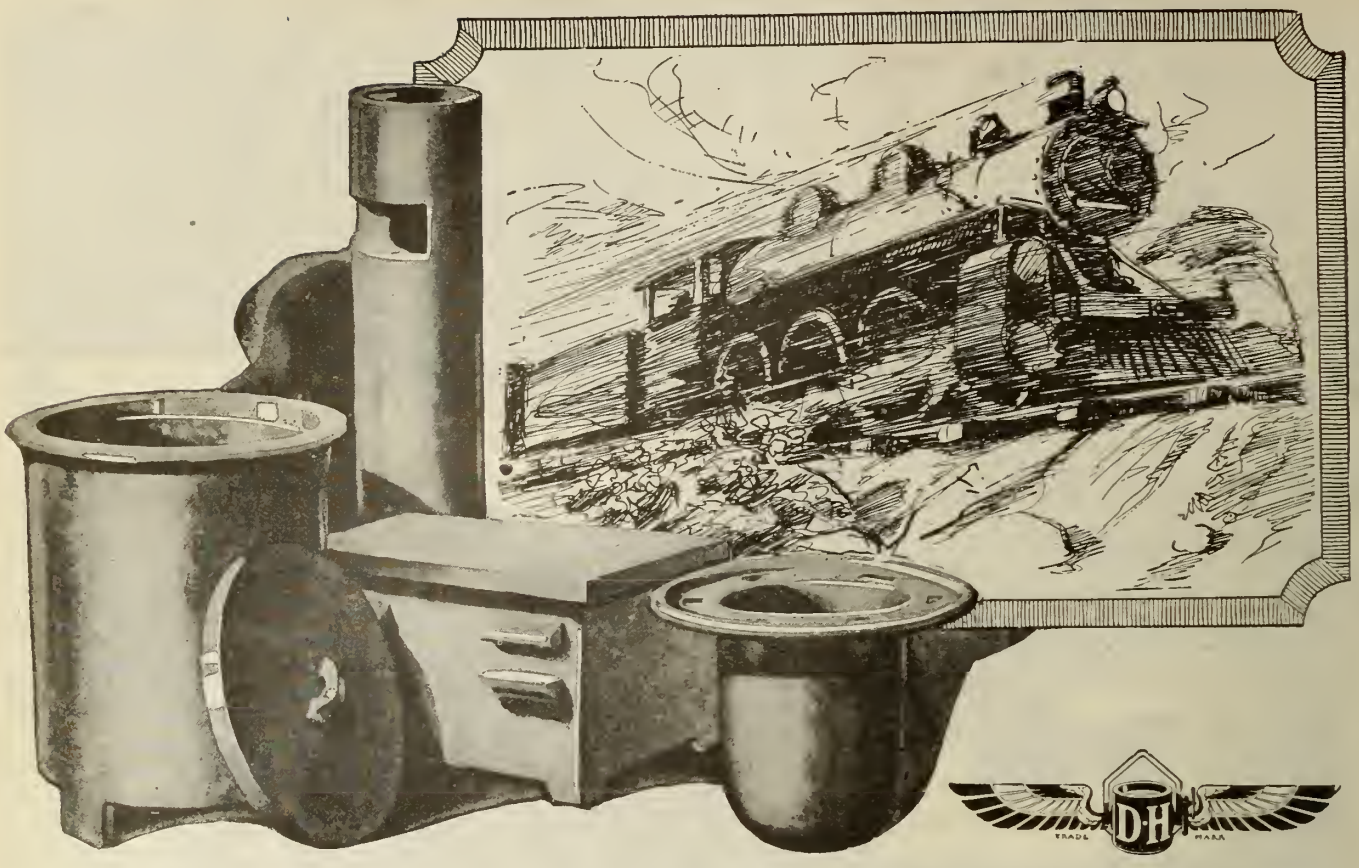

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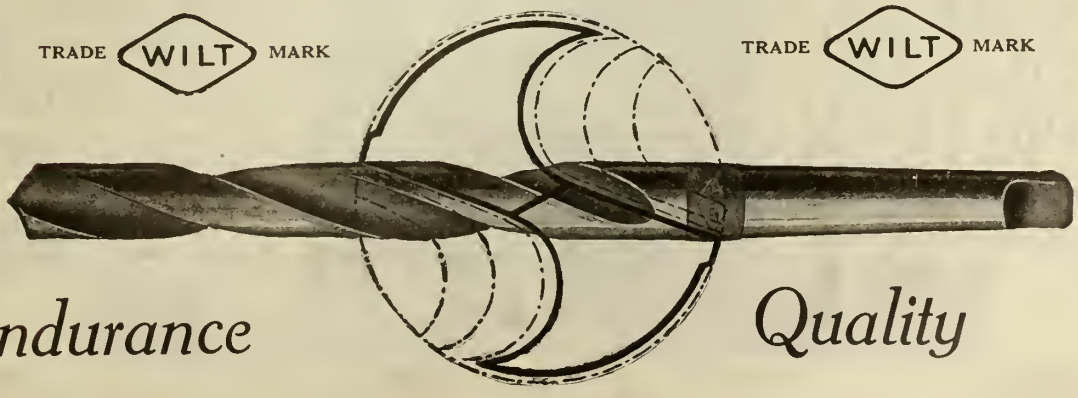

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All of these steels we supply in HOT ROLLED BARS

We also furnish in BLOOM, BILLET and SLAB FORM

STEEL RAILS
Open Hearth Quality
(All Sections from 12 lbs to 100 lbs per yard)

SPLICE BARS

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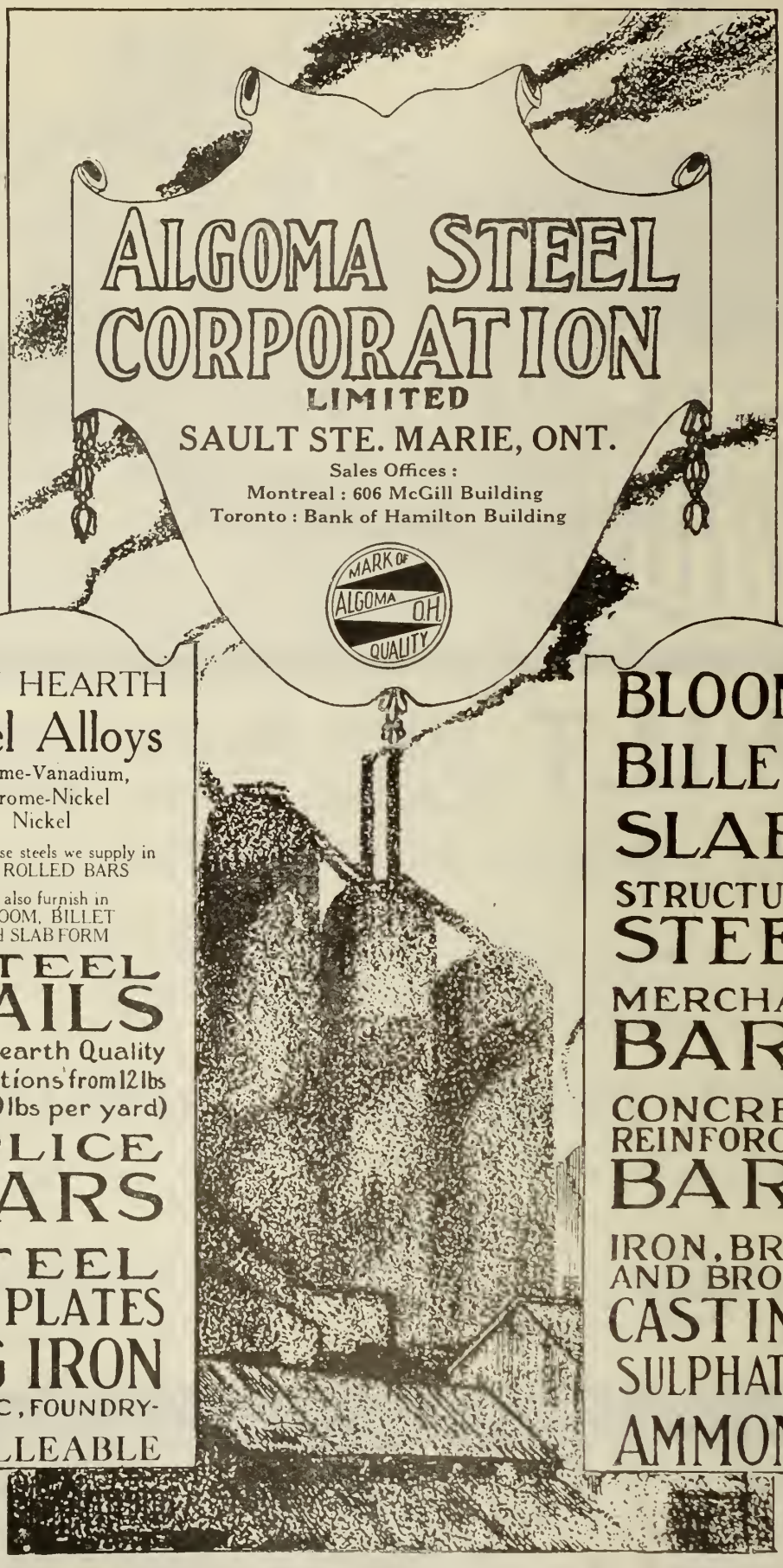
PIG IRON
BASIC, FOUNDRY-
MALLEABLE



BLOOMS,
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IRON, BRASS AND BRONZE CASTINGS

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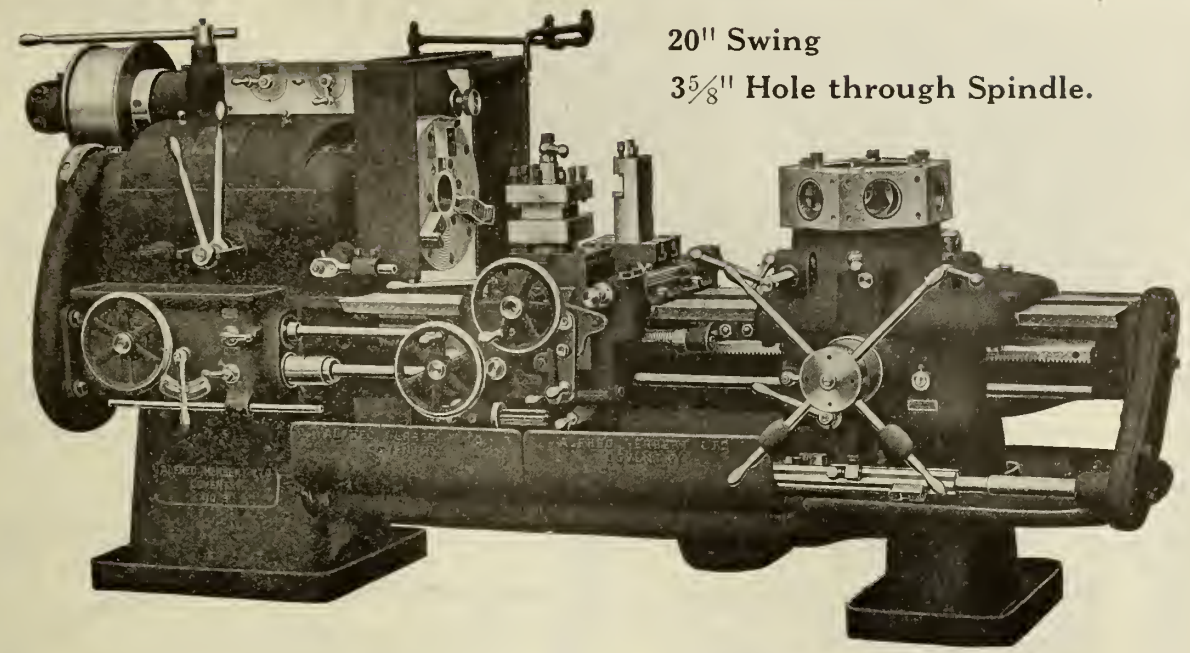

20" Swing
3⅝" Hole through Spindle.

No. 9 Combination Turret Lathe With Chasing Saddle

AT YOUR SERVICE

We have been building labour-saving machine tools for 29 years during which time we have built up an organization almost world wide.

We are now establishing (another link in the chain) in Canada where our tools have already made us many friends, and where we now confidently look to making many more.

Our old friends we can assure of closer co-operation and better service with the organization we now have available in Canada.

We solicit from the new friends we hope to make an early opportunity of proving the merits of our machines and the value of the service that goes with them.

In addition to our own lines we are representing in Canada a selection of leading British and American Tool Makers, all of whose products like our own are the result of hard constructive work on which design, materials and workmanship have been continually modified in accordance with the eternal law of the survival of the fittest.

We are in a position to give assistance on the lay-out, equipment and operation of any machines which we supply.

Enquiries Solicited

ALFRED HERBERT, LTD.

Phone No.
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Other Branches and Associated Companies: Brussels, Belgium; Milan, Italy; Calcutta, India; Sydney, Australia; Yokohama, Tokyo, Osaka, Japan; Toronto, Canada; Barcelona, Spain; Paris, Lille, Lyons, France.

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Ripping a ⅜" chip from ½" plate at the rate of 7 inches in 48 seconds.

Little David Air Tools

Do More Work
Stand Up Longer
Use Less Air

If you watch a "Little David" Tool at work, you will notice that it is more speedy than others—enough so to warrant its use on that ground alone.

Then measure the air consumed, and you will find a substantial power saving per unit of work done, and its continued service will reveal a marked decrease in the items of lost time through breakage and expense of spare parts.

These are strong claims—but claims that we stand back of and are ready to prove to your satisfaction.

The rugged simplicity and strength of "Little David" design, the accurate workmanship, and the careful heat treatments which are given to the wearing parts have proven vital factors in the attainment of ultimate pneumatic tool economy.

There's a "Little David" for every air tool need and each lives up to the "Little David" standard of satisfactory service.

All are described in the "Little David" bulletins. Shall we send you copies?

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Do Your Furnaces Waste Oil?

OILGAS

Industrial Furnaces

Will save 50% of the fuel used by ordinary furnaces of the same capacity.

Continuous forge furnaces, and furnaces for heating, reheating, heat treating, annealing, hardening, sherardizing, and welding. Any industrial process requiring *heat*.

The only distinct advance in furnace practice since Siemens' time.

Are you interested in a description of these furnaces? Bulletin 54 is yours for the asking.

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High Carbon Steel
Manganese Steel
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OWEN SOUND, ONTARIO
ESTABLISHED 1860

Announcing

the issuance of a new catalog of prime interest to all users of milling and gear cutters and small tools. Herein you will find listed styles and sizes of end mills (special and plain) T-slot cutters. Key cutters, thread mills, gear slots—in fact your needs in the small tool line of this class are sure to be covered. Get your copy and note its completeness.

If your special requirement doesn't appear, Bilton can produce it—and in true Bilton Quality.

just sign your name and address on a card and post it to

The Bilton Machine Tool Company
Housatonic Ave., Bridgeport, Conn.

SHIPS' ANCHORS

WE are sole makers in Canada of Baldt Anchors, which are supplied to Lloyd's requirements and tested in a testing machine of 200,000 lbs. capacity. This machine is also approved by Lloyd's for testing anchors of other than British-owned ships.

Write to Davidson's for all types of Anchors for any ships building in Canada. Fishermen's anchors also a specialty.

We shall be glad to supply in addition to our General Catalogue, literature on

Steel Castings	Lithographed Ware
Galvanizing	Enamelled Signs
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Steel Foundry Division
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BRAND
FIRE BRICKS
FOR
Quality and Service

Remember—we make several qualities of Fire Brick, all perfectly adaptable to the purpose for which they are intended. Now, here is where our Service stands you in good stead: we recommend the class of brick particularly suitable for your purpose. In other words we do not sell you a costly high-class brick when another class of brick suits just as well.

Our Various Brands

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"Elkco" Special	"M. D. Elk"	"Keystone Dust"
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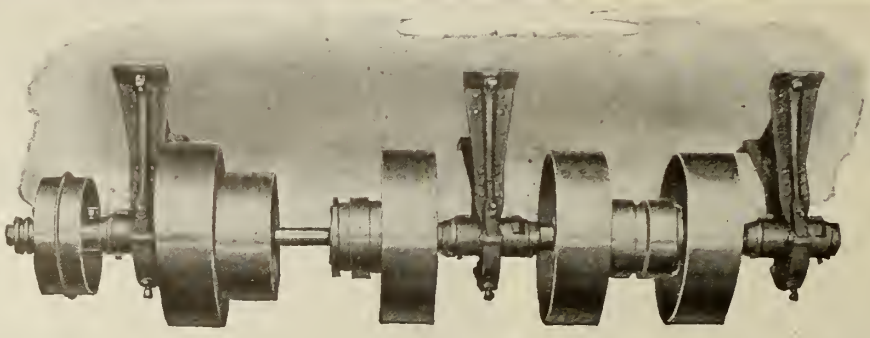
When you select Elk Brand Fire Bricks you know you are getting the right quality. Our warehouse is well stocked to supply your immediate needs.

ELK FIRE BRICK CO. OF CANADA
LIMITED
Sun Life Building, HAMILTON, ONTARIO

THE JOHNSON FRICTION CLUTCH



Put Johnson Clutches on Your Countershafts

Here's a countershaft equipped with three Johnson Clutches—two of the single type and one of the double—providing two speeds, a reverse, and a light auxiliary drive. An exceptionally neat and compact construction is obtained, light in weight and smooth-running.

Wherever really high-grade equipment is desired, Johnson Clutches are the selection. For general transmission purposes there is no clutch more reliable, and none so adaptable to all conditions. Johnson Clutches in special types have also been incorporated successfully in machinery of all kinds. Their exceptional fitness for this line of work is described in our booklet, "Clutches as Applied to Machine Building."

Write for our Yellow Catalog.

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STEEL *for*
Every Commercial Purpose

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We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.

Steel Ingots *by the* HARMET Liquid Process

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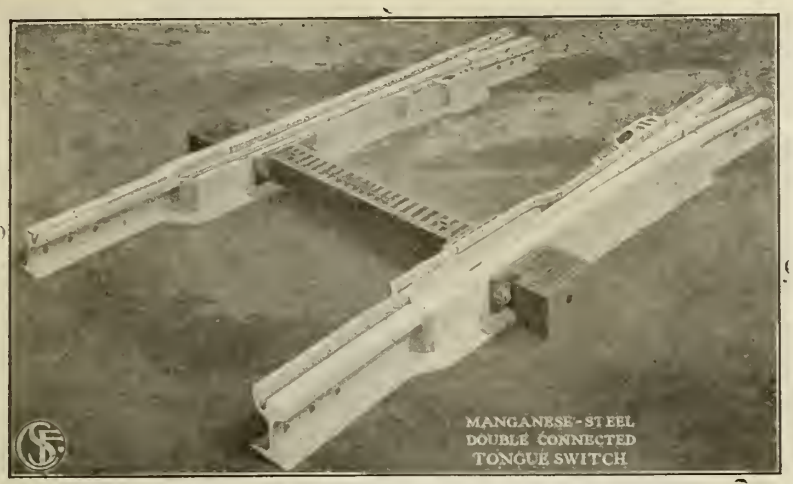

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Steam and Electric Railways

Manufacturers of Balkwill Articulated Manganese-Steel Crossings

CANADIAN STEEL FOUNDRIES LIMITED

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BABBITTS

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Stanley Process

"Used the World Over"

No other class Babbitt Metals has so world-wide a reputation for quality and service.

Made in our Montreal Plant

BRITISH SMELTING & REFINING Co. Limited.

Drummond Building Montreal.

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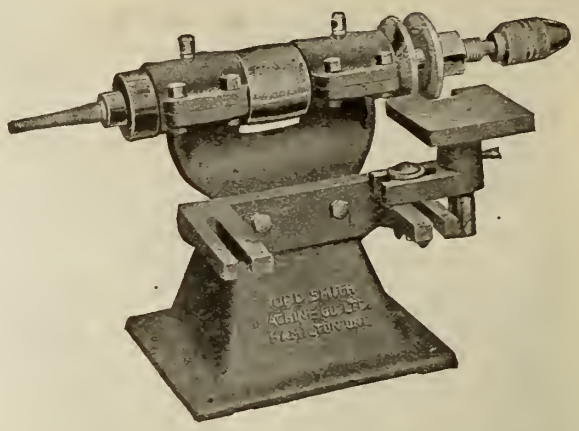
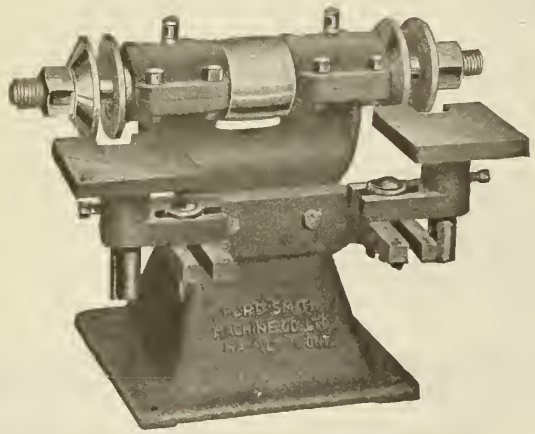
Bench Grinders For Every Need

Ford-Smith Grinders are made in a variety and range which covers every class of ordinary work and will give satisfaction on the most exacting of special requirements.





A Ford-Smith Grinder, plenty of water and no lack of belt power puts your grinding on a properly efficient basis.

A Ford-Smith really costs far less in the long run. Less trouble, quicker work, lower upkeep expenses—and **Ford-Smith Grinders are guaranteed to give satisfaction.**

Shall we send you our catalog?

Ford-Smith Machine Co., Ltd.

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W. E. Storey, London, England Gollin & Co., Melbourne, Australia

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Handle Any Material

The Canadian Standard Mill Exhauster will handle any kind of material efficiently—sawdust, shavings, cotton lint, or stringy material, gases, fumes, smoke, etc.

They are adjustable to any angle of discharge instantly—have universal type of wheel and carefully constructed self-aligning oil-ring bearings.

Catalog 410-77—gives technical data and prices. Write for a copy.

Canadian Blower & Forge Co., Ltd.

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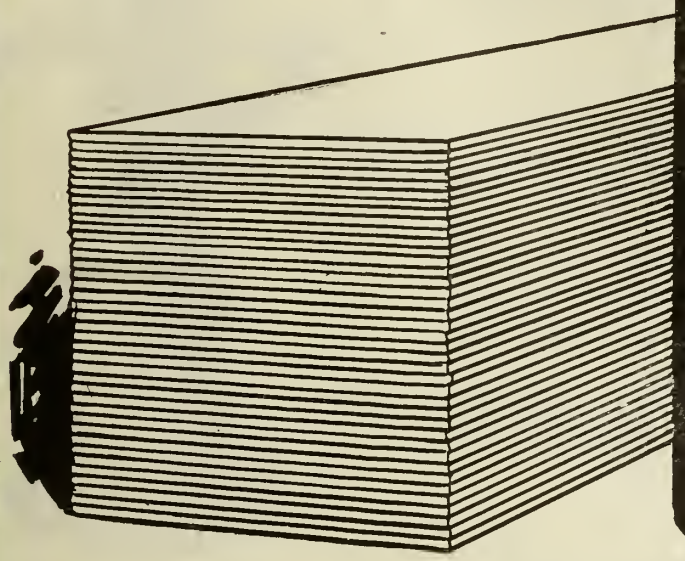
Deep Drawing Plate



WE manufacture plates of various drawing qualities for such work as

AUTOMOBILE FRAMES
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PRESSED STEEL PARTS
of all descriptions

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Made in Canada

Equal to the World's Best

Reliable Quality

We have solved the problem of Reliable Quality in Grinding Wheels by making our own abrasives and we are now prepared to guarantee that DOMINION WHEELS will give equal service to the best imported wheels.

There's a Dominion Wheel for every grinding requirement. They are made by expert workmen and every step in the process of manufacture is carefully inspected to insure a STANDARD QUALITY when the wheel leaves the Dominion factory.

You have nothing to lose by giving them a trial.

Dominion Abrasive Wheel Co., Limited
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A Simpler Hydro-Pneumatic Press

Complications in the construction of our High Speed Hydro-Pneumatic Press are so few that its operation is more readily understood than that of a more intricate machine.

Straightening, Forcing, Broaching

Particularly adapted for straightening cam, crank, pinion and wheel shafts, axle tubes, pinion tubes, assembling differential housings, assembling bearings in hubs, bushings in spindles and wheel rims, testing springs front and rear, broaching brake levers.

EASTERN PRODUCTION COMPANY
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The
NAZEL AIR HAMMER

NOTED FOR ITS BLOW AND CONTROL

A self-contained unit, HAMMER AND COMPRESSOR COMBINED, built in three types, six sizes arranged for BELT OR DIRECT MOTOR DRIVE, with capacities up to 7 inches square, for all manner of jobbing, manufacturing and certain classes of drop forgings.

Nazel Engineering & Machine Works
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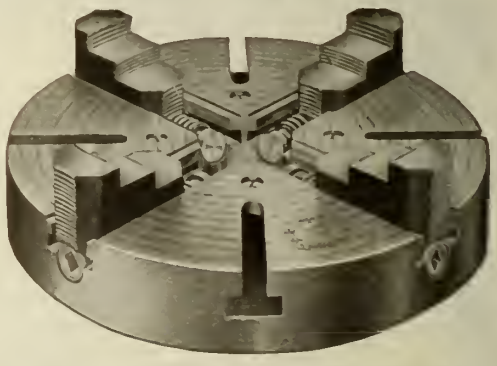
ALL STEEL
INDEPENDENT CHUCKS

are not an experiment—they have come to stay. They are a necessity with the modern machinery and high-speed steel cutting tools.



THE UNION STEEL BODY CHUCKS
are well designed and have all the elements of strength and durability for which they are designed. We make other types in steel also, including the Geared Scroll Chucks and the Geared Scroll Combination—all designed for heavy work and hard usage.

UNION MANUFACTURING COMPANY
New Britain, Conn.
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Makers of a complete line of chucks

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

"WACO"

THE HIGH-SPEED STEEL

MARSHALL, SON & BUNNEY
39 Richmond Street East TORONTO, ONT.

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ALL SIZES
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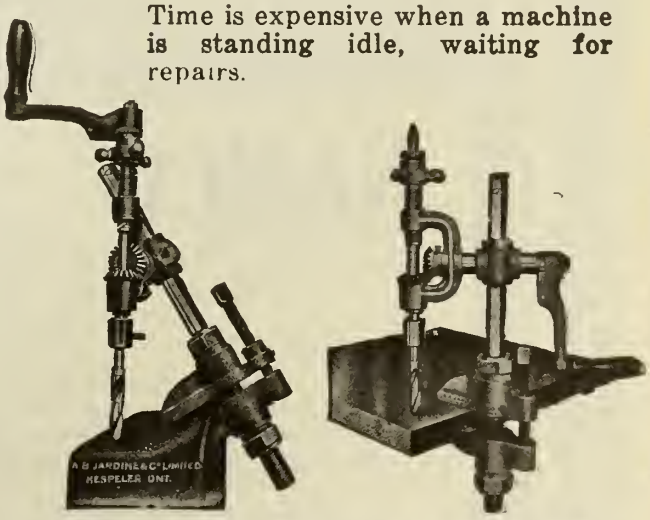
Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.



On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, $26.50 net.
Sold by all Machinery and Supply Houses

A. B. JARDINE & CO., Limited
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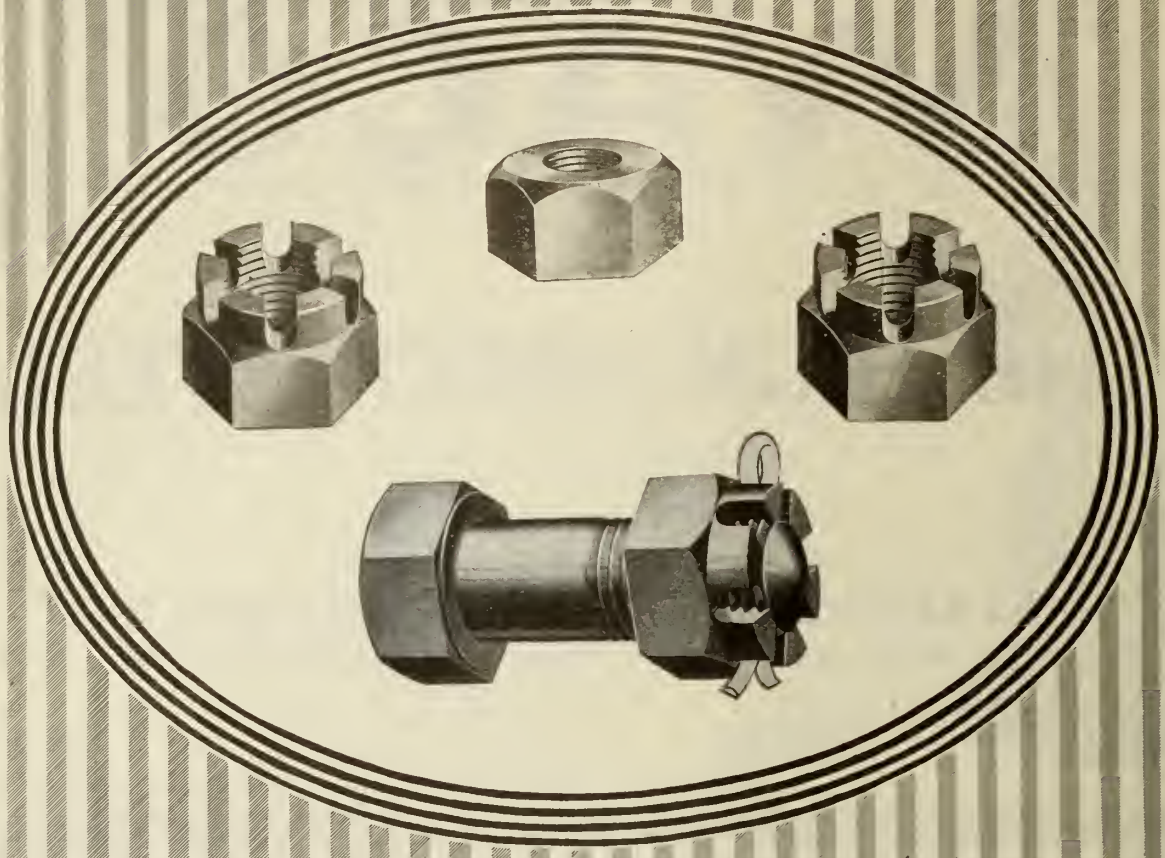

NAMCO Plain Castellated Semi-Finished NUTS

"V," U.S.S., & S.A.E. Cap Screws
"V," U.S.S. Set Screws

Special screw machine products
up to 2¼" diam., to specifications

Owing to the market shortage of raw material, it is the customers' advantage that they anticipate requirements as far ahead of use as possible.

THE NATIONAL ACME COMPANY

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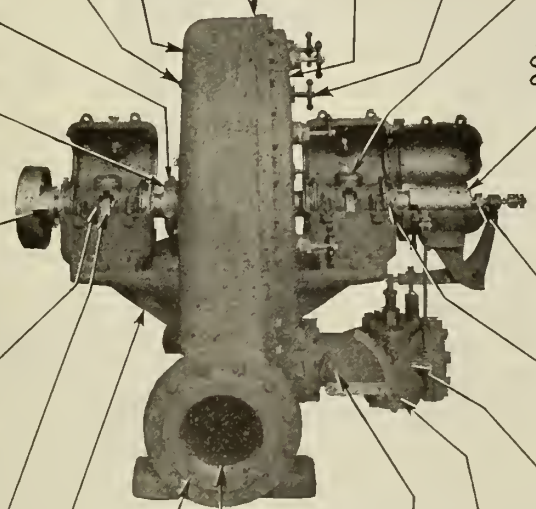
THE PRODUCT OF THIRTEEN YEARS REFINEMENT

Designed especially for driving fans, blowers, generators and pumps.
Made ranging in horsepower from one to five hundred

Sturtevant
(REG U S PAT OFF.)

TYPE 6 TURBINE


SIMPLICITY IN ALIGNING ROTOR AND NOZZLES THROUGH THESE INSPECTION HOLES
ALL JOINTS AT POINTS OF CONTACT ARE SCRAPED AND GROUND WITHOUT THE USE OF GASKETS OR PACKING
INDIVIDUAL NOZZLE CONTROL VALVES FOR HIGH EFFICIENCY CORRESPONDING TO LOAD
EXHAUST CASING
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SPLIT BEARINGS ARE EASILY REMOVED WITHOUT DISTURBING SHAFT
THREADED THRUST COLLARS HOLD ROTOR IN PLACE
LARGE SOLID OIL RING FURNISHING AMPLE LUBRICATION
INDEPENDENT EMERGENCY TRIPPER, AN EXTRA SAFETY CONTROLLING DEVICE
EXHAUST CAN BE ON EITHER END
EMERGENCY BUTTERFLY VALVE
BEARING BRACKETS CAST INTEGRAL WITH CASING, ELIMINATING TROUBLES ARISING FROM UNEQUAL EXPANSION
RELIEF VALVE ON OPPOSITE END OF EXHAUST RELEASES STEAM IN CASE EXHAUST IS CLOSED
BALANCE CONTROLLING VALVE OPERATES VERTICALLY THEREBY ASSURING A PERFECT CONDITION OF ACTION

WRITE FOR 3-PART CATALOG 256 H

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No 3 o'clock fatigue with Boyers

'LONG about three o'clock, when fatigue comes to most riveters not Boyer-equipped, this riveter is still setting an all-day Boyer pace.

Boyer Riveting Hammers *do* save thousands of arms daily through vibrationless operation —the result of all moving parts functioning in the same straight line. This saved arm power, if put together, would total many work days. (Figure *your* percentage.) And their passing from rivet to rivet tells the tale of combined power and speed.

Hardest wear without waste of air is a daily Boyer record—*full power* at every stroke. The patented Boyer design, finest materials properly heat treated and fitted, insure long years of faithful service.

And the best test of service—the *real* test—is that riveters *do* more and *earn* more with Boyers than with any other riveting hammer yet built.

Stock delivery of Boyers may be obtained from Branches listed below. Ask for new complete Pneumatic Tool Catalog No. 560.

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354-356 St. James Street, Montreal, Canada

Sales and Service Branches: TORONTO, 342 Adelaide Street, West WINNIPEG, 150 Princess Street VANCOUVER, 81 Pender Street

Canadian Factory: Canadian Pneumatic Tool Company, Montreal

P-79-H

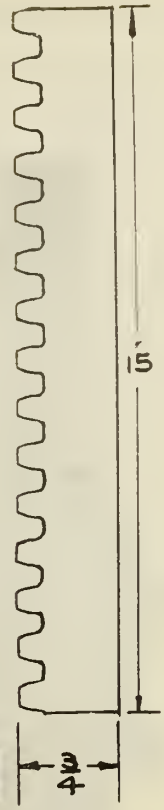
BOYER PNEUMATIC HAMMERS · · LITTLE GIANT PNEUMATIC AND ELECTRIC TOOLS
CHICAGO PNEUMATIC AIR COMPRESSORS · · VACUUM PUMPS · · PNEUMATIC HOISTS
GIANT OIL AND GAS ENGINES ROCK DRILLS · · COAL DRILLS

BOYER HAMMERS

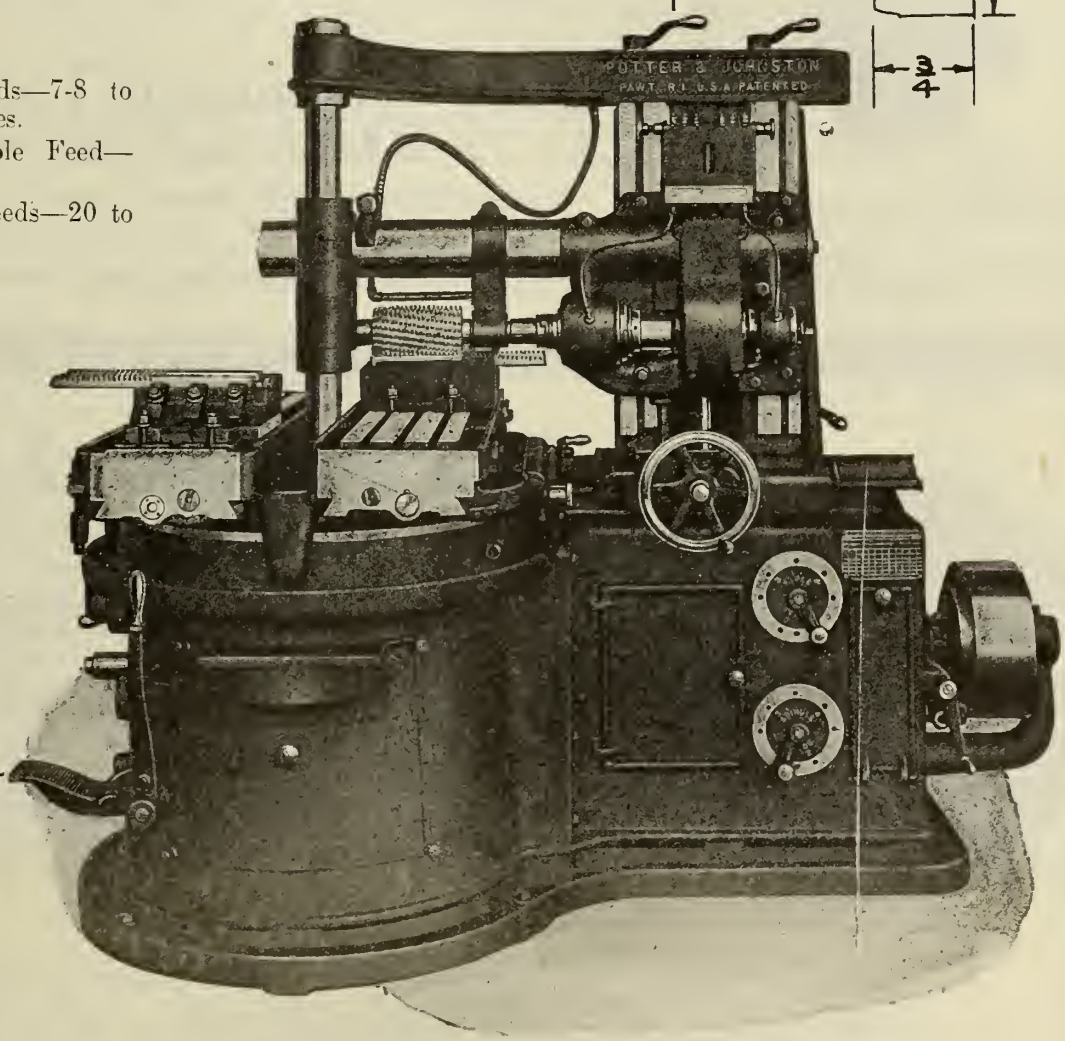
The world's standard *wherever rivets are driven*

Keep Two Tables Going at a Time on the P. & J.

Keep two tables going at a time. Load up on one while the cutter is milling work mounted on the other. With the exception of ten seconds for indexing table turret, bringing work into alignment with cutter, and advancing table — automatically—to cutting point—there's no time used that doesn't go directly into cutting.



16 Table Feeds—7-8 to 12 5-16 inches.
Length of Table Feed—29 inches.
16 Spindle Speeds—20 to 180 R.P.M.



Bulletin 40

Canadian Offices: POTTER & JOHNSTON MACHINE CO.

ROELOFSON MACHINE & TOOL CO., LIMITED

Head Office: 11 Wellington Street East, Toronto, Canada

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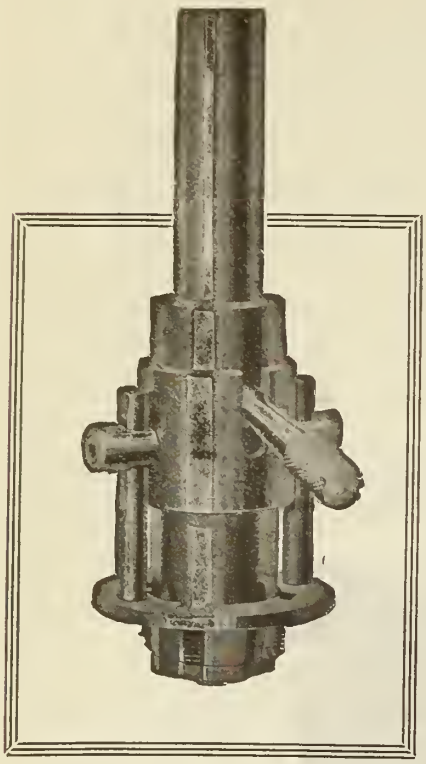
MURCHEY



COLLAPSING TAPS AND SELF-OPENING DIES

The most economical way to cut threads.

Murchey Tools are sources of increased profit for your shop. They are production boosters on a dozen tools —tapping machines, drill presses, monitor machines, boring machines, turret lathes—on every machine where threading operations are performed, where quantity production is required, **where clean, accurate threads are essential.**

Backed up in operation by our perfect chaser service—a service that gets replacements and new chasers to you when you need them without waiting for expensive delays.

Murchey Machine & Tool Company

75 Porter Street, Detroit, Mich.

Coats Machine Tool Co., London, Glasgow, Newcastle, Eng.
Fenwick Freres and Co., Paris, France

The Convenient Chuck

Your workmen know that Jacobs Chucks with the key and toothed sleeve give greater convenience and save time in changing drills, and that their grip is sure and saves in broken drills.

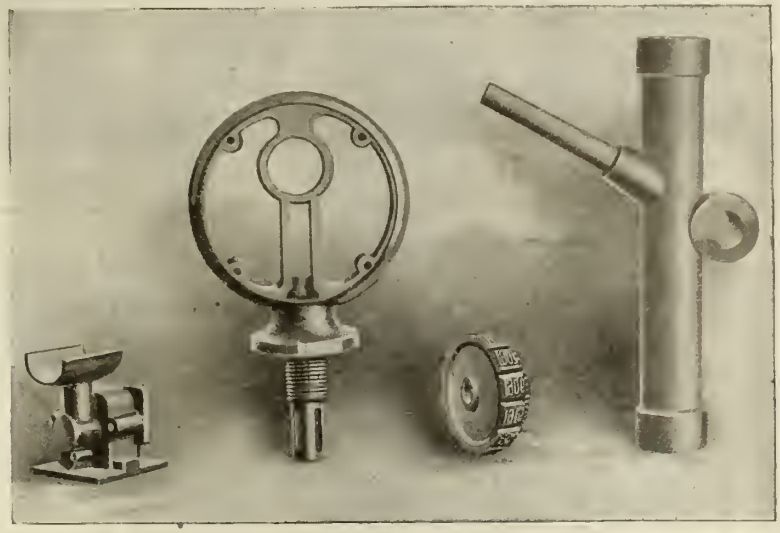
The sooner you use them the quicker they will commence to save your money.

Dept. C.M.

THE JACOBS MFG. CO. HARTFORD, CONNECTICUT, U.S.A.

Our Quotations Will Convince You of the Saving of Die-Castings

Send us blue prints or samples of your parts. Our quotations will show you just what saving die-castings will mean to you. And remember—die-castings require no machining. They come to you in clean and accurate shape, all ready to assemble.

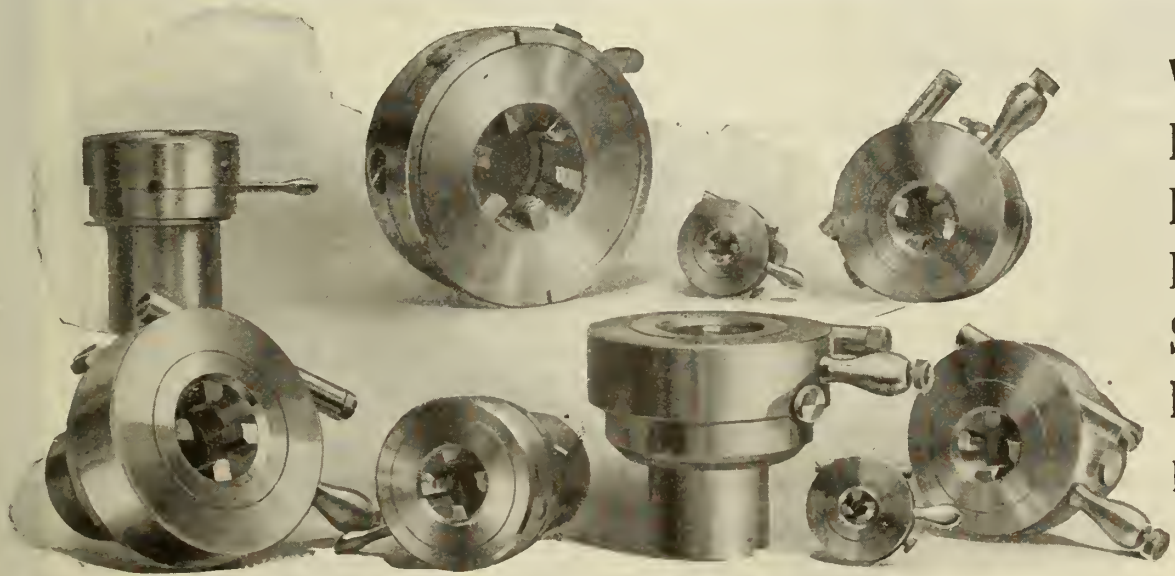


Die-Casting Chat No. 17

Imagine a die which is an absolutely accurate mould of the casting you desire. Through this die we have an entrance, into which we shoot molten metal at a great pressure. On opening the die, there you have a perfect casting, which, owing to process of manufacture, is called a Die-Casting. This in brief is our procedure in turning out the accurate work for which we are famed.

THE FISHER MOTOR CO., LIMITED

ORILLIA, ONTARIO



Wide Range, Few Dies, Small Expense

The No. 1 Hartness die will thread from 3/32 inch to 9/16 inch diameter, all pitches.
The entire range from ¼ inch to 2¾ inch for standard threads, and to 3 inches for 8 pitch or finer, is covered by three sizes of dies, whose ranges overlap.
And any of these dies, even the large No. 9, will thread pitches as fine as 32 per inch on its largest diameter without danger of stripping.

Jones & Lamson Machine Company

(DIE DIVISION)

SPRINGFIELD, VERMONT

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E. L. Essley Machy. Co., Chicago, Milwaukee and Moline.
Robinson, Cary & Sands Co., St. Paul and Duluth.

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Holland—Spliethoff, Beewukes & Company, Rotterdam, Holland.
Australia—McPherson's Pty., Ltd., Melbourne, Australia.
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BELTING

One of These Lines is for You

SCANDINAVIA BELTING

Scandinavia Belting

The original Solid Woven Belt. Especially adapted for hot, oily, dusty drives; also used to advantage on your other work.

LANCO BALATA BELTING

Lanco Balata Belting

A thoroughly waterproof belt not merely waterproofed. As nearly stretchless as is possible in a good belt. Splendid for motor drives.

Saturn Hair Belting

A solid woven belt made of camel and goat hair. Has the advantage of a solid woven belt, quite heavily made and waterproof as well.

Scandinavia Conveyor Belt

Gives long life for conveying coal, coke, stone, ore, etc. No plies to come apart.

Flour Mill

Elevator Webbing
Undressed Belting for Screen Cleaners
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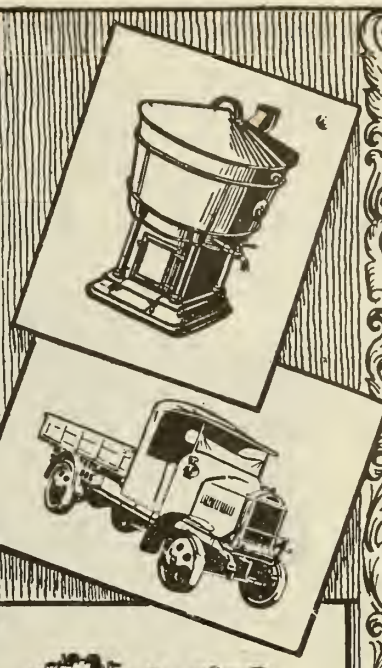

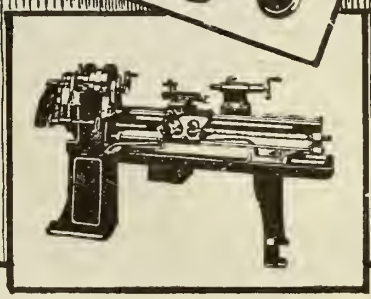
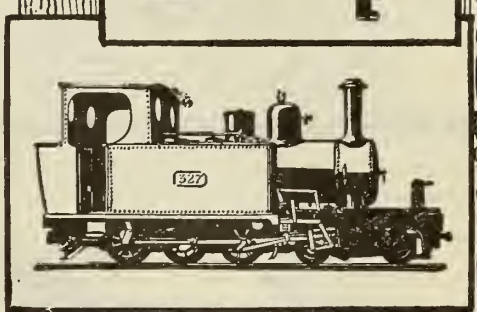
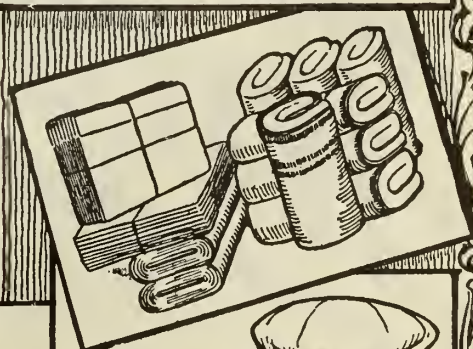

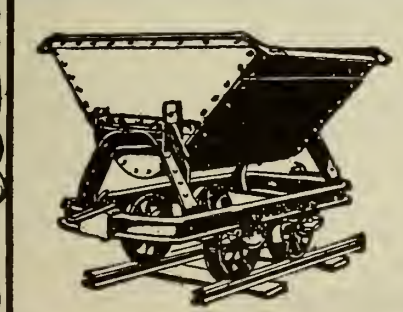
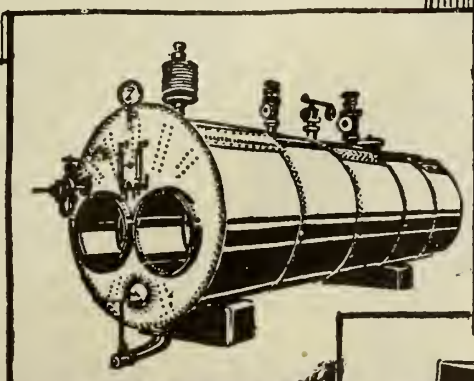
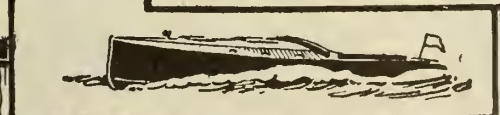

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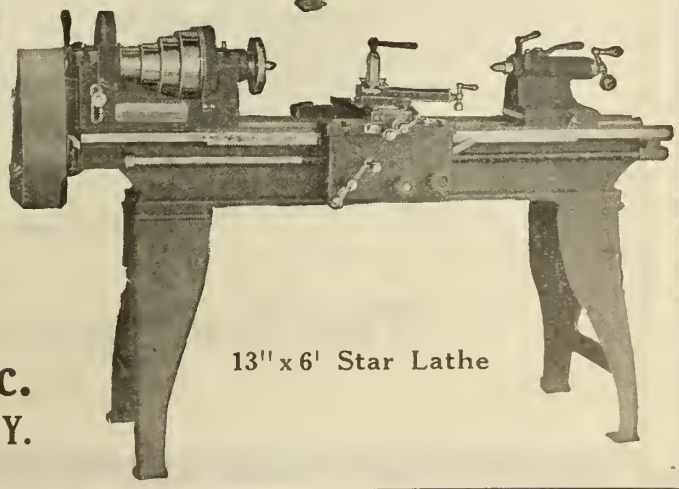

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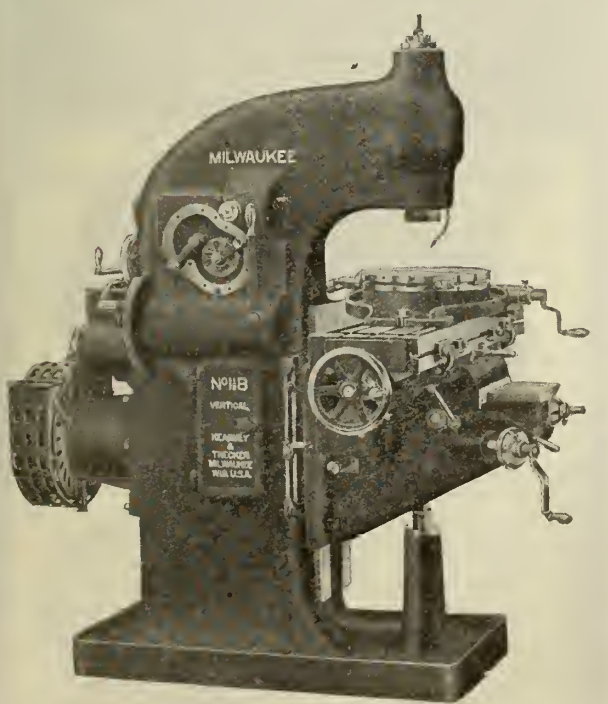

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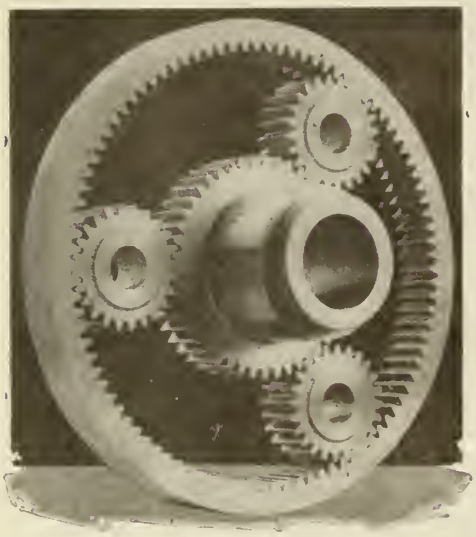

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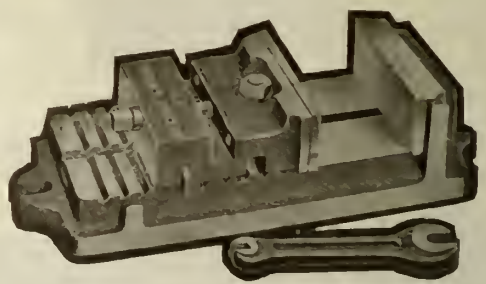

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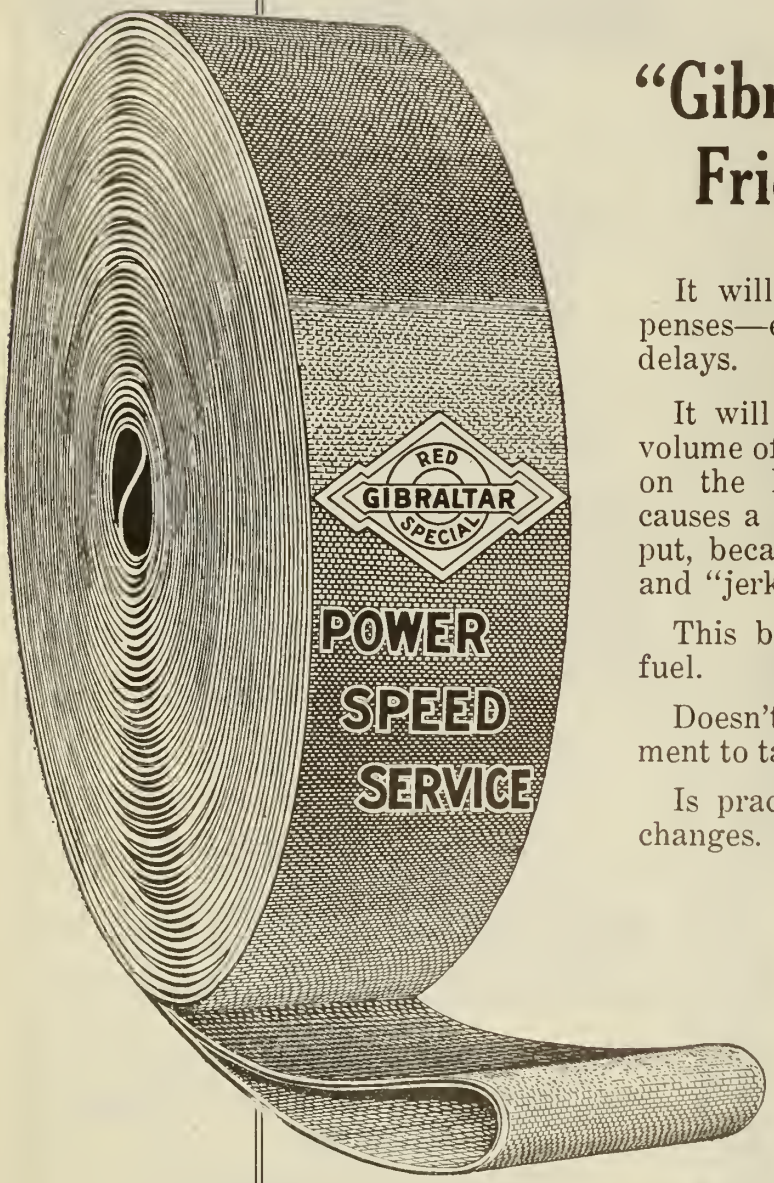

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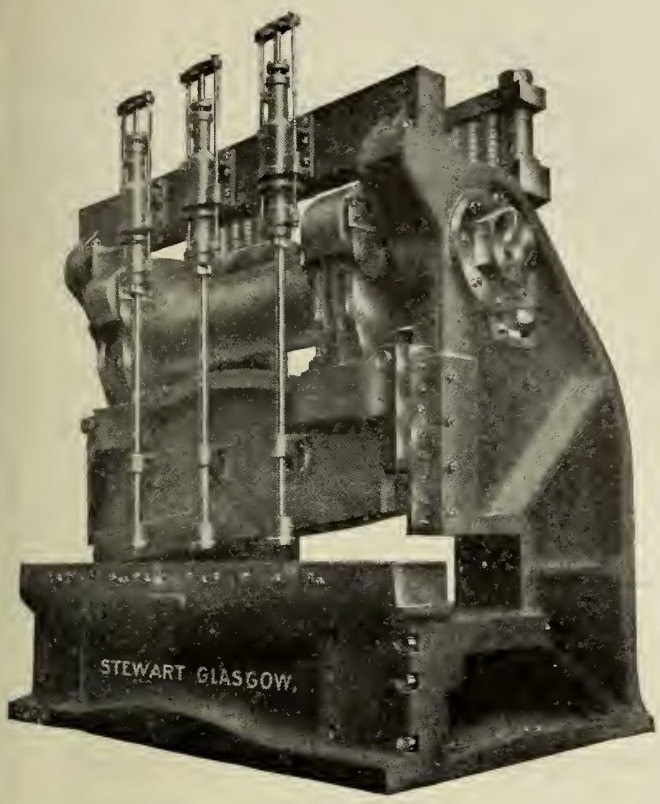

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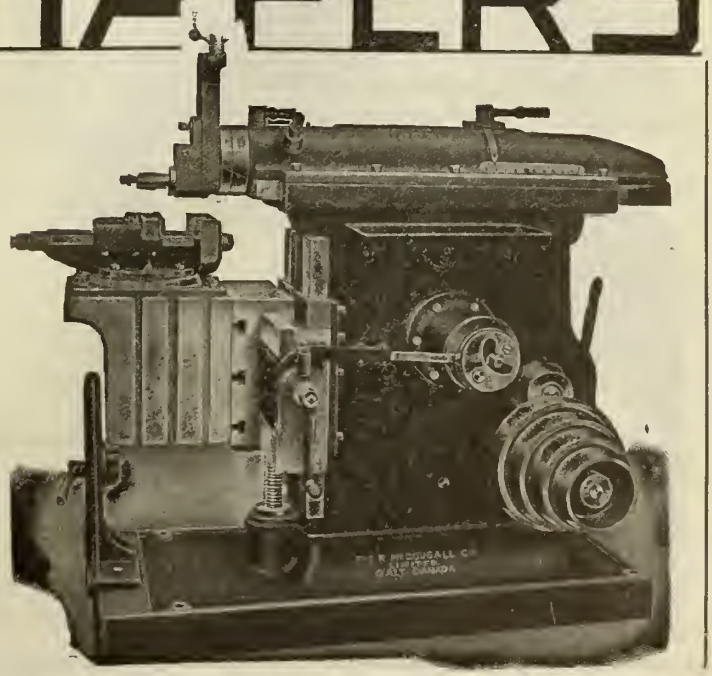

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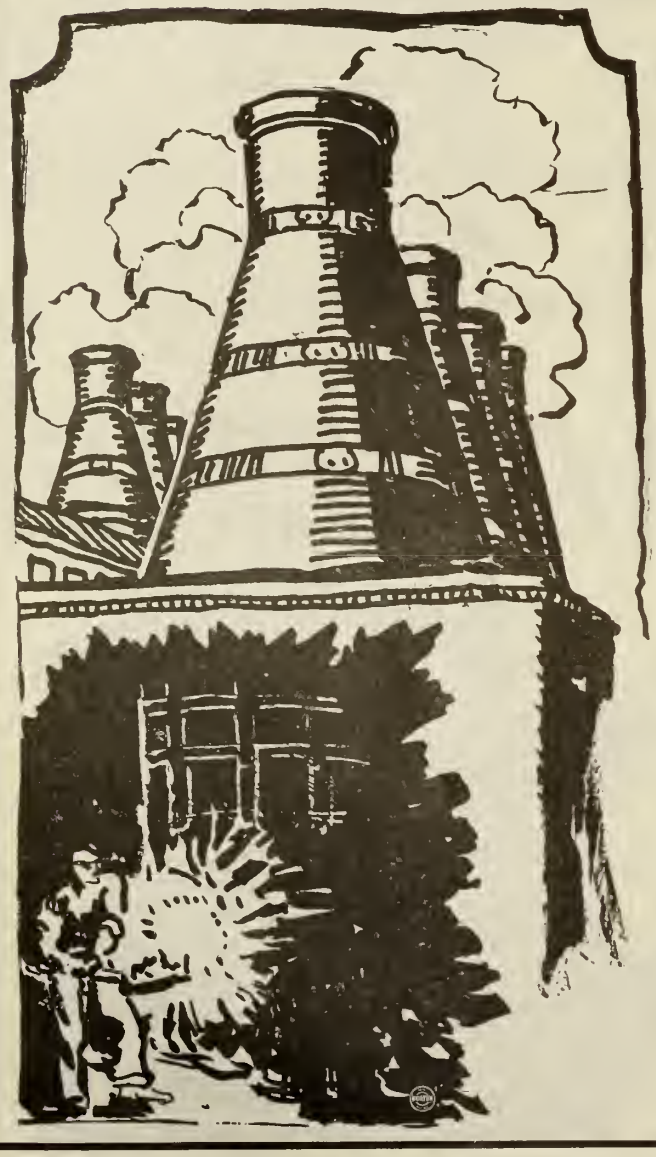

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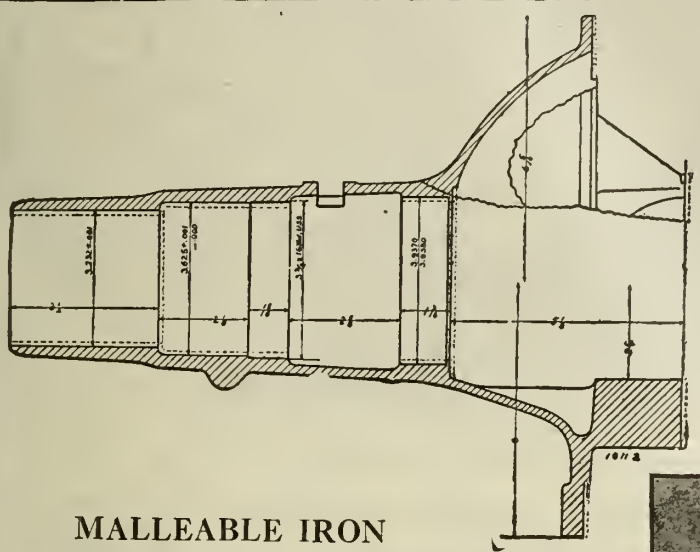

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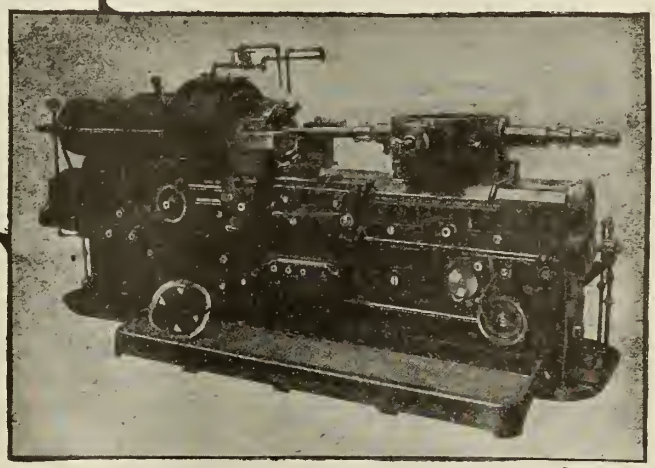

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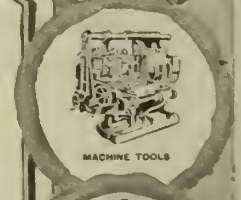
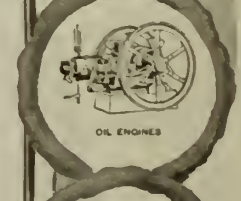




CANADIAN MACHINERY
AND
MANUFACTURING NEWS

Vol. XXIV. No. 5 July 29, 1920

Making Connecting Rods for Overland Four

Have You a Manufacturing Problem? Ten Chances to One the Solution is This, "Make Sufficient Efficient Fixtures to Do the Work—Then Go to It."

By J. H. Moore

IN previous articles dealing with the plant of the Willys-Overland Co., Ltd., we have described and illustrated several general features in connection with the making of the Overland Four, but in this case we will touch on only one part of the car, namely, the making of the connecting rod.

In order that readers can be familiar with all details regarding the machinery of this rod we are about to describe, the sketch at Fig. 2 has been prepared. We would not only suggest a study of this drawing as to sizes, but also as to the careful routine of operations. It is the policy of this plant to issue a set of operation and tool record sheets with every piece that goes into the car, and these sheets are blue-printed and used in special operation books, where they can be looked up for reference at any time. At a later date we intend showing this sheet in detail.

Suffice for the present to state that on these sheets are mentioned all data regarding tools used and the sequence of operations. Referring to such sheets we find that the connecting rod is made from a steel forging and passes through the following 18 operations:

First the rod is straightened on a special straightening fixture on an arbor press, and a step gauge is used to ascertain if the correct height between the large and small bosses has been obtained. Next comes the operation shown at Fig. 1. This consists of the straddle milling of both bosses. The operation is accomplished on a special Becker miller and a rotary fixture is installed. The holding stations are really separate vises and are worked from worm screws. Two small vee blocks are made to grip the bosses securely, and the screw pushing these out tightens the work. Twenty rods are milled at one time, and 250 rods are completed every 8¾ hours. Two sets of cutters are used and the two large cutters mill the large end, while the two small cutters mill the other end. The method of setting these cutters is very simple. Special gauges are made the exact width which the cutters should be apart, and they are set from these gauges. After milling the rods are tested by both step and snap gauges.

The third operation is shown at Fig. 3. This consists of the drilling of a 1 19-32" hole in the large boss on rod. A four-spindle Foote-Burt drill is used for this purpose, and four duplicate jigs are placed on the table as shown in the photograph. Note the type of screw bushings used on these jigs. They are very quick in action and the bottom is bell shaped to centralize the large boss on the rod. The other side of this boss also rests on a stationary bell-shaped bush. The rod itself simply hits up against the jig as shown, this preventing it from turning. Plug gauges are used after the operation to ensure accuracy.

The fourth operation consists of chamfering the hole which has just been drilled, and the work is done on a 20" McDougall drill by means of a 90° countersinking tool. Next comes the fifth

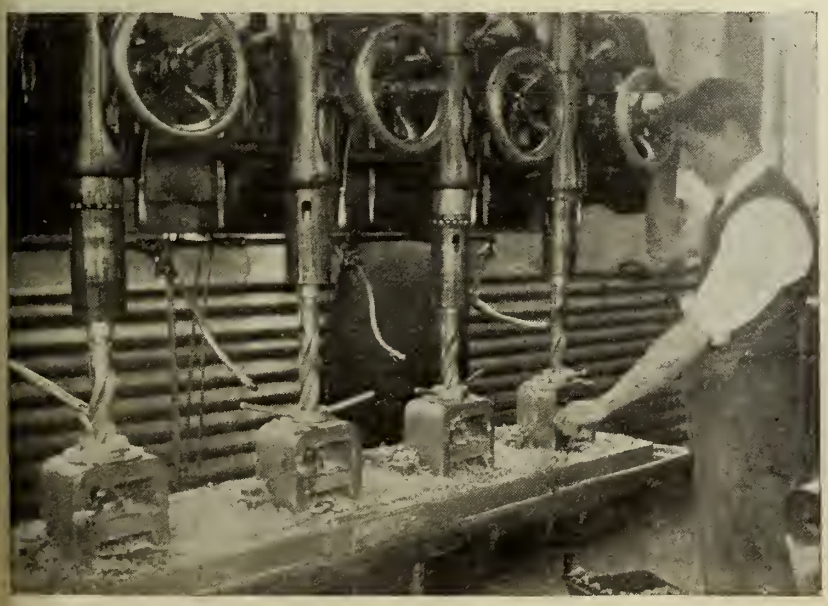


FIG. 3—USING ALL FOUR SPINDLES TO SPEED UP PRODUCTION.

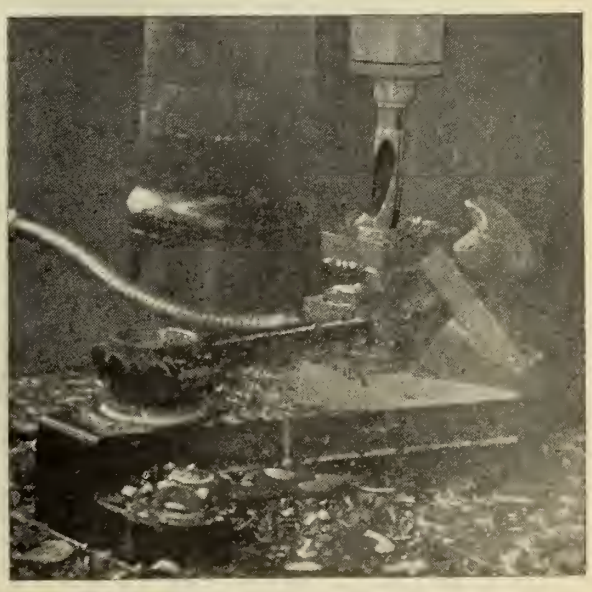


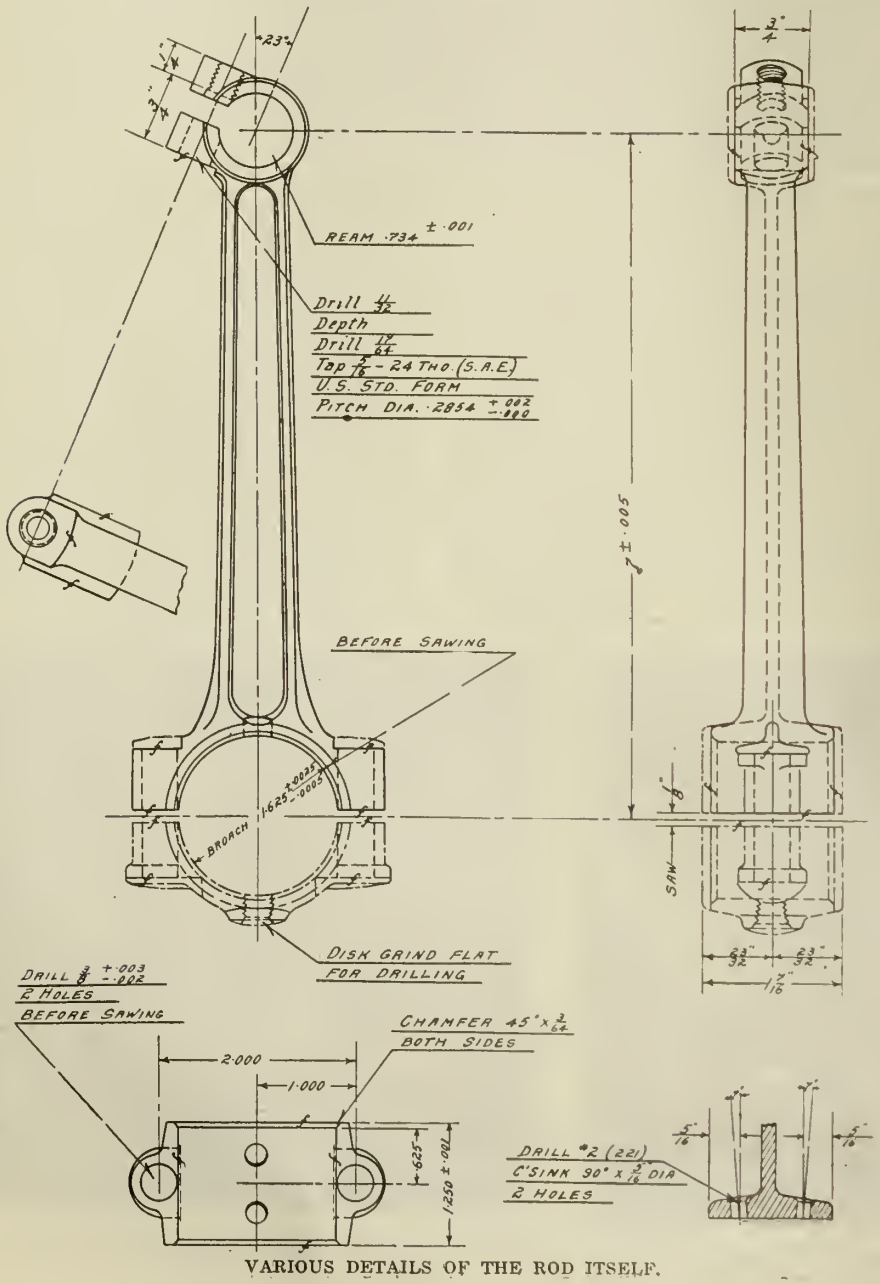
FIG. 4—A SIMPLE TYPE OF DRILLING JIG USED FOR THIS WORK.

operation shown at Fig. 4. The 23-32" hole in the small boss is now being drilled, and the method of holding the same is self-apparent. The jig is so arranged that the large hole in the rod goes over, and is centered by an oval-shaped pin, whose major axis is the correct diameter to suit the hole. The small boss of the rod fits up against a vee block, and the tightening screw, set at an angle, squeezes the rod both down and into the vee block. This work is accomplished on two 22" Barnes drills, the one operator attending to both machines, and sometimes also the chamfer operation previously mentioned. Plug gauges are used after this operation to make sure the hole is keeping to correct size.

FIG. 1—MILLING BOTH ENDS OF CONNECTING RODS ON A BECKER DOUBLE SPINDLE MILLER.

Broaching the Rods

Next comes the sixth and broaching operation. The work is performed on a No. 3 Lapointe broaching machine, with two broaches, one the size of the large hole, the other the size of the small hole. Fig. 5 illustrates this machine at work, and the method of holding the rods can be clearly noted. Oval-shaped pins locate the one end of the rod, and, of course, the broaches locate the other. The operator can keep both broaches going very easily and the production figure is all that could be desired. The broaches are of sectional design, this allowing to regrind and push up the sections as required. The size of broaches are 1⅝" and .734", and a combination plug gauge is used after the operation to test both holes.



VARIOUS DETAILS OF THE ROD ITSELF.

The seventh operation is that of drilling the bolt and oil scoop holes. This is accomplished on a seven-spindle Natco drill, but only five spindles are used. A special indexing jig is made as shown at Fig. 6, and briefly, the drilling performed is as follows. The two bolt clearance holes are drilled half way down in the rod, then the two tapping size holes are drilled the remainder of the distance. Lastly a 11-32" hole is drilled on top of the rod to suit the pipe tap which is later tapped into this portion. The jig as shown at Fig. 6 illustrates the style of locating pins used. One of these can be seen at the small end of the loading station A. The jig locates every 90 degrees by means of a spring handle as shown.

The next operation is termed operation 7A, and is merely the minor operation of reaming out the bolt holes. This is done on a 25" Barnes drill, and a special Hoefer drilling head is used on the single spindle in this way, making the drill a multiple spindle machine, and both ⅜" reamed holes are finished at one time.

Operation No. 8 consists of tapping the ⅛" pipe tap hole on top of the rod. This is done on a 20" McDougall drill, an Errington tap chuck being used. As this operation is so simple we need make no further comment. The ninth operation is that of spot facing the two bolt holes. This is also a very simple operation, so we pass on to the tenth step, namely the milling of bolt head surface. This is done on a No. 3 Kempsmith, with a fixture for the purpose, but as the operation has no special feature we will pass on to the eleventh operation, depicted at Fig. 8.

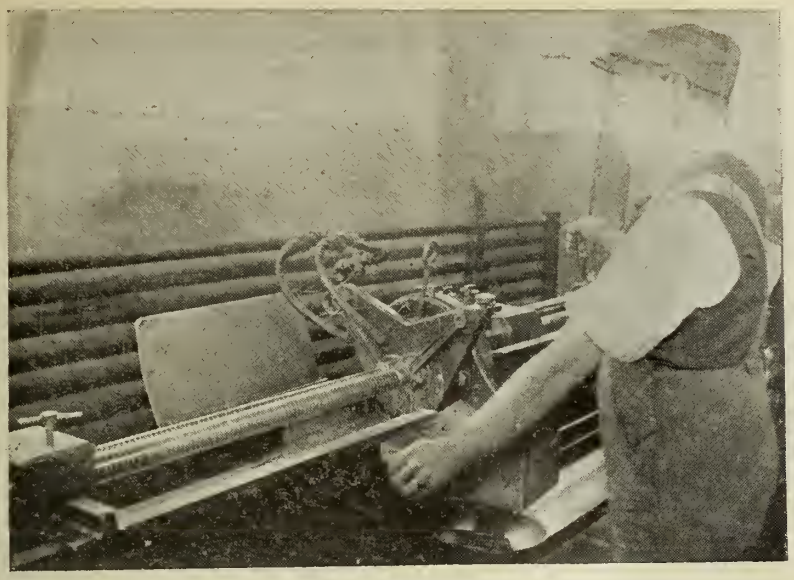


FIG. 5—THE BROACHING FIXTURE USED. NOTE THAT ONE BROACH IS SMALL, THE OTHER LARGE.

Using Four Spindles to Advantage.

This is really a combination of operations, Nos. 11, 12, 13 and 14, and these steps are accomplished on the same drill, this being a four-spindle Leyland-Gifford type. The first step is to drill an 11-32″ hole as shown at A, the second step the drilling of a 17-64″ hole as shown at B, while the third step is the tapping of a 5-16 x 24 SAE tap hole as shown at C. This is, of course, the natural sequence of operations, as first the hole at A was a bolt clearance hole, the second hole, at B, the tapping size hole, and the operation at C the actual tapping. The fourth step in this series of operations is the drilling and countersinking of the two oil holes in the lower boss of the connecting rod. A combination drill and countersink is used for this purpose. Note the style of sliding clamps used on these jigs, and in order that readers can see the spring used behind these clamps we have left the clamp off altogether at C. This style clamp can be adopted in many styles of jigs, and should be used as it is exceedingly quick and handy.

The fifteenth operation consists of the sawing of a ¼″ slot and facing of bolt head surface on the small boss end of the rod. The work is accomplished on a Toledo hand miller, and needs no special comment.

The sixteenth operation, shown at Fig. 9, is that of sawing off the cap. This is performed on a No. 3 Kempsmith miller, and a special milling fixture is used. Referring to the photograph we note that the fixture is of the revolving type, the handle A locating the fixture by means of a pin entering a hole similar to that at B. In fact, when the jig is reversed from the position shown in photograph the pin is engaged with the hole B.

An explanation of the action and loading of this fixture will be time well spent. First note the shape of locating pin at C. This shape of pin is used universally throughout the plant, having proved itself to be much better than the regular round pin. The plug D is made of correct diameter to suit the hole in the rod, and this plug is removed after the cap has been sawn off. The plug is held in place by the screw E, and this screw is tightened by the wrench F. The construction of the tightening screw, as shown, is well worth duplicating in any jig, especially where a good pressure is needed in a speedy manner. A wrench such as shown at F is easily made and accomplishes its purpose admirably. The jig itself revolves 180 degrees, and while the cutter is slitting or sawing off the one cap, the operator is unloading the completed one, and loading on a fresh one.

The seventeenth operation is a bench operation and consists of the removing of all burrs or rough spots of any kind on the rod. The last, and eighteenth operation, is that of final inspection.

Having thus completed our journey of operations, and left the rod in a completed state in as far as machinery is concerned, we need not consider the babbitting or assembling of the rod to the engine, but had better summarize what we have discovered during our tour and discussion.

To the writer's mind we have discovered various things of interest, chief among them being the need and advantage of systematic planning of operations. It will be noted that every operation has been carefully thought out and planned step by step. There is no lost motion, and in various cases the one operator performs several operations unassisted. The machinery is so laid out that the rods pass directly down a line and do not have to be trucked here, there

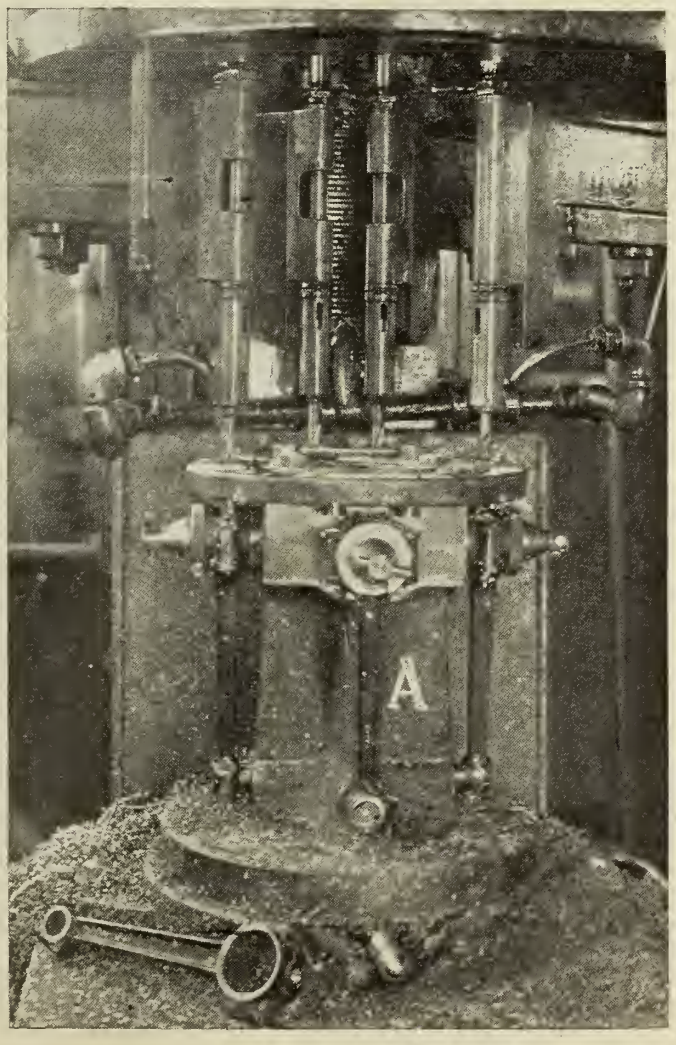


FIG. 6—A CONTINUOUS DRILLING FIXTURE FOR TOP OF RODS.

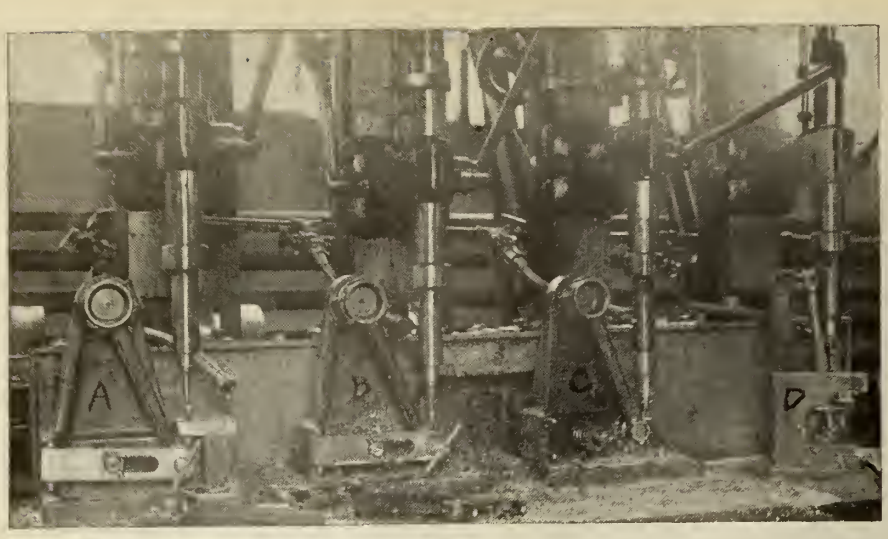


FIG. 8—A GOOD EXAMPLE OF FOLLOW UP STEPS IN DUPLICATE MANUFACTURE.

and everywhere. In every case the rods are handled on special trucks which have wooden pins in them on which the rods hang. Every operation has its gauge or gauges so that there is no guessing as to the product being correct. Each operator is a specialist in his own particular operation and this obtains maximum production. The benefits derived from special fixtures are fully realized and the most is made of this fact. By such a statement we do not mean that they spend money widely on intricate fixtures, but rather that they make the fixtures as simple and fool proof as possible, yet in every case efficient. This combination of simplicity, efficiency and fool proofness is an ideal one and should always be adhered to, for it is not the intricate or expensive jig that always turns out the best or the most work.

All these points are well worth remembering, and if such a concern as the one we have been describing finds it good practice to adopt such a procedure, it is surely a safe and sane policy for every reader to follow out.

CONE PULLEY BELT SHIFTERS

Speaking on the above subject before the summer conference of the National Safety Council (Engineering Section), Mr. H. E. Somes, electrical engineer of the Chevrolet Motor Co., made the following statements:

At your last meeting, I volunteered to obtain time studies on mechanical belt shifters for cone pulley belts and on the hand method. After going through a number of large machine shops, I was very much surprised to find that, with the exception of an isolated instance, belt shifter devices for cone pulley belts were not used; and due to that fact, and also the short period of time left to investigate this subject, I have been unable as yet to obtain the time studies. One of our factory managers who has a successful belt shifter installed expressed it as his opinion that a green workman can shift cone pulley belts by means of the belt shifter as rapidly as an experienced workmen can shift them by hand —with the additional advantage that in doing so he is safeguarded from injury. However, in my investigations on this subject, I have been convinced of the fact that mechanical belt shifters can be developed that will shift belts on cone pulleys more rapidly than by means of the hand shifting method—much more safely and efficiently and without serious injury to the belt itself. Possibly such shifters have already been developed.

The problem, however, seems to be where should cone pulley belt shifters be required? Such a shifter has its maximum value when it is installed on a machine where belts are shifted many times per day. If a saving can be realized in the workman's time, due to an improved method of shifting belts and the machine itself has a greater capacity, these advantages will become more apparent as the number of belt changes increases. Usually the advantages become of lesser importance as the number of shiftings decreases.

I would submit, therefore, at this time that mechanical belt shifters for cone pulleys are particularly adapted to shop installations where frequent shiftings of the belts from one step cone to another is necessary. Among such installations we find the tool room, the maintenance or the repair shops, and many other types of manufacturing machine shops which can possibly be classified wherein belt shifting is a necessity.

Considering the modern manufacturing machine ship, such as the automobile manufacturing plant, we are struck at once by the fact that belt shifting is very uncommon, and in fact in many cases, if the manufacturer could obtain them, single purpose machines would be purchased.

In a shop of the type commonly called production machine shop, we find that an individual machine is tooled up for a single job, and that frequently this machine runs several years without having any change made in the method of manufacture or the speed of either feed or spindle.

Illustrating this point, I was in Flint, Mich., recently and went to our plant to see a screw machine which had been fitted with a mechanical belt shifter. I asked the operator what he thought of the shifter in question and how he found he could shift the belt by means of the shifter. He replied that he had been employed on that particular job for approximately eight months; he thought the belt shifter was very satisfactory, but that he never used it to shift belts with, excepting to satisfy himself that the shifter would work. This condition exists throughout that entire plant.

The field where the belt shifter would give greater service would undoubtedly be in a shop not engaged in production manufacturing, but rather where on account of the special nature of the differ-

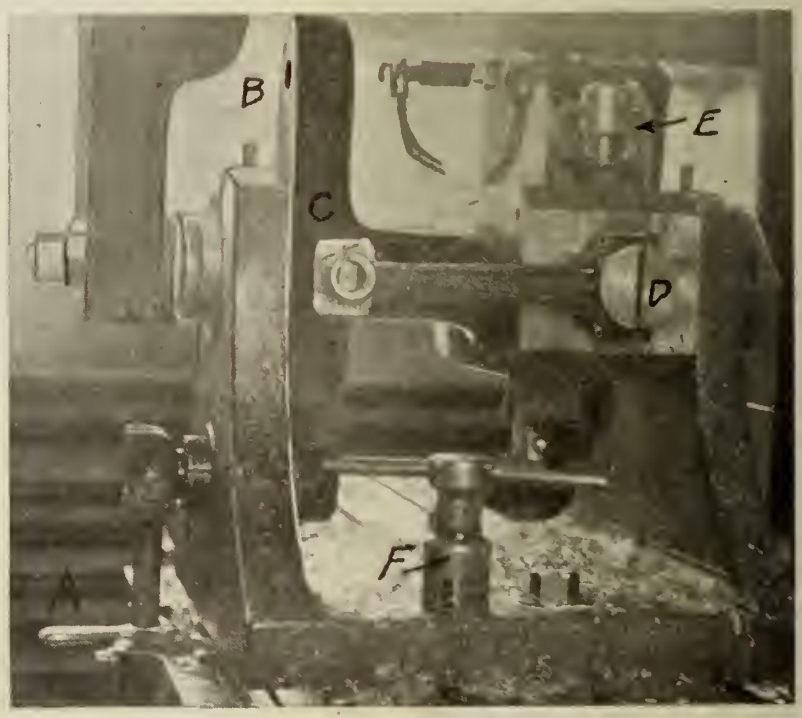


FIG. 9—THE ROD SLITTING FIXTURE. NOTE ITS REVOLVING ARRANGEMENT.

ent jobs, wide variations in the spindle speeds are necessary. This would also apply to drill press operations where the step cone pulleys are not on the machine itself and where one is exposed within twelve or eighteen inches of the floor. Drill presses, excepting where they are used over long periods of time on a single operation, require a large number of changes throughout the working day, owing to the different sizes of drills which may be used on an individual job.

While observing a belt shifter at Flint, several days ago, I noticed that it seemed to be very satisfactory in shifting from high to low; but in shifting from low to high speeds, I noted that the belt curled and that it was very difficult to make this shifting. The plant engineer advised me that the shifter had been thoroughly satisfactory until the belt became oil soaked from long use.

In order, however, that we may obtain accurate information as to the advantages of using mechanical belt shifters over the hand shifting method, and also in order that we may know definitely whether a satisfactory shifter has been developed, our company has arranged to conduct a test on several types of shifters. This test will be strictly impartial, and as a result, we hope to learn whether by using a mechanical shifter the belt is injured, and whether the shifters are satisfactory after the belt has become thoroughly oil soaked and very pliable.

The Manufacture of Iron by the Use of Rolls

This Concludes the Article which Appeared in July 15th Issue— The Design of Rolls is Next Discussed, Also Various Types of Gases Used.

By W. S. Standiford

Producer gas, unfortunately, has only one-half of the heat calories contained in the natural article, it being therefore more expensive to use. As regards powdered coal, the writer must say that he is prejudiced against that material for use in heating furnaces, for the reason that the moisture or some other cause made the powdered coal clog the blast pipes where it entered the furnaces, the result being that—in one mill where the writer saw it used—the heating furnaces had to be shut down for a time, while the machinists cleared the pipes, it sometimes taking two to three hours. This would occur at different intervals during a month's time, it sometimes taking longer for the pipes to clog up.

New Type of Gas

There is a new gas that has been invented by a man named Elliott, that is far superior in cheapness and heating power to the natural gas, which it would seem has a bright future ahead of it for the melting and heating of iron or steel, etc. The Struthers Furnace Company, of Struthers, Ohio, are using the new gas to operate blast furnaces, also the city of East Palestine Ohio, has discarded natural gas, which latter has gotten to be unsatisfactory for use in cooking stoves owing to its weak pressure and uncertain supply. East Palestine having bought the mains from the natural gas company, is installing the necessary apparatus to make the new gas. The problem of fuel in these modern times in our days of keen competition has become a most important item in the overhead costs of article production. The heater of iron or steel, by his handling of the furnace, can spoil the best metal ever produced—too quick heating burns the outside, while the interior of the pile is not hot enough to weld. If they are sent to the rolls in this condition, the resulting bars will be burnt on the outside and not welded together on the inside. When bent, such a bar will break easily and split lengthwise through its centre. If the iron is, on the other hand, left too long in the furnace, it loses its quality by the absorption of gases given out by the coal, the result being that the metal is brittle and it has little tensile strength. The guide or finishing mill comes next in description.

The rolls in this mill are smaller and lighter than those used on the puddle mill, the latter weighing 5,000 lbs. and over, while the heaviest ones operated in the guide mill weigh about 1,000 pounds apiece. There are various sizes of rolls used on guide mills, some being 5, 6, 7, 8, 9, 10 or 12 inches in diameter. The smallest sized rolls, such as those of 5 or 6 inches diameter, are generally used to make the smaller sizes of rounds, such as 3-16 of an inch, etc.; the smaller rolls require to be driven at a very high speed, as the iron or steel gets cold very quickly before it reaches the finished size. Small rolls wear out more rapidly and require dressing oftener, which is due to the sharper peripheral surface and contact points rubbing against the metal rolled. Some persons in rolling mills seem to think that only 5 or 6-inch diameter rolls should be used for making 3-16 or ¼ inch metal. But it has been found out by experience better to make small sizes of iron and steel on larger rolls as they do not wear out so rapidly. This is especially true when hard manganese steel rods are to be rolled. Wire rod mills use rolls of 12½ inch diameter, the rod made, a number 5, being about 7-32 of an inch thick. The mills that we are to make these 1½-inch rounds on uses rolls ten inches in diameter and consists of the roughing, strand, ovals and finishing rolls. Each set has its own pair of housings securely fastened to the bed, and all rolls are connected together by means of boxes and spindles as described in the puddle mill. The roughers are three-high and are driven at the middle, the

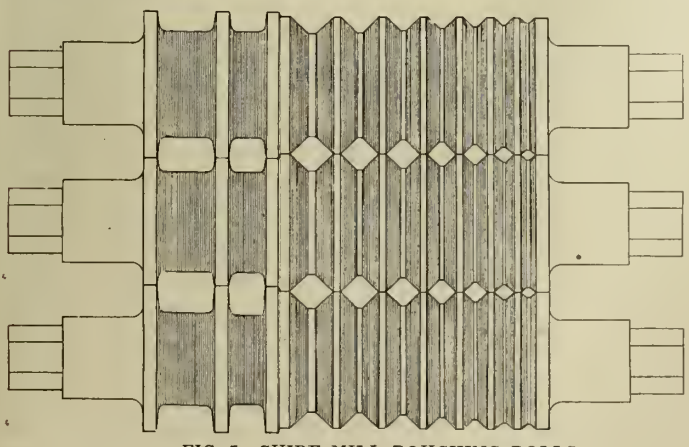


FIG. 7—GUIDE MILL ROUGHING ROLLS.

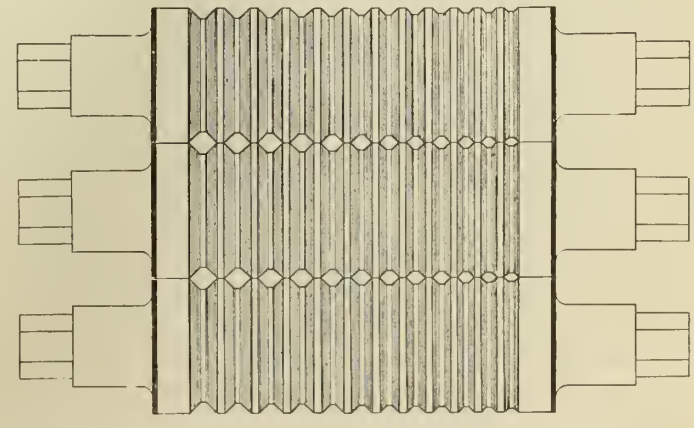


FIG. 8—STRAND ROLLS.

centre roll revolving in an opposite direction to that of the top and bottom rolls. This arrangement enables the iron to be rolled between the grooves of the bottom and middle rolls and then passed between those of the top and middle rolls. It will readily be seen that by using a three-high mill, much time is saved over that of the two-high design as well as a greater output of rolled metal being obtained.

The passing of the iron over the top roll in order to enable the worker to put it into the next groove smaller in area than the one that preceded it, is avoided by the three-high system. The worker also at the end of his day's work is less fatigued by using the three-high rolls, as a minimum of heavy lifting is done. The average quality of the iron rolled is also better—which is due to the fact that it has a better chance of its component parts being welded together. It is absolutely necessary that the pile should be welded into one solid mass while it is at a white-heat, and this is best done with three-high rolls, as no time is lost dragging the pile over the top roll as is done in the two-high mill.

Fig. 7 illustrates a good working set of guide roughers, that is made to take a box or bar pile 4 inches wide. This style is used extensively and they are called "box and edging" roughers. The use of square grooves in rolls of this description allows very heavy drafts to be used to weld the metal together. After the pile is heated in the furnace, it is pulled to the front by the heater, who uses a long rod for the purpose. It is then gripped between the jaws of a long pair of tongs, which latter has a ring through it. Overhead is a curved track containing a two-wheeled trolley traveller having a chain of suitable length

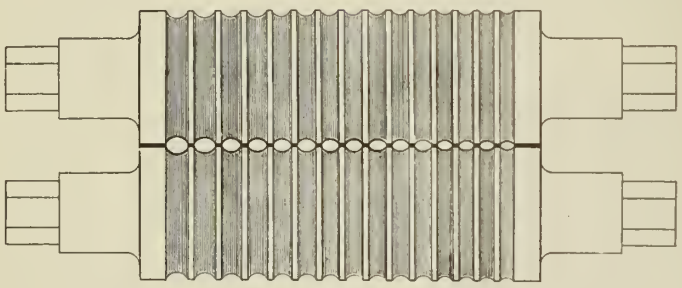


FIG. 9—OVAL ROLLS.

fastened to one end; the other end of chain is attached to the tongs. This takes the weight of the pile off of the worker. The latter, seizing the white-hot pile with tongs, runs at full speed to the rolls, the object being to get it there as quickly as possible in order to avoid as much loss of heat as possible during transit. Then he pushes it into the largest pass in bottom roll and returns to his furnace. Stationed at the rolls are two roughers, one on each side. After the pile goes through rolls, the rougher on other side returns it through the top roll groove. The pile is then turned over on its side and sent through the next pass in the bottom roll called "edging" pass. In going through the first two passes the work done by the rolls is on the top and bottom of the pile, the iron getting welded together in that direction. In the edging grooves, the sides are well compacted together due to the pile being turned over and worked on its sides. After it goes through the top and bottom edging passes, it emerges in the shape of a long bar having sides of equal width.

By reference to Fig. 7, of the guide roughers, it will be seen that all remaining grooves are put in roll on an angle. This causes the metal to be rolled on all four sides and also on its top and bottom but not the corners opposite the joint between the rolls. These passes are called "square grooves," although in reality, their angles are five degrees more open than a square which has a 90 degrees angle. In general, roughing roll angles vary from 95 to 100 degrees, the latter being called a "diamond." The variation in angles in various mills is due to the personal preference of the roll designer, some believing that one angle works the impurities out of the iron better than another. Square and diamond grooves do not allow of such heavy drafts as can be gotten by using box and edging passes; the latter are also safer to work with in regard to the flashing of melted metal of which there is always a certain amount in the interior of a white-hot pile. Some roll designers use a diamond groove for the first pass instead of the box variety. While a diamond groove reduces the metal quickly, it is a most dangerous form to use on a pile that contains melted metal in its interior as the violent change in shape from a square to a diamond, causes the molten iron to spurt out viciously which the rougher tries to dodge, but often in vain. Any visitor to a rolling mill will notice that the roughers' clothes are pretty well shot to pieces by flashes from the rolls. The writer has seen a man who had one eye put out by a flash. The companies usually provide goggles for their roughers, but the men get careless and leave them in their cupboard. There would not be such violent flashing in using a diamond pass, if the pile was put in the pass on an an angle, but this would not weld the material together as effectively, as when the pile is placed with its flat side facing upwards.

After the bar goes through the last edging pass, it is turned over on its corner and run through the first square groove in the bottom roll; the rougher on the other side then turns the bar over to a right angle to the direction in which it came from the first pass and inserts it into the next smaller groove between the middle and top rolls, each rolling making it reduced in section and also longer. The roughers on both sides continue the process of passing the bar back and forth through the various sized passes until it is of the required size to make the 1⅛ inch round, which in this case is 1 1-2 inches square.

Now to the Strand Rolls

At this stage, the bar is then ready to go into the strand rolls. These are three-high and are made shorter in length than the roughing rolls. The grooves are also put in on an angle, the latter being 92 degrees. They are made out of chilled cast iron, which wears better than the soft variety. Chilled rolls are made with an intensely hard surface by casting in a metal jacketed mold of the shape desired. When the hot iron comes into contact with the cold sides, the latter cools suddenly, the result being a fine and close-grained material that will stand a lot of wear. The chilling of iron also makes it very brittle; so that the rolls have to be handled very carefully in putting them in the mill. Strand rolls usually contain a number of duplicate grooves. This is done to keep the number of rolls on a mill to be changed down to a minimum. By arranging them in this manner, the strands will last from 3 to 5 months in a mill before they require dressing. The bar from the roughing rolls goes into the 1 3-8-inch pass between the middle and bottom rolls, then it is put through the 1¼-inch grooves between the middle and top rolls. It is then turned over at a right angle to its previous position and put into the same pass between the middle and bottom rolls. This is done so that all the corners will measure the same in diameter as the metal is getting near the finishing rolls, and it is necessary to have it as perfect as possible.

Fig. 8 shows what strand rolls look like. The next set to be described are the oval rolls illustrated in Fig. 9. These are made two-high as only one pass is needed to convert the square strand bar into an oval one. The length of body is 30 inches, not including necks and wobblers. They also have duplicate passes. This set contains the following grooves: one¾, one 13-16, two 7-8, two 15-16, three 1 inch, two 1 1-16, two 1 1-8, one 1 3-16, and one 1¼ inch sizes. From the foregoing, it will be seen that there is a sufficient variety to keep the rolls in the housings for quite a while before they need dressing. They are also made out of chilled iron and wear well. The width of the oval to make a 1 1-8-inch round bar is 1 7-16 inches with a total thickness of 15-16 inch. This thickness is divided, half of the depth being put in each roll when they are turned; allowance is also made for wear and springing apart of the rolls which ensues when a bar enters. The reduction of the square strand bar to an oval-shaped one allows heavier drafts to be used, the metal thus being rolled quicker. By the time the strand bar is ready to go

into the oval pass, though the reduction is heavy, there is no flashing, as practically all of the impurities are worked out of the metal by this time. In the manufacture of small rounds such as those of ¼ or ⅜ of an inch sizes, the metal from the strand rolls is reduced by passing the strand bar into an oval groove—the oval bar then going into a square pass. The process is repeated alternately until the final sized oval is obtained, ready for the finishing rolls. If this were not done, the iron would get cold too quickly, long before the finishers were reached, as small iron cools very rapidly.

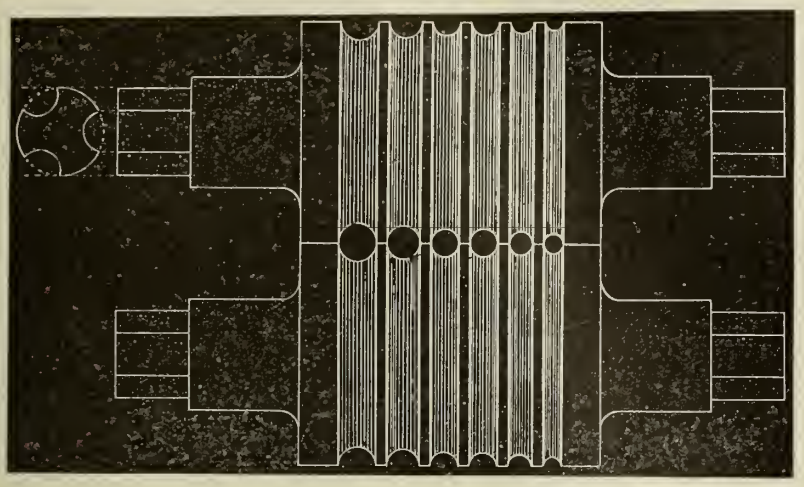


FIG. 10—FINISHING ROLLS FOR MAKING THE 1-INCH ROUND BAR.

The manufacture of iron while it is hot is also easier on the machinery and does not put such heavy strains upon it; as well as on the rolls. In fact, nothing will wear out rolls more quickly than running cold iron into them. It must be understood by this, it is meant that the metal is black-hot and not cold as defined in the absolute sense of the term commonly used. The strand bar has its end cut off while it is hot, by a small shears placed in front of the rolls and operated by suitable means. The ends of any bar are colder than other parts, which is due to contact with the iron floor plates, so in order to make strand bar enter the oval groove easily about six inches is cut off of it. Only occasionally do the other bars from the roughers need one end cut off, as they are hotter than the bars which are nearly finished. After the strand bar's end is removed, it is shoved into the oval—flat side facing upward, and held in this position while passing through the groove by side guides.

The 1¼-inch strand bar is in actual practice made slightly larger than the sizes given, it generally being about 23/1000 of an inch oversize; this allows for the scraping action of the guides, which have to be made sufficiently tight to prevent the oval bar from turning over; which would cause a jam in the pass with a probable breaking of the roll. The roller in charge makes the bars slightly larger by means of the housing screws. As the width of the strand bar is 1¼ inches and oval 1 7-16 inches, it will be seen that the strand bar is spread out to the oval width, the reduction on top and bottom sides deing the work, and filling the area of the oval pass completely. There are different styles of oval groeves put in rolls; some are very wide and not very thick; others approach the size of round to be made, the thickness being nearly the same diameter as the round and the width only 3-16 of an inch larger. Such an oval will not cause the rolls to wear as heavy as the thinner and sharper ovals do; therefore they last longer in the mill before requiring dressing. There is one drawback to the round shape ovals, viz., they take more force and are harder to get into the finishing round groove, especially when the speed of the mill is high. On the other hand, the sharper edged ovals enter a finishing groove very quickly, whether the speed of the mill is high or low, hence they are extensively used by a great many mills throughout the country.

Design of Finishing Rolls

We now come to the resign of the finishing rolls depicted in Fig. 10. As this is a 10-inch train the rolls are ten inches in diameter. The top roll is made of 1-8 of an inch larger so as to throw the iron down. Their length is 12 inches, not including that of the necks and wobblers. They are two-high as only one pass is required to convert the oval bar into a round one. Rolls contain the following passes: One ⅞, one 15-16, two 1 inch, one 1 1-16 inch and one 1⅛ inch groove. As a general rule, there is a heavier demand for one inch iron than for some of the other sizes, thus an extra pass is put in for the former. This enables these rolls to be kept in the housings much longer, the idea being to have all of the passes equally worn before they are sent to the lathe for dressing. Dressing consists of taking just enough metal off rolls so as to make them smooth. Turning rolls is the making of new ones from rough castings as they come from a foundry. When the bar comes from the oval rolls, it is tken by the workman (called "the finisher") and inserted in the guides with sharp edge of oval facing upwards. The finisher then waits until the iron is at the right heat—which is between a cherry-red and a yellow color, and then pushes it all the way through the guides and into the grooves, the rolls then pulling it through by friction. In front of the pass used, on discharge side, a rail is laid on its side or piece of angle iron as preferred by the roller. This guides the hot bar straight on its way to the place to be cooled, called "the hot bed." The temperature at which iron is rolled in the guide roll is most important; too high a heat causes the oval to over-fill the finishing round groove, thus making it mark the iron bar at joints between top and bottom rolls.

With too low a heat, the metal will not fill out the entire area of pass in rolls, thus making a bar of uneven diameter. The temperature of finishing iron and steel is of the greatest importance to the appearance of the finished product. Too high a temperature will cause a thin layer of scale, which will fall off in spots, especially under strain of bending and spoil the looks of the bar. Too low a finishing temperature will yield a spotty-reddish appearance, which is prone to oxidize or rust. To prevent the latter in damp warehouses, some mills pass their iron as it comes hot from the rolls, through a trough containing cuttings of fibres or leather saturated with tar—the vapor of which will give the metal a thin, glossy coat. Others paint their bars when cold; while some mills leave them in their natural color as they are rolled.

The setting of guides in the finishing rolls is also a matter of great importance to the appearance of the finished bar. If one guide is set farther over on one side of the groove, the iron will twist from that guide and have a flat side, and also mark the iron on the opposite side of bar. Should one guide be higher than the other, there will be a twist from the higher guide. If the oval is not quite large enough to fill the area of the round groove, there will be flat sides to the round. Should the grooves in top and bottom rolls not be exactly opposite each other, the iron will be marked on its sides. It will be seen from the foregoing, that both rolls and guides have to be set carefully in order to make as perfectly shaped bars as possible. The straightening of the metal comes next. This is usually done by boys. After a bar leaves the rolls, the straighteners take hold at each end with tongs, pull on it and then throw bar down on hot-bed and roll it against the other bars. After the first one is straight, it is an easy matter to make the others the same. They are next cut to desired lengths and put on a small car and weighed and put in warehouse.

Where mills make a specialty of supplying railroads and car builders with iron (which is tested by both the makers and railroad inspectors), it is absolutely necessary to keep the chemical constituents and rolling factors controlling manufacture as uniform as possible, in

order to keep the tensile strength and elongation of metal testing highly, if the companies' reputation for manufacturing a high-grade product is to be maintained. So it will be seen that all persons engaged in making the product have to work together if high-grade iron is desired. To readers who are not familiar with rolling mill work, the methods of lubricating the hot necks of the rolls will be interesting. The contact of hot iron with the rolls heats them through so that they have a very high temperature. This is kept down to a certain extent by means of streams of water, used on both rolls and necks. The latter have pieces of beef suet placed against them; the heat causes the suet to melt gradually, and the water carries the melted suet into the bearings. On some journals, a thick black grease is used. But the suet is superior on account of its great stiffness. The lubrication of the necks is very effective when either of the above-mentioned materials are used, it being renewed from time to time as needed. The roll turners' part of the work, in designing and turning the rolls, is most important and complex. Rolls that work well in some mills will not do so in others, but require to be altered. This is due to the material used and the engine power. Attempts have been made to find quicker methods of making iron bars than by rolling.

One of these consisted of a large cylinder, open at one end; the other had a removable die with a 1-inch round hole in its centre. The cylinder was charged with hot iron. The piston being worked by hydraulic power was inserted and operated, the metal emerging in the form of a long round bar. On testing, the quality was found to be very good —but the dies wore out rapidly and would not stand the heavy pressure combined with the heat imparted by the metal. It is most likely, that nothing better can be devised to take the place of making sections in iron and steel, etc., than the rolling process, which is used extensively in all civilized countries.

Grinding as Applied to Machine-Shop Work

Australia is Vitally Interested in the Art of Grinding as This Article, which Appeared in "Commonwealth Engineer," Clearly Shows—A Perusal Will Prove Worth While.

HISTORICALLY, the use of revolving wheels and also abrasive powders for shaping, forming and polishing materials, is one of the oldest mechanical practices. In modern engineering works, however, it is only comparatively recently that their use has become general as a machining process. The general principles of abrasive wheels and grinding processes are still new to many Australian shops.

There are two distinct machine operations in which an abrasive material is employed, viz., grinding and lapping or polishing. These found a very wide use in munition manufacture during the war; in after-war plants they are being very extensively employed. Grinding is applied to the forming or finishing of parts by the action of a rigid revolving wheel composed of a hard abrasive substance. Lapping or polishing is employed only when the highest accuracy or finish is desired, such as in finishing gun tubes, precision tools, gauges, etc.; the abrasive substance used for this purpose is in the form of a powder which is carried embedded in some soft medium such as lead, or gummed to a disc or belt. Lapping requires much hand work and is expensive. In Australian workshops this process is very little called for.

Action of Grinding

Grinding compared with other machining processes, such as turning, planing, etc., in which a single point tool is employed, enables more accurate work to be carried out, it produces a finer finish, and the hardest metals may be dealt with. On the other hand, it requires greater motive power and more skill in keeping the wheel and machine in proper adjustment for turning out good class work. The reason for these differences can be understood by comparing the action of a grinding wheel with that of a single point tool, if we regard the wheel as consisting of a large number of single point tools, or as a multiple tool milling cutter.

Application of Grinding

It is obvious that each grain of abrasive material on the surface of a wheel offers very inefficient cutting angles. The top rake on the points being invariably in the wrong direction and also on a blunt grain, the bottom rake or clearance is practically non-existent. Truing up the wheel with a diamond improves the bottom rake, but has little effect on the cutting angle or top rake. Further, in grinding the length and depth of cut and the feed are all small compared with similar qualities where a single pointed tool is employed. The result is that the material is removed in very fine particles.

This method of removing metal obviously requires more power to be expended than when heavier turnings are cut, and, coupled with the inefficient cutting angles, it accounts for grinding requiring a great deal more power than if the same amount of material were removed by a single pointed tool. For this reason grinding is rarely employed as a roughing process.

Certain firms specializing in grinding now claim that they are producing wheels and machinery which make grinding efficient for removing mass material. However, a study of up-to-date shops shows that this claim is only justifiable for special cases. In repetition work it is sometimes possible to finish a part with sufficient accuracy from the rough by one grinding cut, and also to achieve this by removing a minimum of metal, possibly one-thirty-second of an inch only. Turning, on the other hand, would require to take, perhaps, a 1-8 inch cut to allow the tool to cut well under the hard skin of the casting or forging. This obviously means a considerable saving in material in favor of grinding.

In general, grinding is used to supplement the usual machining processes where accuracy is essential. The bulk of the metal is removed, leaving two or three thousandths of an inch for the grinding operation. Under these conditions it is not unusual to attain an accuracy on a finished product of two-ten thousandths of an inch. With a finishing cut amounting to only a few thousandths, the effect of spring in the grinding machine is practically eliminated. In precision grinding, by reversing the direction of the cut or feed, the effect of wear on the grinding wheel itself is inappreciable.

Grinding Wheels and Abrasive Materials

For machining materials of different toughness and hardness, wheels of varying coarseness, hardness, and toughness, are necessary. The coarseness or fineness of the material in the wheel is called the grit. The hardness which depends on the quality and quantity of the material cementing the grains in a wheel is termed the grade, while the hardness or toughness of the abrasive itself is varied by employing different kinds of abrasive material.

In manufacturing the abrasive material the artificial or natural mass is crushed and sieved into sizes designated by numbers ranging from 6 to 250. These mean the number of spaces or wires per inch in the sieve, e.g., No. 30, has passed through a sieve with 30 wires to the inch run. Sizes finer than 250 are separated by making use of the fact that a small particle takes longer to settle in water than a larger one. The powder from No. 250 sieve is mixed with a slowly moving stream of water which classifies it on the principle of riffles in tin or gold concentration into sizes known as F, FF, and FFF, etc. There are other methods of designating this, such as the time taken for the powder to settle

in water, but the one mentioned above is that in most general use.

The most common grits for wheels used in engineering shops are Nos. 24 to 80. A coarse grit cuts larger chips, and is therefore used where a considerable amount of material is to be removed; the coarseness of the grit is governed by the toughness of the material to be cut. A satisfactory finish for ordinary purposes can be obtained from a fairly coarse grit, provided the work-speed and feed are not excessive. The wheels composed of fine grit are stronger than those of coarser grain and may be run at higher speeds. At the same time they are more liable to glaze or load, especially in tough metals such as mild steel, than coarser wheels, which are of a more open texture.

Grade

This term is used to denote the hardness of the wheel, and depends on the amount and nature of the cement or bond holding the particles of the wheel together, also, to some extent, on the abrasive material of which the wheel is composed. Grade is not a definitely measurable quantity. It is estimated by the resistance offered to a steel pointed tool, digging away a few grains when pressed in by hand. Mechanical tests to measure as a skilled tester working in the above manner.

The grade of a wheel requires to be regulated to the work so that as a grain of abrasive becomes dull and bruises material away instead of cutting it, the frictional resistance should tear the blunt grain out of the wheel. Further, in turning, the chips easily fall clear, but in grinding this may not be so, and the bond should be porous enough to obviate chips being driven into the wheel and causing glazing. Another requirement of a good bond is that it should not be affected by water, oil, cutting compound, or deterioration with age.

The three classes of bond in most common use are known as vitrified, silicate, and elastic. In vitrified wheels the abrasive is thoroughly mixed with clay or kaolin. pressed into a mould of the desired shape, dried and burned in a kiln until the bond material frits or runs. It is then cooled slowly, and when cool the lead centre is run in and the wheel face trued up with a diamond. The wheel is then spun and properly balanced. Later it is tested for safety by being revolved at about 50 per cent. above its working speed. Vitrified bond is not as strong as elastic bond, but is stronger than silicate bond. The vitrified type of wheels is generally employed in engineering shops, it is porous, not liable to load or glaze, is very fast cutting, and is unaffected by liquids or age.

In elastic wheels, as the name signifies, the bond is rubber. They are much stronger than wheels of other bonds, and are consequently used for very thin wheels, or where a side thrust may come into play. They are affected by some cutting compounds and may deteriorate with age.

Silicate bond employs sodium silicate as the cementing material. Wheels of special shape and of large size can be made by this process, such as would be difficult to manufacture by the vitrified method. Silicate bond is weaker than either of the above, but can be made more uniform in quality. It is employed where a soft wheel is required, being especially suitable for surface grinding with cup wheels.

Choice of Grade

When grinding hard materials the bond should be soft enough to allow the particles being torn from the wheel as they are moderately dulled. The softer the material, on the other hand, the stronger should be the grade and the longer the grains of abrasive should be retained in the wheel before they are torn out. Dull grains in soft material produce a better finish than sharp grains, the latter being liable to give a scratchy finish.

Different makers have various methods of designating grade. That adopted by the British Abrasive Wheel Co., and the Norton Co., is probably the best known. Vitrified and silicate wheels are lettered from E to Q—the lower letters of the alphabet signifying soft wheels, and the later letters hard wheels. In general, it may be said that E, F and G are very soft, and used on surface grinding with cup wheels; H to K are medium soft and suitable for work on hardened steel or tool steel; K to M are for general work on mild steel, or when made with carborundum for cast iron. Internal grinding requires slightly softer wheels than external grinding, and for surface work even softer still.

Abrasive Materials

Passing over quartz or silicate, well-known on sand belts and in grindstones, the oldest and probably best known abrasive is emery. This was mined by the ancients in the Grecian Islands, and consists of a mixture of oxide of aluminium and iron. It is dark in color, moderately hard and tough, and breaks with an irregular fracture, giving a good grip for the bond on a wheel, or the glue in the case of emery cloth. Emery offers a cheap wheel suitable for steel and for the intermittent work in small general shops.

Corundum

Is nearly pure oxide of aluminium. It is yellow or almost colorless, and possesses the qualities enumerated for emery, but in a more marked degree. It is harder, faster cutting, and very suitable for general work, particularly steel, but is not adapted for cast-iron grinding.

Artificial Abrasives—Carborundum

Is a chemical compound of carbon and silicon, produced in the electric furnace by heating together coke, sand, sawdust, and salt to a temperature of 7,000 deg. Fah. for 30 to 40 hours. As mass of irridescent, usually black crystals is produced, which is broken up, ground, and classified into the various grits. Carborundum is extremely hard, being next to diamond on Mohs scale, and breaks with a smooth, glassy fracture. It is most effective on hard and brittle materials, such as glass and cast iron, but is not efficient on steel. The reason for this is probably that the grains having a glassy surface, do not offer a sufficient grip for the bond, and are thus torn out by the resistance of tough metal.

Artificial Corundum

Is sold under various trade names—alundum, aloxite, electric, etc.—and is an electric furnace product made of bauxite, a hydrated oxide of aluminium. By regulating the temperature, rate of cooling, and working up the cooling mass, and the admixture of small quantities of iron and chromium, various degrees of hardness and toughness are obtained. This gives a range of abrasives which are eminently suited for grinding and finishing all classes of steel, bronze and general work.

The Canadian Engineering Standards Association have informed us that a stock of the most important publications of the British Engineering Standards Association are now available for distribution. Of course a nominal price must be charged for these publications. Below is a description of some of these books.

Requests for copies should be addressed: Secretary Canadian Standards Association, Room 112 West Block, Ottawa, Ont.

10-1904. British Standard Tables of Pipe Flanges.—This report gives the British standard dimensions for pipe flanges for steam and water piping for low pressures and high pressures, dimensions of welded-on flanges for pipe lines, for working steam pressures of 125, 225, and 325 lbs. per square inch, dimensions for short flanged bends and tees of cast metal for pressures up to 325 lbs. per square inch, and dimensions for long bends of wrought iron and steel. 25 cents net.

46-1909. British Standard Specifications for Keys and Keyways.—The specification covers material, tests, definitions and tables of dimensions for three classes of key: (a) Parallel Sunk Key; (b) Taper Key; (c) Taper Sunk Key. 25 cents net.

21-1090. Report on British Standard Pipe Threads for Iron or Steel Pipes and Tubes. (Revised November, 1909).—This report gives definitions and tables of dimensions for British standard pipe threads. In this system the Whitworth form of thread is employed, but fine pitches are used, and both parallel and conical screw ends are provided for. 25 cents net.

95-1919. British Standard Tables for Use in Engineering Workshops, Giving Corrections to Effective Diameter Required to Compensate Pitch and Angle Errors in Screw Threads of Whitworth Form.—This important paper gives the necessary information in convenient form for correcting threads of Whitworth form from 28 per inch to 2½ per inch. 25 cents net.

Investigations Pertaining to Heat Treating

This Paper, which Was Presented Before the American Steel Treaters' Society, States in an Able Manner the Results of Various Investigations in the Heat Treating Field.

By Frederick J. Griffiths*

IN the past a great deal has been written and said pertaining to the heat treatment of both carbon and alloy steels. This has contained a great deal of valuable data which, when properly applied, no doubt has been of material value in furthering the art of heat treatment and bringing it up to its present day standard. But in a great many plants, especially those which are not large enough to employ the expert service of metallurgist, there are still a great many antique and injurious methods used in heat treating and many erroneous ideas entertained in regard to the thermal treating of steel. Because of the necessarily brief character of this paper, we will confine our remarks mostly to alloy steels used for structural purposes disregarding the refinements of procedure required by the high-priced tool and kindred steels.

The time that is given over to the consideration of fuels before furnace equipment is installed is time well spent. Very satisfactory results have been obtained in using natural or artificial gas, oil, coal, coke and electricity in different localities. The controlling feature of the decision upon fuels is the cost of obtaining same, and the question of the constant source of supply as well as the availability of cheap labor to handle the same, the labor consideration being especially important in the case of the solid fuels. Coal, coke and oil also involves the consideration of storage space. In tool work where ease of regulation and accuracy of heat control are very important and only small quantities of fuel are used and where high-priced steels are always handled the higher priced fuel often shows the highest ultimate economy.

Low Furnaces

Too much attention cannot be paid to the proper furnace equipment. Almost every special class of work requires some modification of the general types of heating furnaces that are now on the market. A great many of the smaller parts when produced in quantities can be cheaply and properly handled in continuous furnaces. These usually consist of a chamber in which the heat is generated and applied, and a revolving drum, the drum being equipped with an automatic charging and discharging device. In some cases the heat may be directly generated in the revolving drum. With this type of furnace very uniform results may be obtained with very little attention and with low production costs.

Crankshafts, camshafts, leaf springs, axle and propellor shafts as well as connecting rods can be advantageously handled in flat hearth continuous furnaces, when produced in quantity. These are usually constructed with some sort of guides and runners on the hearth in the shape of rails or flat strips. With this type of furnace one or several of the parts to be heat treated are introduced periodically into the furnace with some mechanical device pushing them along the hearth until they are dropped at the other end of the furnace into a quenching medium. These furnaces are usually so constructed as to permit a regulation of temperature as may be required by the different analyses of steels used. The charge end is usually of a low temperature, the furnace gradually becoming hotter to where the proper temperature of quenching is maintained.

In selecting a furnace for special work where quantity production is not possible, it is well to bear the following facts in mind: The furnace should be of the proper size to allow the uniform heating of the steel without direct contact with the flame. It is usually safer to use a large furnace rather than one just large enough to accommodate the work to he handled. For annealing operations of any extent and quality, the car type furnace probably gives the most satisfactory results considering the amount of time taken in loading and unloading the furnace.

If the furnace is so located as to permit of charging at one end and discharging at the other, two cars may be used permitting the loading and unloading of one while the other is in the furnace. This also permits the utilizing of the heat retained in the furnace walls when the car is drawn by a rapid introduction of the other car, thereby preventing an excessive cooling of the furnace.

Pyrometery

In the last few years with the introduction of alloy steels for most stressed parts in automotive engineering, and machine manufacture, high physical properties have been required by manufacturers' specifications. These properties were not only required in test pieces but were uniformly demanded in every part combined with a great volume of output. This accurate duplication of the best qualities that the steel contained can only be obtained by the most accurate control of the time and temperature of the heat application. In order to constantly obtain this, a system of reliable heat measuring instruments must be installed in such a way as to at all times show a representative record of the thermal condition of the interior of the furnace as close to the steel as is practically possible.

It is not sufficient to merely put a thermo couple in one end of the furnace and take temperature regardless of how the furnace is loaded or being operated. A couple inserted in the top of an underfired furnace will usually show from 15 to 40° higher temperature than an instrument placed near the work. There is also some difference in temperature across the width of the furnace. This is in well-constructed furnaces not more than 20° to 25° and does not seriously affect heat treating operations. Constant checking and replacing of defective and worn-out thermo couples is essential to reliable heat control.

It is very important to take into consideration the difference between the temperature of cold end junction of the thermo couple and the room temperature, as the measuring instrument only shows the difference in temperature between the hot and cold end junction. It has very often been found that the cold end junction of the thermo couples that was inserted through the top of the furnace would have a temperature of 175° while the registering instrument would be calibrated to take care of a cold end temperature of 75°. Such practice of course makes it impossible to even gain a close approximation to accurate heat treating. In order to eliminate any worry in this regard two very simple methods of automatically controlling cold end temperatures are in use at present. The first, which is probably the more advocated at present, is accomplished by running leads of the same composition as that of the thermo couple wires directly to the measuring instrument. The other is by sinking a hole down 10 to 20 feet into the ground and running leads of the same composition as that of the thermo couples into this hole and there connecting any convenient leads to the indicating instrument. Some other methods of controlling cold junction temperatures are in use such as taking temperatures by thermometer and calibrating the measuring instrument to this. Another is by encasing the cold end with a cold water jacket keeping a constant flow of cold water in this jacket and calibrating the instrument to the overflow water temperature.

A great amount of breakage in thermo couples can be avoided by using care in charging and discharging the furnace. When the couple has attained a high heat very little shock is sufficient to often times rupture the protecting casing, allowing the furnace gases to have fr

*Central Steel Co., Massillon, Ohio.

access to the couple wires, rapidly oxidizing them.

Handling Apparatus

The proper heat treatment of many irregular shaped pieces depends largely upon the way they are handled after the proper temperatures have been applied for a sufficient length of time. It is well for a hardener to study the proper handling of every new shape to be heat treated and in this way much scrap due to warpage and breakage can be eliminated. Small gears can be usually successfully handled by quenching along the axis of the hole. Flat gears of small face and considerable diameter will usually warp less when quenched perpendicular to the axis of the hole. Machine quenching by having dies that firmly grasp the web of the gear and so constructed that proper oil circulation is obtained has been successfully used on many gears which by other methods of quenching were warped beyond possibility of straightening.

Straight shafts should be quenched paralled to the axis, and when of considerable length can be kept straight by rolling into and through the quenching medium by a series of screens of guides. Small saws such as screw slotting saws can easily be kept straight in hardening by clamping them between two internally water-cooled cast iron disks. Leaf springs are hardened by placing the straight hot leaf between curved dies which come together shaping the spring and then running in the quenching medium. Bolts, valves, universal joint bows and similar small parts can be hardened in quantity by making sheet metal retainers through which holes are drilled to receive the parts. The loaded retainer is inserted in the furnace and brought up to heat and quenched. Small parts are often laid in sheet metal pans and heated and quenched. Special shaped tongs are very useful in handling gears, the tongs being so constructed so that the jaws open out while the handles are pressed together, enabling the handling of gears by expanding in the hole, thus eliminating strains set up by unequal cooling at the contact point of the tongs.

When low furnaces are used, having the hearth of the furnace on the floor level or level with a small platform, a device consisting of a flat plate mounted on two wheels and equipped with a long handle can very advantageously be used for charging and discharging the furnace. This device will equally well handle carbonizing boxes, automobile front axles, heavy forgings and the like.

There is a considerable number of parts used in construction to-day which require that certain sections be left softer than others, sometimes due to the fact that a cotter pin or taper pin hole is drilled in the part after assembling or to avoid chipping and cracking of threads or to give the section a greater amount of ductility in order to resist shock at that one point. Threads on shafts can usually be protected by slipping on a loose nut before hardening. In rivet sets when it is desirable to have the centre section ductile to resist shock, and the shank and cup hard to resist wear a simple jig fixture can be made covering the part desired to be left soft and quenching the jig and sets clamped in place. By tapering off the edges of the jigs a sharp line of demarcation of hard and soft sections can be avoided. Designs of this kind easily suggest themselves to hardeners for the particular shape they may have to treat.

Forging Operations

A very considerable portion of the steel which goes through the heat treating room has had a previous forging operation which has a very direct and important bearing on all subsequent operations. The amount of care which is expended on the heating operations of forging is well repaid by the elimination of trouble and extra operations necessary to rectify careless forge shop heating in the hardening room. There is no doubt but that there is a considerable amount of steel ruined by being overheated and burned in the forge shop, where most of the furnaces used are constructed to allow direct impinging of the flame upon the work to get maximum speed of heating, and where no temperatures control except the eye of the heater is maintained. Due to the fact that greater ease of working the steel is obtained as the temperature is increased many forgers work dangerously close to the burning point of steel to get the maximum flow of metal, especially in difficult forgings where great care must be taken in filling up the dies. After a piece of steel is once burned it is impossible to put it in condition where it will again even approximate the physical properties of a sound piece of steel and its only value is that of scrap. Even though a piece of steel is not actually burned it may have been overheated to such a degree that considerable grain growth has been induced. This makes a piece of steel brittle, low in shock resisting qualities, giving very little elongation and reduction of area. To bring a piece of overheated steel to its normal structure expensive heat treating operations must be followed in the form of normalizing and annealing which will be discussed later. It is advisable for every forgeman to study his product and to determine the lowest temperature at which a reasonable production from his dies can be obtained and not to exceed this temperature, taking into consideration that different classes of steel will require different forging temperatures.

Annealing and Normalizing

All steel which is to be used for any part subjected to stresses of any amount should be first put into a proper condition for complete response to heat treating operation, which is required to bring out the necessary physical properties. This is accomplished by an annealing or normalizing operation or both. Too little attention has in the past been given to the value of the normalizing treatment. The high temperatures used in rolling and forging of steel causes a considerable grain growth, leaving the steel brittle and hard and in a condition where it is not susceptible to steel hardening treatments. It, therefore, becomes necessary to heat the steel to varying degrees of temperature dependent upon the grain growth, but always above the critical point in this coarse structure. Where a very coarse grain size is dealt with temperatures as high as 1,800° F. are required to break this up. It is then advisable to quench, as on slow cooling from this high temperature to the critical point grain growth again sets in and the same condition which was present in the original piece is set up, but to a much less extent.

After this normalizing treatment an annealing treatment for machinability is required. This can be either to a point closely above or below the critical point and should have as slow cooling as is consistent with the facilities of the plant and the urgency of the work, down to 800° and 900° F., after which rate of cooling is practically immaterial to the final condition of physical properties.

Annealing to remedy structure should always be carried out before machining operations are started. The possibility of warping and shrinking of steel is reduced to a minimum if a proper annealing or normalizing has been used prior to the quenching and drawing operation. When heavy machining operations are performed on steel a short anneal before hardening to avoid warping, due to the machine strains, is beneficial. The finished machining operation should be performed after this light anneal.

Hardening—Oil Quenching

Alloy steel should never, except in very exceptional cases, be used without heat treating. It is a useless expense to buy alloy steels and not develop their maximum possibilities. In order to intelligently handle any class of steel it is necessary in order to determine the proper heat treatment to know the chemical analysis of the steel. Reliable information of this nature can usually be obtained from the invoice of the manufacturer to the user. Since the proper heat treating data for all analysis of structural steels have been fairly well determined upon, this information can always be secured from the steel manufacturer, if he is told what application is to be made of the steel. Probably the safest way to handle alloy steel is to use oil as a quenching medium. This reduces the danger or warpage and crackage to a minimum, and leaves the steel in a tough, fibrous condition. After about 35 points of carbon is used in alloy steels oil quenching becomes almost a necessity except as mentioned later. For camshafts, piston pins, gears, and in the larger shafts, high carbon oil quenched steels are preferable, due to the increased strength and ease of manipulation, freedom from spauling or surface chipping, decreased warpage, cheapness of treating, greater uniformity of results and

increased production as compared with carbonizing steels. Oftentimes sufficient hardness is not obtained with oil quenching due to deficiencies of the oil cooling and circulating system and often causes good steel to be blamed.

Water hardening of alloy steels should not be attempted with steels above 35 carbon unless facilities are at hand to keep hot water at constant temperatures, except in cases when the alloy content in the steel is very low. Water quenching steel may well be used for certain classes of work such as small shafts, nuts and bolts, steering arms and knuckles, crankshafts, connecting rods and similar parts. Water quenching usually causes hardening to penetrate deeper than oil for the same section. Water hardening lends itself to many different methods of quenching. When very drastic cooling is required a spray of water under pressure gives very desirable results. Almost any physical properties from extreme hardness to those closely approximating oil quenching can be obtained by regulating the temperature of the water and its circulation and renewal, but this usually involves more or less mechanical equipment to regulate the supply of water at a constant temperature, therefore, it is usually customary that when the physical properties which are required can not be readily obtained by quenching in water as supplied from the main and using a subsequent draw, or in cases when the carbon is so high that danger of cracking or warping is imminent, to use an oil quench.

Brine and Solution

Brine and other solutions play a very small part in alloy steel hardening. The object of using brine or solution in quenching is that of increasing the speed of cooling and thereby gaining greater hardness. It seems plausible enough to use this method when an off analysis of steel or low carbon alloy content is being used to save the steel, but if steel is ordered for a particular purpose, a proper combination of carbon and alloys can in most cases be obtained so that a special solution is not necessary.

Double Treatment

In occasional instances such as in aeroplane and in some motor car construction when lightness and strength is of considerable moment and where cost is a secondary consideration, a double treatment of steel has been extensively advocated and used. Beyond a doubt a considerable increase in physical properties can be obtained, in exceptional cases having obtained 10 per cent. increase. The greatest value of this treatment seems to lie in the fact that a uniformity of results is secured by this method. Any refinement of grain structure which is not obtained by the first treatment is secured by the second. The first treatment is considerably above the critical point, usually 75-100°, while the second is ordinarily very little above the critical point.

Corbonizing

A great deal more importance has been attached to the carbonizing treatment in the past than is justified by more recent developments in the handling of high carbon alloy steels. Carbonizing at best is always an expensive, uncertain and dirty process, unnecessarily tying up a great deal of furnace equipment and labor causing a considerable expenditure on carbonizing boxes and carbonizing materials. It also takes up a very large amount of floor space due to the packing and storage of the boxes and material and the necessarily slow cooling of the boxes after the carbonizing operation. The process itself is incongruous to the opinion on the handling of steel entertained by the best informed men in the country. No metallurgist to-day would consider it good practice to overheat a piece of steel at long intervals and then subject it to several different heat treatments in order to again regain its proper structure when he could easily attain the same or better results by a simple quench and draw. In the author's opinion this is being done daily in carbonizing.

There are still some isolated cases where it has not as yet been found practical to supplant carbonizing steel by high carbon steel. Successful results have been obtained in making piston pins, camshafts, practically all sizes and shapes of gears, valve tappets, shafts and numerous other similar parts from high carbon heat treated steels.

Lead and Cyanide

Lead and cyanide has been extensively used as a heating medium in hardening materials which would be spoiled by excessive scaling. With present day construction of muffle furnaces it is not altogether necessary to go to expense of a costly lead and cyanide pot installation.

Tempering

There is probably no more important phase of heat treating than the drawing operation. Oftentimes steel that has been rejected as absolutely worthless for certain parts has proven itself ideal after the proper drawing conditions have been established. Time plays as important a part in the drawing operation as the temperature itself, and it is safe to say that in practically half the cases where drawing is used, were the time to be doubled at which the part is maintained at temperature, considerably better results would be obtained. The opinion has been entertained in the past that in sliding and wearing parts such as gears on spline shafts, gear teeth meshing with gear teeth, ball and roller bearings working on shafts or races and rollers working on camshafts, absolute or glass hardness must be obtained in order to make the life of the part consistent with its application. This has proven itself erroneous in the majority of cases. It has been found that high carbon heat treated alloy steel, and this is particularly true of properly refined carbon chrome steel, when given a sufficient draw to bring the scleroscope hardness up to between 60 and 70, possesses a satisfactory wearing surface, although it may be readily touched with a file. After a short time in actual operation such steel takes a very high surface burnish with a negligible amount of wear.

The Canadian Engineering Standards Association have informed us that a stock of the most important publications of the British Engineering Standards Association are now available for distribution. Of course a nominal price must be charged for these publications. Below is a description of some of these books.

Requests for copies should be addressed: Secretary Canadian Standards Association, Room 112 West Block, Ottawa, Ont.

C. L. 3750. Interim Memorandum on French Metric Screw Threads for Aircraft Purposes.—This memorandum describes the system of screw threads for aircraft purposes used by the French military authorities, and is accompanied by tables showing limits of size, tolerances, etc., for two grades of fit. The form of thread is that of the Systeme International, in which the crest is cylindrical, while the root of the thread is curved in section. The finer tolerances are provided for cases where great accuracy is required. The second grade tolerances are suitable for ordinary bolts and nuts. 15 cents net.

C. L. 7270. Interim Report on British Standard Whitworth (B.S.W.) Screw Threads and Their Tolerances (¼ inch to 6 inches diameter). (Superseding Reports Nos. 20 and 38.)—This important report gives the British standard nomenclature and definitions referring to screw thread work, also standard dimensions of B.S.W. threads, followed by tables of standard sizes and tolerances for both bolts and nuts, on pitch, angle, full diameter, effective diameter, and core diameter. 25 cents net.

C. L. (M) 7271. Interim Report on British Association (B.A.) Screw Threads With Tolerances for Nos. 0 to 15 B.A. Superseding Report No. 20.) — Gives similar information to that contained in C. L. (M) 7270, but applying to B.A. threads from .010 to 236 inch full diameter (0.25 to 6.0 mm.). 25 cents net.

84-1918. Report on British Standard Fine (B.S.F.) Screw Threads and Their Tolerances.—This report gives revised tables of dimensions for British standard fine screw threads and covers theoretical dimensions and standard sizes and tolerances of bolts and nuts for two grades of fit. The report also contains an appendix dealing with methods of determining and compensating for errors in pitch, form of thread, and diameter. Much information is given regarding methods of gauging screw threads. 25 cents net.

WELDING AND CUTTING

BLOWPIPE MANIPULATION

POSITION of blowpipe.—The flame of the blowpipe should be given a definite inclination. In certain cases and especially with expert welders, familiar with the new method of executing welds, this inclination of the flame to the plane of the weld is very large; in other words, the flame is almost perpendicular to the weld. We have, however, made a series of experiments to discover the best angle and have found that an angle of 20 degrees gives the best results, that is to say, the angle between the nozzle of the blowpipe and the perpendicular should be 20 degrees, the flame being turned backwards as shown in Fig. 6. Beginners should pay particular attention to obtaining and practically working at this angle of inclination.

We have previously stated that in welding backwards it is the welding rod that is given a movement and not the blowpipe. The blowpipe is therefore held in such a manner that the flame advances along the bevelled faces with as great a regularity as possible, the rate of movement being in proportion to the speed of welding. A very slight transversal movement may be given to the blowpipe to produce more rapid fusion of the two bevelled faces.

A series of welds have been made by this new method with a blowpipe fitted to the loose headstock of a lathe, the advancing movement being thus mechanical. In spite of the absence of the slight transversal motion we are convinced that this basis of construction can be adapted for welding machines constructed for welding backwards.

However, it is interesting to note that the hand of a welder holding a blowpipe, even without movement other than that of advancement, seems to be much preferable to a machine because, without giving precisely the lateral movements to the flame, the hand can constantly direct the welding part of the flame to the requirements and thus advance or retard the movements in such a way that the bevelled faces are attached properly and the weld is being executed in conjunction with the proper handling of the welding rod.

(Position of the Flame.)—The white cone of the flame should penetrate very deeply into the angle of the V as shown in Fig. 7. If held too high as shown in Fig. 8 the melting at the bottom of the V is not sufficient, the size of the weld is unnecessarily increased, the metal near the surface is overheated and the speed of welding is diminished.

The penetration of the white cone should be carefully observed if the advantages, economy and quality of welds which can be obtained by welding backwards are required.

Position of the Welding Wire.—The melting of the metal is produced, as previously explained, behind the blowpipe and not in front as is the common practice.

This melting is no longer obtained by the welding cone of the flame, but by the additional heat contributed by the envelope of the flame, the blowpipe being inclined towards the rear, in other words, towards the welding wire, as shown in Fig. 6.

The position of the welding wire and its movement should be closely followed. The wire is inclined to the line of welding, in the advancing direction, that is to say, in the opposite direction to the inclination of the flame. The best angle of inclination, between the weld and the wire, has been found to be 45 degrees for material about ¼-inch thick, and for thinner material, say ⅛-inch, an angle of about 30 degrees. This inclination is maintained whilst the welding wire is given its proper movement in the line of welding This movement for the thicker material, say, about ¼-inch, consists in alternately moving the molten extremity of the wire from one side to the other of the line of welding, as shown in the small illustration in Fig 6. The movement for material less than this thickness becomes first of all ellipical or gyratory, and then for material about ⅛-inch, and especially when the material is about 1-16-inch the movement is translated into a reciprocating one without any transversal movements, as shown in Fig. 9. In both these cases the extremity of the wire remains continually in the molten bath.

Execution of welds.—In order that the line of welding should present a homogeneous appearance, it is advisable to operate in the manner already laid down and with the same speed at the commencement and completion of the execution. If, say, one of the extremities of the weld is attacked too soon with the blowpipe, free fusion and regular advancement are not obtained until after a certain time, with the result that irregularities are noticeable at the beginning of the weld. To avoid this the plates should be preheated for a length of a few inches with the blowpipe so as to obtain, at the beginning, regularity, and a normal rate of welding. The blowpipe and the welding wire being held in the manner indicated, the cone of the flame is directed so as to well penetrate into the angle of the bevel, and the first molten bath is obtained by giving the blowpipe a slight gyratory movement, immediately after which the extremity of the welding wire

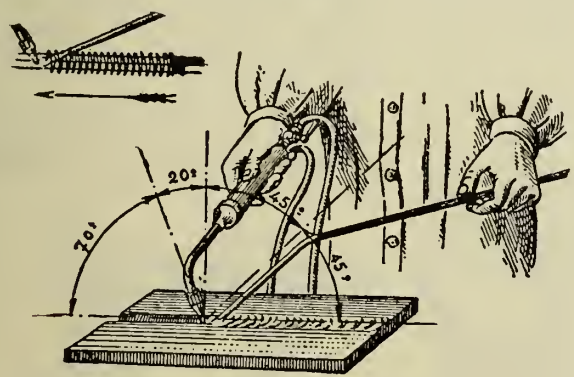


FIG. 6—POSITION OF BLOWPIPE AND WELDING WIRE.

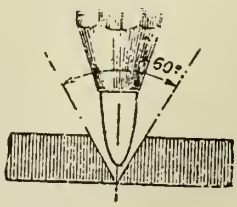


FIG. 7—POSITION OF THE FLAME.

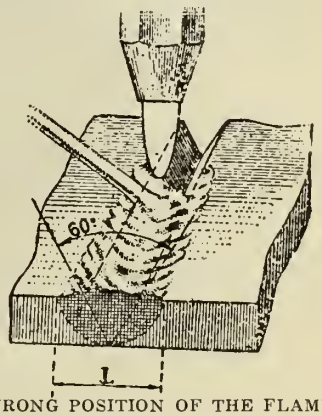


FIG. 8—WRONG POSITION OF THE FLAME.

is introduced into the molten bath and the blowpipe is then given its regular advancing movement.

The welding wire, on the other hand, follows immedately after the flame, and describes a reciprocating or a more or less elliptical and longitudinal motion, according to the thickness of the metal, as indicated and shown in Figs. 6 and 9, taking care to always maintain the given

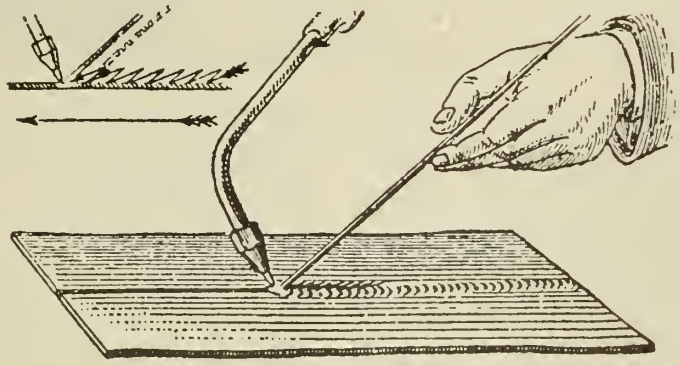


FIG. 9—MOVEMENT OF WELDING WIRE FOR THIN MATERIAL.

angle of inclination The weld is thus obtained in a normal and very continuous manner. Care must be taken to use a welding wire which satisfactorily fills the lines of welding, without excess or insufficient addition of material. If necessary, the position of the blowpipe is changed when the extremity of the weld is reached in order to obtain a clean finish as is usual with the ordinary method of welding.

The melted metal being attacked in the rear, as a result of the inclination of the flame, the bevelled faces are always well melted; the weld is what is commonly said to be well penetrated and the defect of adhesion is almost impossible. However, it is advisable not to travel too fast so as to give the beveled surface sufficient time to melt freely, otherwise candles of molten metal will appear on the underside of the weld as a result of the addition of too much heat at the bottom of the V.

(Defects in Welds).—If the weld is badly executed, as is common with beginners, its general appearance is irregular. The surface does not consist of a series of overlapping ripples all practically in the same plane but consists, as a section along the line of welding will show in Fig. 10, of a series of hills and valleys.

The most serious defect with beginners is to form a channel on either side of the weld throughout its length, these channels, shown in Fig. 11, being below the surface of the plate.

These channels not only weaken the whole length of the weld along each side but are the starting points of cracks, as is proved by bending tests on welds containing this defect.

With a little experience a welder soon reaches the stage in which he eliminates these irregularities and defects. We have proved by a wide range of tests that a welder who has not previously welded backwards does not require much practice before he obtains excellent results.

(Characteristics of Well Executed Welds).—The welds are very regular in appearance and are not so wide as the welds done by the ordinary method. No channels which correspond to a thinning at the edges of the welds are present. There are no hollows or excess addition of metal on the surface. The underside of the weld shows that the fusion has been complete throughout the thickness of the metal, in other words the penetration is complete and there is no starting point for cracks.

(Examination of Welds).—The following observations made during the examination of welds executed by this new method of welding, accompanied by the results of the first series of tests will conclude this first study. Some notes on the industrial results obtained over a period of eighteen months are also included.

It is incontestable, from the point of view of good penetration of the metal and the absence of the defect of adhesion, that welding backwards offers considerable advantages over other methods of executing welds and is capable of entirely eliminating these defects.

Etching tests on welds obtained by the new method show a perfect joining between the metal of the plate and the added metal. The welds show distinctly less oxide inclusions than those obtained by the ordinary methods, and are free from blowholes. In addition they possess ordinary hardness and the remaining mechanical properties are more regular.

Bending tests have given good results. It is possible to fold the weld without starting a crack which is a very good indication of excellent elongation properties and good penetration of the weld. The tensile strength of the weld is also greater than that of ordinary welds and improvement in the other mechanical properties is obtained.

A series of welds made by welding backwards, has been obtained from various works carrying out commercial oxy-acetylene welding and although we are not permitted to give the results obtained by testing, they are all favorable to the new method. Extremely favorable results have been obtained in Italian workshops.

From the point of view of instructing welders, there is no doubt that apprenticeship need only be brief as when the fundamental principles are well understood rapid progress is made. We have shown that after a very short period of instruction a beginner can produce welds free from the defect of adhesion, and the burning of the metal, with good penetration and good joining of the metal.

In the construction of projectiles, shells and bombs, by oxy-actylene welding, the percentage of leaks, or rather sweating, in one workshop, when the welds were placed under the hydraulic tests was 15 to 16 previous to the introduction of the new method of welding. This figure was reduced to 4 per cent. and was practically eliminated at the point where leaks were common, namely at the junction of the circular and longitudinal welds, but it was found necessary to instruct workmen to give a little more attention to making the junction of the welds. In the case of aeroplane bombs the reduction in the percentage of leaks was of the same order after the new method had been applied. Hydraulic tests to destruction demonstrated the good quality of the welded joints.

Comparative tests made under practically the same conditions showed a gain of 6 per cent. in elongation for mild steels executed by the new method.

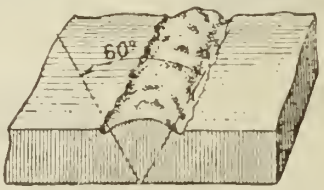


FIG. 11—CHANNELS IN BADLY EXECUTED WELD.

FIG. 10—BADLY EXECUTED WELD.

The following figures relative to the increase in the speed of welding, with a consequent economy in gas and labor, bears out the previous statement that the gain is in the neighborhood of 30 to 35 per cent. In repetition work an average welder executed 54 feet of $\frac{3}{8}$-inch plate in 10 hours, practically 5½ feet per hour, which can be considered as an excellent output, by the ordinary method of welding. The same welder, welding backwards, executed almost double this quantity, namely, 98 feet in 10 hours, almost 10 feet per hour.

In analogous work, but on $\frac{1}{8}$-inch plate, the output for numerous welders varied between 210 to 310 longitudinal cylindrical seams, each about 9 inches long, and in the welds were free from

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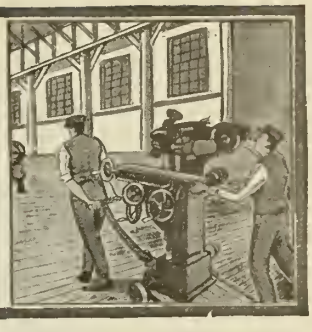
DEVELOPMENTS IN SHOP EQUIPMENT



DRILLING MACHINE

The Hoosier Drilling Machine Co., Goshen, Ind., have placed on the market their line of drilling machines, which are now being built in 16 in. and 20 in. sizes and in various styles. These comprise what is known as Nos. 1, 2, and 3 machines.

Fig. 1 shows a 20 in. stationary-head, back-geared machine, equipped with power feed and an automatic stop mechanism; and in Fig. 2 there is shown a No. 1, 16 in. machine with a plain drive. It will be seen that in one case the machine is provided with a round table and with a finished extension of the base in which T-slots are cut to provide for securing large pieces of work in position for drilling, while the other machine has a square table and a round unfinished base. Various combinations of these arrangements may be provided to suit the requirements of different shops.

On the power-feed machine shown in Fig. 1, a sufficient range of speeds and feeds is provided to cover average classes of work. There are eight speeds, four of which are obtained direct, and four through the back-gears; and three power feeds are obtainable in addition to the handwheel and lever feeds. The spindle is furnished with a ball thrust bearing, and it is counterbalanced by a weight in the column. An automatic stop in connection with a graduated spindle sleeve provides for accurate depth drilling and boring. Machines equipped with plain drive, as shown in Fig. 2, have the same general features of design as the power-feed, back-geared machines, but the construction has been simplified to meet the requirements of shops which do not need a drilling machine furnished with power feed and as wide a range of speed changes.

Fig. 3 shows a vise especially made by Hoosier Drilling Machine Co. for holding work on drilling and milling machines, although it is also adapted for use on shapers and planers. The jaws are faced with steel, and flanges with bolt slots are furnished on the body to enable the operator to securely anchor his vise to the table of the machine. A key slot milled the entire length of the body allows the vise to be brought into perfect alignment with the table of a milling machine or other tool on which it is used

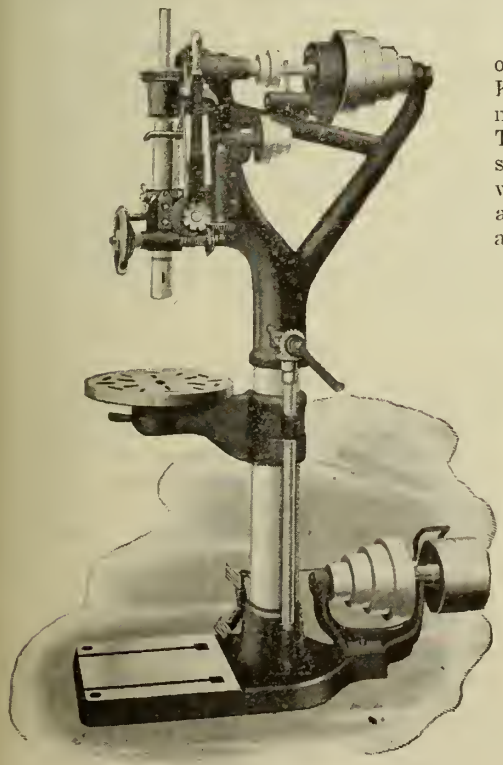
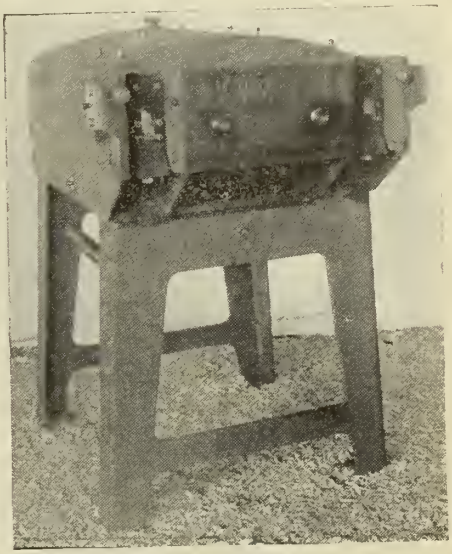


FIG. 1—THE BACK GEARED, POWER-FEED MACHINE.

SEMI-AUTOMATIC TWO-SPINDLE POINTER

A new type of pointer has been brought out by the Kent Machine Company, Kent, Ohio, which will be known on the market as the Kent Semi-Automatic Two-Spindle Pointer. The machine, as shown in the accompanying illustrations, will accommodate bolts and rods up to and including ¼ in. in diameter and of any length from 1½ in. up.

The illustration of the interior of the machine shows it to be very simple in design and construction, but still a departure from the pointers at present on



VIEW OF POINTER WHEN CLOSED.

the market. The exterior view of the machine shows what great care was taken to entirely enclose all running parts so as to insure absolute safety to the operator, and yet make the machine easily accessible for adjustment, repair, or inspection. When necessary to adjust either the cutting tool, or the chuck jaws, only the front cover need be removed.

This two-spindle machine requires only one operator for bolts or rods of ordinary length, but it is so designed that rods of any length may be pointed. It is only necessary for the gripping chuck, where it is securely gripped, after which the pointing spindle advances and the pointing operation is accomplished. The spindle then withdraws, the jaws in the gripping chuck are opened and the bolt drops into a tote box or other receptacle below the machine. All of these operations except the placing of the bolt

FIG. 2—THE PLAIN DRIVE TYPE OF DRILL.

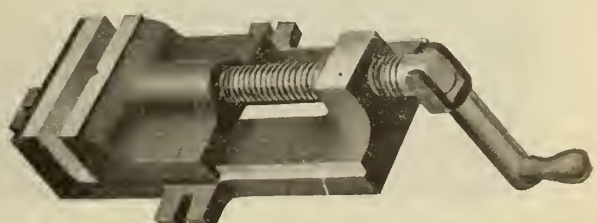


FIG. 3—STYLE OF VISE USED ON SUCH DRILLING MACHINES.

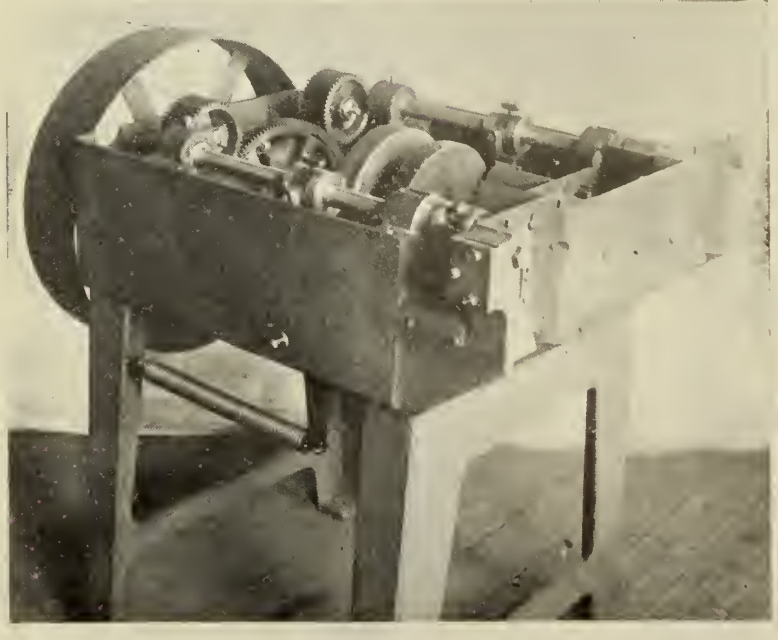
in the receiving chuck are entirely automatic.

The two-spindles, as shown, are actuated by the large cam and have alternate motion which makes it possible for one operator to feed both spindles. The forward motion of the spindle is spring actuated, so that no particular care need be exercised in placing the bolts or rods in the receiving chucks, except they must extend at least 1 inch beyond the face of the jaws to permit the pointing operation. The jaws of the gripping chuck are well protected, room being left only for the insertion of the bolt. Since all subsequent operations are entirely automatic one operator can easily feed both spindles with the cam shaft running at 25 r.p.m., making the total production of the machine 50 bolts or rods per minute.

As may be noted in the accompanying illustrations, the pointing chucks are made from a solid piece of steel, which gives them great strength and rigidity. The cutters are securely held in milled slots by self-adjusting clamps, and by loosening the screw shown they may be easily adjusted or removed and replaced when necessary. The head of the chucks are provided with tool steel guide bushings for centralizing the work to be pointed. These guide bushings are removable for the different sizes of bolts or rods.

The gripping chuck consists of two slides made of tool steel with formed jaws at their end for gripping the work. One of these slides is stationary in the machine, the other being movable is opened by a cam mechanism. Like the forward action of the spindle, the gripping device is actuated by a spring which prevents injury to the machine should a larger bolt or rod than those being pointed be placed in the gripping chuck by the operator. The stationary jaws may be adjusted for the different sizes by a small set screw. The jaw actuated by the cam and spring automatically adjusts itself. The jaws grip the work at four points which approximately centres it ready to enter the centralizing bushing in the pointing chuck.

There is plenty of chip space, and as bolts and chips are carried away in different directions, a pointed product, clean and ready for the next operation, is assured. The floor space required for the machine is 31 x 41 inches, and the distance from the floor to the centre of the spindle is 37½ inches. The total weight of the machine is 1,100 pounds.



ONE CAN READILY SEE THE INTERIOR FROM THIS VIEW.

New Things in Machine Tools

BRINELL TESTING MACHINE

The Brinell method of testing the hardness in metals is one which has been adopted in many countries, and various sizes of these machines have been placed on the market in order to conform to the different sizes of test pieces.

To meet the demand for a Brinell tester that will suit the requirements of the laboratory and toolroom, the Pittsburgh Instrument and Machine Co., 101 Water Street, Pittsburgh, Pa., has developed a style C machine as illustrated. There is a slight difference in the construction of this machine from the standard type, inasmuch as the oil reservoir is attached to the side of the supporting frame, and so arranged that the overflow of oil from the cylinder will always circulate back to the reservoir The maximum distance between the 10-mm. steel ball and the press table of this machine is 3 in. The procedure of making tests is the same as with that of their standard style A machine.

MARKING MACHINE

J. Merey, 2842 N. Maplewood Ave., Chicago, Ill., has placed on the market what is known as a Stampograph. This is, as can be noted from the illustrations, a rotary machine for lettering and numbering and can be used on all kinds of metals or substances that are in their soft state.

The impression is adjustable and can be perfectly spaced and aligned. The machine has an automatic feed, subject to the sizes of the characters there being a fixed feed provided for each size. The disks for the characters are made from the very finest tool steel and carefully hardened and tempered.

The feed is caused by means of cams and a multiple rack shaft; the impression is obtained by means of crankshaft connected with a handle and connecting rod, which is so constructed, that the characters should not break in case some part of the metal should resist, or from any other cause. The adjusting to obtain the impressions for various sizes of objects or work, can be gained by turning the ball handle in either direction and following the gauge affixed on the side until desired impression is obtained. The machine illustrated, as can be seen, is made for hand power. The machine as built for machine power weighs about 350 lbs. and requires space 2 x 2 feet, and can be run from a countershaft or motor driven. The handpower machine weighs about 200 lbs.

The power machines are only built on specification and the stock machines are fitted out with full alphabet, 1-16, 1-8, 3-16, 1-4 in.; numerals 1 to 0 in same sizes. Special multiple engraved dies can be furnished if desired. Both machines are outfitted with all engraved characters, and all necessary requirements, as cross table, vise and circular table with graduations to stamp in radius

SCREW PRESS

The Manhattan Machine & Tool Works, Grand Rapids, Mich., have placed on the market what is known as their four-post screw press, type BB. The illustration herewith gives readers an idea as to its general appearance, and following are other particulars regarding the same.

The massive construction is, of course, apparent, and all parts are properly balanced in so far as strength is concerned. Every convenience for facilitating work, and simplicity of operation, has been embodied in its design. Of course this four-post type is more adaptable to heavy work than the regular two-post style of press.

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Looking Over the Field

THE specialized shop is a good thing for the company, a good thing for the shell-buster type of "mechanic," but a mighty poor institution for the man who wants to develop.

That may be a queer way of stating the case, but there is good authority for the verdict. Only a few days ago I had a long chat with Mr. Robert Patterson, of Stratford, who was for twenty years or more master mechanic of the Grand Trunk shops at that city. Had his health remained good he would no doubt be to-day filling that or some other responsible railroad position. But he still retains a very keen interest in the mechanical field, and he can approach it from the standpoint of the apprentice, the mechanic, the employer, or the purchaser of equipment. More than one young chap wanting advice takes a trip across to Robert Patterson's house, and he gets the best that the ex-railroader can give him from a wide experience in many shops and from a close connection with the mechanical world.

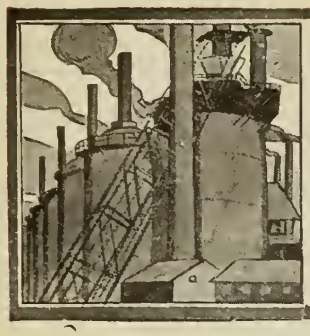
MR. PATTERSON was always a student. In fact he still is, and the chances are he will continue to be. Especially in his active days of shop work, he was a reader of books, technical papers, magazines, and anything that might contain something of interest. He went far afield from the railroad world to look for ideas, and he found them. "I remember one idea," remarked Mr. Patterson, "that we made good use of. We had difficulty in taking bolts from locomotive frames, and it was a matter of some three days to attend to this operation on an engine. I read in some of the technical papers published then, of a little hydraulic arrangement that was used for a job, and the idea struck me that it could be applied to our work. So we got it in the shop and figured it out, and it worked. Those bolts were driven out in about half a day, and it does not take much figuring to see what was saved in the way of time in the shop and getting the engine out quickly again. I suppose, in all, that idea was worth a good many thousands of dollars to the company."

MR. PATTERSON is not enthusiastic about the high wages paid to apprentices in railroad shops now, and he sees a chance in this tendency to either make or break the boy, depending largely on the influences that are brought to bear on him. Of course it would be hard to convince a boy that high wages were not good for him, but it must be remembered that a boy in his apprenticeship age does not know nearly as much as he thinks he does. Mr. Patterson holds that the high wage to the apprentice is apt to make him independent of his home at a period in his life when he ought to be subject to a certain amount of home restraint and correction. He has seen cases where boys, making more as apprentices than their fathers used to as journeymen, have picked up and left home at the least pretense, their high wage enabling them to have an independence that was very unhealthy for their after career. A certain amount of discipline is also necessary in apprenticeship, as no boy prizes highly a thing that comes easily to him and for which he has to make no sacrifice and very little effort.

"I REMEMBER very well," recalled Mr. Patterson in the course of conversation, "one time when the late Mr. Hays, then president of the road, was inquiring about certain makes of equipment in use in the shops. We were able to speak very highly of several lines, and this was the reason: They stayed with us after they put the machine in the shop. To make that a little clearer, here is a case in point. We put in five tools of a certain type, and they gave us good service. A few months after a representative of the firm came to the shop and asked if he might go out and see them in operation. So we went along, and after watching them he stated that there was an improvement out which would suit our work nicely, and that he would send the attachment along at once. This was done without any cost to us. That firm gave us a real service with everything we ever bought. It paid them and it paid us."

E. J. Dodd, writing from London, says that at the Canadian Exhibition, the MacLean business and technical newspapers and magazines, and "The Financial Post," were displayed at the stand of the Department of Overseas Trade and that quite a number of copies were sold, mainly to persons interested in buying from Canada. One of these was a member of the staff of the Russian Bolsheviki, Trade Ambassador M. Krassin, who made special enquiries and asked if he might be allowed to follow up the reading of the papers by a call on MacLean Newspapers' London office. It is difficult to know just what is going to happen in Russia, but one thing is certain, Russia cannot get on a normal producing basis without machinery plant and industrial brains. The Jews, who are controlling Russia, know this and there are bound to be developments favorable to Canada.

"Green Fields and Pastures-New"—The Red Peddler at the Door of the Orient.



MARKET DEVELOPMENTS

Premium Material Keeps Them Going Now

Cars Sent Over from Canada to Handle a Shipment—Takes a Good Deal More Money to Handle the Same Tonnage—New York Market is Dull.

IT IS taking an increasingly large amount of money to carry on business in some sections of the steel and iron world, as well as in the machine-tool trade. Right now the steel warehouses of Canada face a position that gives them the option of sitting back and waiting until mill shipments come in, or going out and paying a high price for material they can procure at once. The firms that are carrying on under the latter conditions take on a greater risk with every purchase they make, for their only safe course is to get the material in and sell it at once before there is a chance of decline in prices. Many of these places have material on order, but not delivered, at 2.65 per pound, while they are paying 8 cents per pound for shipments which they can get inside of a week or two.

Deliveries at best are very poor and show no indication of being influenced by the talked-of improvement. A reduction was made during the week by makers of high-speed drills in Canada, amounting to 10 per cent. This equalizes prices to some extent, and also brings the Canadian price on level with the figures that are quoted by Old Country firms doing business here and which have been the means of losing quite a few orders for the Canadian trade.

There is nothing brisk in the machine-tool trade. Some of the houses are going as far as to quote spot delivery on a large number of their lines, which is quite a change from the extended schedule that has been in force for many months. The New York market is dull, and it is expected that should this continue, some of the makers will be out looking for business, signifying a return to something near normal conditions.

Scrap markets are stagnant at Canadian points. Dealers are not anxious to buy, in fact in many lines they are out of the market.

CONSTRUCTION IN MONTREAL HELD UP BY UNCERTAIN DELIVERY OF STEEL

Special to CANADIAN MACHINERY.

MONTREAL, July 29—Transportation difficulties and car shortage would appear to retain the central position on which present industrial activity depends. It is doubtless true that shipments of material have shown some slight improvement but of such a meagre character that dealers and manufacturers are not yet enthusiastic regarding the better outlook. The promised advance in freight rates on American and Canadian railroads is a cloud on the horizon, that may eventually bring on another storm of general price boosting.

Steel conditions are showing gradual but very slow improvement and dealers here are reluctant to predict any pronounced betterment until the midsummer season is over. Passenger traffic is usually heavy during this period and this frequently interferes with the regular passage of railroad freight. Machine tool activity is seasonably light with supplies featuring the sales. Scrap movement is largely confined to local foundry requirements.

Freight Changes Will Affect Sales

"We are still waiting improvement in delivery, in order to meet the constant needs of our customers," said a steel dealer." The summer season is generally marked by a falling off in production and likewise less buying, but this condition this year is aggravated by the fact that, in many instances, forced curtailment in operation of factories, is necessitated by the inadequate railway facilities, so that fuel and material is not being shipped regularly to the mills." Much construction work, both in the building and equipment line, has been greatly delayed or even deferred, on account of the uncertain delivery of supplies. Dealers, however, are generally hopeful that improvement will develop from now on, but will not commit themselves to any fixed time or period. The car situation has become so uncertain that many mills, while willing to accept business, will not guarantee delivery, only with the stipulation that it will be shipped at a later date. A factor that will require some attention shortly is what condition will apply on the shipment of material purchased at a specified figure but when delivered will carry the charges of increased freight rates. There appears to be only one logical solution to this problem, and that is the passing on of the additional charges, as usually happens. "We as dealers," remarked one, "are here endeavoring to fill the needs of our customers. If, in the interval between the placing of the order and the delivery of the goods, unforseen charges are incurred we can only expect to have this taken on by the purchaser. We cannot carry on at a loss." Some cancellations are anticipated, but it is thought that these will be few, as nearly all contracts, at the present time, are made so elastic as to be easily adjusted to sudden changes in industrial conditions.

Tool Requirement Light

Apart from a slight flurry in railroad enquiry the demand for machine tools has been relatively quiet, but this is to be expected at this period of the year, owing to the general easing up of business in the holiday season. The movement of supplies continues almost normal, but prices on all commodities are maintained, or show advances. As soon as freight charge adjustment has been made dealers are anticipating proportionate increases on the cost of equipment.

Easier Tendency in Scrap

Although few dealers will commit themselves as to what effect a buying movement would have on price quotations, the impression gathered from different statements would imply that a more active market might tend to bring prices to a lower level, probably not sufficient to appear slumpy but enough to

ease the situation from the present state of tension and induce consumers to take a more active interest in the market. Present movement is exceedingly quiet and any visible signs of heavy buying is conspicuous by its absence. Local business is steady but comparatively light. "The foundries are taking considerable scrap but not greatly in excess of normal," said one dealer; "many of these places are kept very busy making up for strike losses." Wrought iron has been easier and dealers are asking around $20 per ton. Malleable scrap is also weaker and the price of $23 shows a recent decline of $2 per ton. Other steel lines are likewise easier but quotations are usually based on individual sales.

NEED MORE MONEY TO CARRY ON NOW

Warehouses Either Have to Take on High Price Material or Wait Turn For Delivery

TORONTO.—The limit to which conditions in the machine tool, iron and steel trade can improve is largely fixed by the increase that can be shown in the ability of the railways to handle the business that is piled up and waiting for them.

Information coming to hand this week does not indicate that an improvement is in sight. For instance the Carnegie mills alone would require, according to their own estimate, 13,000 cars in excess of the supply granted them, to handle the finished and semi-finished material that is stacked up at their plant.

On the other hand some makers of machine tools are quite anxious to take on business, and New York advices indicate that if present conditions prevail for a couple of months, many of the makers will be out looking for orders, something that has not been the case for some time past. When we say "looking for orders" we do not mean that there has been any time when they would not consider business, but rather that their business was so far booked ahead that there was little use of them looking for business. It has been more a case of getting out the material than selling it.

There are some firms that even go so far as to state they are prepared to make spot delivery on nearly all their lines, no doubt depending on cancellations to some extent to make this promise possible.

A Testing Time

The steel market of to-day, that is, for the firm that wants to go ahead and turn over a good tonnage each month, is a greatly changed business from the well-defined business of the old steel merchant as we have known him in years gone past. If the steel warehouses depended right now on what they could get from business booked with the mills some months past, they would be in for a quiet session. Their one big chance is to get out and buy what they can at what they have to pay for it, and then get busy and get out from under the obligation. And in many cases the obligation is increasing at such a rate each time as to cause a person to stop and think seriously.

Here is a case that shows what we mean: One Toronto firm right now has a good-sized tonnage of black sheets (28) on the way. The firm selling them is a high-price mill, and they made arrangements with one of the Canadian roads to get five cars across to handle the material which they claim will be back here in 20 days. The cars are marked and the promise is given to the railroads that they will not be used for any other purpose. These sheets cost eight cents at the mill. When all the extras, such as freight, exchange, etc., is added, the selling price, with the warehouse profit, will be about 12 cents per pound. Some $30,000 will be necessary to handle this one deal, and there is considerable more risk in this class of business than formerly, as many buyers state they are out until they can get a more reasonable price.

This same Toronto warehouse has a large tonnage placed on the books of the Steel Corporation, but they can get no delivery. Hence they face this situation: (1) Sit back and wait for delivery from the Corporation at 2.65, or (2) go ahead and buy from the independents at eight cents, and they are choosing the latter course, although they make less money per dollar invested than they did in the old days when sheets were around two cents per pound.

Little Material In

Some plate and structurals have been arriving lately, but the amount is comparatively small. There would be more work done if more material were forthcoming. Firms building cars and railway equipment are finding it hard to get enough material together of a widely assorted character to permit them going ahead. The same thing is found in the automobile field. In fact the whole automobile industry is suffering, more or less, from this same cause. Some of the shops in this district are operating on a much reduced production schedule.

Reduction in Drills

A reduction has been made in the selling price of high-speed drills in Canada, at least as far as the Canadian-made article is concerned. The idea is to equalize prices. Large consumers are now quoted list plus ten up to 1-2-in., from 33-64 to one inch, plus 20 per cent. and over 1 inch plus 30 per cent. The smaller consumer will pay 10 per cent. additional to each of the above classes.

There is a lot of small business moving now in cutters, drills, taps, dies, etc., and dealers claim that if the larger concerns were buying, as they do when running to capacity, there would be a splendid trade moving for them.

Scrap Stays the Same

The scrap dealers are not happy. They are not busy. They are neither buying nor selling to any great extent, and if anything will put the damper on the scrap market it is lack of enquiry. Dealers plainly state that for the present they are out of the market in many lines, unless they can take on material at their own price, and be prepared to hold it for future improvement, which they are none too certain of realizing. The tightening of credits in many quarters is blamed for the dullness, but from whatever the cause, the dullness is in the scrap metal market, and it has been camping there for some weeks.

POINTS IN WEEK'S MARKETING NOTES

Canadian-made high speed drills have been reduced ten per cent. Prices are now listed plus ten to thirty.

New York machine tool market remains dull, and the prediction is made that in a short time the makers will be out looking for business.

British automobile makers have been making purchases in the American machine tool market.

Some warehouses having business booked at 2.65 with the Corporation, are paying 8c for material that can be secured on short notice.

The Carnegie mills need, in excess of their usual supply of cars, at least 13,000 freight cars to move the finished material that is piled at their mills.

Pittsburgh mills declare that if they do not get a better supply of cars, they will have to let up in their production of steel.

Several of the automobile plants are running on short time, reports from various centres asserting that cars are in stock now for the first time in many months.

The American Engineering Standards Committee has requested the American Society of Mechanical Engineers and the Society of Automotive Engineers to act as joint sponsors in the matter, leaving the decision to the joint sponsors as to whether a new sectional committee shall be organized for the project, or whether the work should be done by a sub-committee of the Sectional Committee on Screw Threads, for which the same two societies are acting as joint sponsors.

BELIEVES THAT THE BUILDERS WILL SOON BE OUT LOOKING FOR ORDERS

Special to CANADIAN MACHINERY.

NEW YORK, July 29.—Not in many years has business in machine tools and allied equipment been so quiet. If the present inactivity in buying is prolonged for sixty days or so, some machine-tool manufacturers will need business, at least on some sizes of machines. While shipping conditions are by no means good, enough shipments are being made to catch up to some extent and machine-tool companies can now quote earlier deliveries than was possible two months ago. A few companies are able to make shipment of some machines from stock.

Much has been looked for from the railroads, but so far this prospective business has proved a disappointment, as the aggregate of orders is small by comparison with what the carriers are known to need. The Chicago, Rock Island & Pacific has distributed orders totalling about $200,000, of which one large machine-tool company got about $150,000. The New York Central, the Pennsylvania and the Richmond, Fredericksburg & Potomac have each inquired for a few tools, but the large railroad lists, which were expected to come out by this time, have not been issued. When the Interstate Commerce Commission announces an increase in freight rates, which will probably be within the next few weeks, the railroads will know better where they stand in the matter of finances, and it is quite possible that inquiries for shop equipment will follow that freight-rate announcement.

While domestic business is quiet, there is some export inquiry in which British automobile manufacturers are prominent. Several of the British companies have been buying in this country, and further purchases are in prospect. A. Harper Sons & Bean, Limited, of England, recently appointed W. J. Fuller, for many years manager of the American branch of Alfred Herbert, Limited, as American buyer, and it is reported that Mr. Fuller is now negotiating for considerable equipment of American make. A representative of the Sunbeam Motors Co., of England, has a representative in this country, and machine tools may be bought also for that company's plant.

MILLS CONTINUE TO PILE THEIR MATERIAL OWING TO CAR SHORTAGE

Special to CANADIAN MACHINERY.

PITTSBURGH, July 29.—A better freight movement is reported from the Chicago district, where it is said some of the accumulations of steel have gone from mill, in addition to current production. In the rest of the Central West, including Pittsburgh, shipping conditions are even worse than a week ago, and as production of steel continues substantially at the former rate this means that steel is being accumulated at mill at a more rapid rate than formerly. More of the steel is being left in unfinished form, for prudential reasons, and the actual production of finished steel is smaller than a month ago.

The blast furnaces and steel mills stood to gain some advantage in car supplies by the recent modification. At their request, Service Order No. 7, according preference to coal mines, was interpreted as not including as "coal cars" those flat bottom gondolas that are under 36 inches high, inside measurement, but it seems now that there are not many cars in this region that would be affected. Previous to the new interpretation most of the roads were regarding as coal cars any that were over 30 inches. The industry gets a definite backset in that the requirement that cars regarded as coal cars may be loaded only when the destination of the loaded material is toward coal mines that should be furnished the cars. Previously this rule had been very largely evaded. As it is now, nearly all the coal cars that reach furnaces and mills have to go out empty, while formerly the shippers were taking advantage of their possession of the cars to load them out.

According to some claims the railroads are really handling a great deal of freight the insufficiency of movement being due to the particularly large volume of business offered. At any rate, the shippers at present have little hope of their condition being improved as long as any improvement in car movement redounds only to the benefit of the coal mines, under Order No 7. However, the shippers have recently found hope that within a few weeks the coal mines will be supplied with all the cars they are able to load. The deficiencies in car supplies at coal mines, from the mine ratings, average about 50 per cent., and it is not thought that the car supplies are going to be doubled in the near future, or at any time, so as to provide 100 per cent., the expectation being that with a moderate further increase in car supplies a so-called "labor shortage" will be developed at the coal mines, say when car supplies get to 65 or 70 per cent. of ratings. These labor shortages are not shortages in the number of men, but shortages in the amount of work the men on payrolls will do, as the men will not put in full hours for any length of time. As long as cars are in shorter supply than mining performance all the deficiency is attributed to "car shortage," for the labor shortage is not actually developed.

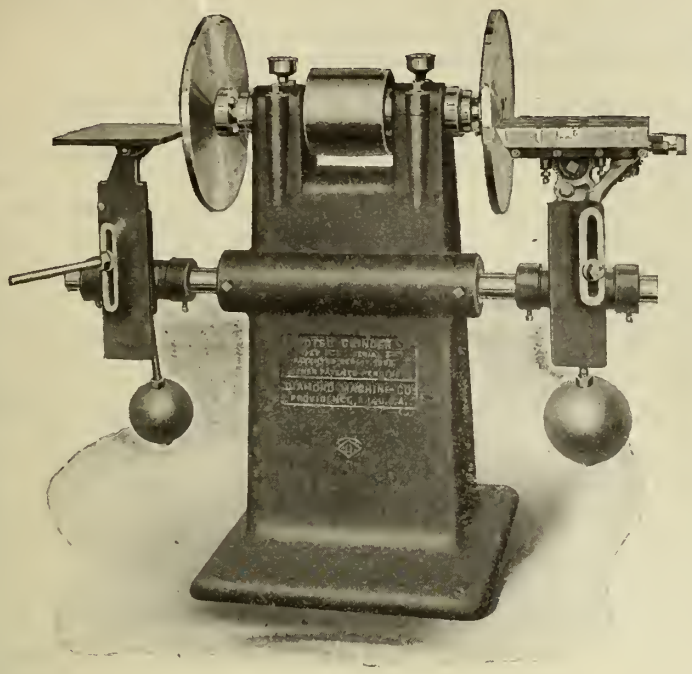
If a decided improvement in car supplies for shipping steel products does not occur within 30 days, or perhaps 60 days at the outside, it will be necessary for the mills to decrease their production of steel, the production of pig iron being of course curtailed at the same time. Thus far the situation has been met, first by simply piling finished steel as made, and later, in the past few weeks, by curtailing finishing operations and piling part of the steel in unfinished or semi-finished form. This process could not be continued indefinitely, even if there were unlimited storage facilities for semi-finished steel such as billets and sheet bars, for the reason that eventually all the steel would have to be finished and the finishing departments can carry only a very moderate overload. A fair estimate seems to be that even the present accumulation of steel will at the very best require from three to six months' time for working off if the railroads get to the point of rendering the maximum service conceivable with their present physical equipment.

Picking Out Shipments

On account of the improbability of all the finished steel now in stock at mills, rolled to customers' specifications, being acceptable to the customers at the late date at which it will have to be shipped, the mills are now making an effort to pick out and ship the more perishable forms of steel, such as merchant bars that are cut to length, and other descriptions of steel at all special in character. This steel is picked out from stocks or from current rollings, as the case may be, so that as far as possible the steel left for later shipment will be more or less in stock sizes, either useful to the customers for whom rolled, or saleable in the open market.

Variations in Demand

Current market demand is excellent for merchant steel bars, particularly small sizes, and in fact almost everything under 2-inch. Demand for shapes and plates, on the other hand, is very light and has been so for several months. The testimony of the mills in this respect is confirmed by the June report of the Bridge Builders' and Structural Society, showing lettings of fabricated steel contracts this month to have been only 50 per cent. of the fitting shop capacity. June is sometimes a light month if this business has been done earlier, but the average for the six months ending with June is only 72 per cent. The fact is that investors are quite indisposed to go ahead with large construction jobs, on account of great delays prom-



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ised for such work and the high cost of labor and materials generally. The mill prices of the plain structural shapes are not particularly objected to, for as a matter of fact they are rather moderate compared with prices of some building materials and with the cost of labor on construction jobs.

All present indications suggest that with construction work involving the consumption of steel at a low ebb, with the operations of various manufacturing consumers materially curtailed by various causes, and with large stocks of steel accumulated at mills, the steel market is going to be an easy one, but the steel market is one of surprises, and present indications may possibly be found to be somewhat misleading.

Pig Iron

As to pig iron, the market such as it is shows rather an upward than a downward trend. Deliveries are very difficult to secure, and some furnaces are piling iron. The stiffness of the market may be due simply to the transportation condition, but a loosening in transportation may increase consumption so as to enable the stocks to be absorbed without weakening the market. The average consumer, at least in this district, has become very conservative and will buy no iron except what is absolutely needed in the near future. The buyers seem to expect the market to decline, but if they all overstay the market they may produce an advance when they come to buy. A fair guess seems to be that there will be simply hand-to-mouth buying of pig iron for months to come.

GUELPH MAY NOT HAVE TRUCK CO.

Some Difficulty Arose Regarding the Location—Subscribers Ask For Their Money Back

According to reports from Guelph, the Commerce Truck Co. is not likely to materialize. Several of those who subscribed for stock are now asking that their payments be refunded, and they have also notified their respective banking houses to stop payment on cheques they have given for future instalments on their stock allotment. An option was taken up on a tract of land in Guelph, for which the purchase price, $10,000, was to be paid in cash or stock, the owner of the land preferring to take cash in this instance. Where this cash payment is to come from is not quite clear.

Several Toronto parties were interested in selling the stock, the capital of the company being placed something like a million and a half, large parts of which were to go to the promoter and to the parent company in Detroit. Sales in Guelph, after the place was covered by a company of salesmen, amounted to about $47,000, most of the subscriptions being with the idea of securing a new industry. Some of the salesmen then tried out Kitchener, with better results, and the suggestion was made that the company be taken to the latter place. This, it is alleged, led to a controversy which caused the Detroit directors to withdraw, and the Canadian directors, left alone in the field, did not know exactly what to do.

Meanwhile, the expense of securing the charter has been incurred, also the obligation to pay $10,000 to the owner of the site in Guelph, while a number of salesmen will certainly want to be reimbursed for the time they took in selling stock to the people of Guelph and district.

One of the most notable improvements in electric furnaces for heating and melting metals has lately been perfected by a British firm. Many attempts have been made to produce a material which would get white-hot under the action of electric current and would yet remain unchanged so that it could be used again and again indefinitely. Long experience in furnace materials, combined with painstaking research, has enabled this company to produce a substance which can be moulded into any desired form, has a high resistance to electricity, and is for all practical purposes permanent. It is now being used in crucible form for melting brass, in tube form for the "heat treatment" of tools, and in the shape of a bath for other purposes.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$42 40
Lake Superior, charcoal, Chicago	57 00
Standard low phos., Philadelphia	50 00
Bessemer, Pittsburgh	43 00
Basic, Valley furnace	42 90
Toronto price:—	
Silicon, 2.25% to 2.75%	52 00
No. 2 Foundry, 1.75 to 2.25%	50 00

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	$ 5 50
Steel bars, base, Toronto	5 50
Iron bars, base, Montreal	5 50
Steel bars, base, Montreal	5 50
Reinforcing bars, base	5 00
Steel hoops	7 00
Norway iron	11 00
Tire steel	5 75
Spring steel	10 00
Band steel, No. 10 gauge and 3-16 in. base	6 00
Chequered floor plate, 3-16 in.	8 40
Chequered floor plate, ¼ in.	8 00
Bessemer rails, heavy, at mill	....
Steel bars, Pittsburgh	3 00-4 00
Tank plates, Pittsburgh	4 00
Structural shapes, Pittsburgh	3 00
Steel hoops, Pittsburgh	3 50-3 75
F.O.B., Toronto Warehouse	
Small shapes	4 25
F.O.B. Chicago Warehouse	
Steel bars	3 62
Structural shapes	3 72
Plates	3 67 to 5 50
Small shapes under 3"	3 62
	C.L. L.C.L.

FREIGHT RATES

Per 100 Pounds.

Pittsburgh to Following Points		
Montreal	33	45
St. John, N.B.	41½	55
Halifax	49	64½
Toronto	27	39
Guelph	27	39
London	27	39
Windsor	27	39
Winnipeg	89½	135

METALS

	Gross. Montreal	Toronto
Lake copper	$25 00	$24 00
Electro copper	24 50	24 00
Castings, copper	24 00	24 00
Tin	62 00	65 00
Spelter	11 50	12 00
Lead	10 75	11 00
Antimony	13 00	14 00
Aluminum	34 00	36 00

Prices per 100 lbs.

PLATES

Plates, 3-16 in.	$ 7 25	$ 7 25
Plates, ¼ up	6 50	6 50

PIPE—WROUGHT

Price List No. 44—April, 1920.

STANDARD BUTTWELD S/C

	Steel		Gen. Wrot. Iron	
	Black	Galv.	Black	Galv.
⅛ in.	$6 50	$ 8 50	....	....
¼ in.	5 13	7 26	$ 5 43	$ 7 56
⅜ in.	5 13	7 26	5 43	7 56
½ in.	6 84	8 42	7 27	8 84
¾ in.	8 45	10 58	9 03	11 16
1 in.	12 50	15 64	13 35	16 49
1¼ in.	16 91	21 16	18 06	22 31
1½ in.	20 21	25 30	21 59	26 68
2 in.	27 20	34 04	29 05	35 89
2½ in.	43 00	53 82	....	....
3 in.	56 23	70 38	....	....
3½ in.	71 30	88 32	....	....
4 in.	84 48	104 64	....	....

STANDARD LAPWELD S/C

	Steel		Gen. Wrot. Iron	
	Black	Galv.	Black	Galv.
2 in.	$30 90	$37 74	$34 60	$41 44
2½ in.	45 34	56 16	51 19	62 01
3 in.	59 29	73 44	66 94	81 09
3½ in.	73 14	90 16	82 34	99 36
4 in.	86 66	106 82	97 56	117 72
4½ in.	0 98	1 23	1 24	1 49
5 in.	1 15	1 44	1 44	1 73
6½ in.	1 49	1 86	1 87	2 25
7 in.	1 94	2 43	2 42	2 90
8-L in.	2 04	2 55	2 54	3 05
8 in.	2 35	2 94	2 92	3 51
9 in.	2 81	3 52	3 50	4 21
10-L in.	2 61	3 26	3 25	3 90
10 in.	3 36	4 20	4 18	5 03

Prices—Ontario, Quebec and Maritime Provinces

WROUGHT NIPPLES

4" and under, 60%.
4½" and larger, 50%.
4" and under, running thread, 30%.
Standard couplings, 4-in. and under, 30%.
Do., 4½-in. and larger, 10%.

OLD MATERIAL

Dealers' Average Buying Prices.

	Per 100 Pounds. Montreal	Toronto
Copper, light	$15 00	$14 00
Copper, crucible	18 00	18 00
Copper, heavy	18 00	18 00
Copper wire	18 00	18 00
No. 1 machine composition	16 00	17 00
New brass cuttings	11 00	11 75
Red brass cuttings	14 00	15 75
Yellow brass turnings	8 50	9 50
Light brass	7 00	7 00
Medium brass	8 00	7 75
Scrap zinc	6 50	6 00
Heavy lead	7 50	7 75
Tea lead	4 50	5 00
Aluminum	19 00	20 00
	Per Ton	Gross
Heavy melting steel	18 00	18 00
Boiler plate	15 50	15 00
Axles (wrought iron	20 00	20 00
Rails (scrap)	18 00	18 00
Malleable scrap	23 00	25 00
No. 1 machine east iron	32 00	33 00
Pipe, wrought	12 00	12 00
Car wheel	26 00	26 00
Steel axles	22 00	20 00
Mach. shop turnings	11 00	11 00
Stove plate	26 50	25 00
Cast boring	12 00	12 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, 7-16 and up	+10
Carriage bolts, ⅜-in. and less	Net
Coach and lag screws	—15
Stove bolts	55
Wrought washers	—25
Elevator bolts	+10
Machine bolts, 7-16 and over	+10
Machine bolts, ⅜-in. and less	+10
Blank bolts	Net
Bolt ends	Net
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	+25
Machine screws, fl. and rd. hd., brass	net
Machine screws, o. and fil. hd., brass	net
Nuts, square, blank	+25 add $2 00
Nuts, square, tapped	add 2 25
Nuts, hex., blank	add 2 50
Nuts, hex., tapped	add 3 00
Copper rivets and burrs, list less	15
Burrs only, list plus	25
Iron rivets and burrs	40 and 5
Boiler rivets, base ¾" and larger	$8 50
Structural rivets, as above	8 40
Wood screws, O. & R., bright	75
Wood screws, flat, bright	77½
Wood screws, flat, brass	55
Wood screws, O. & R., brass	55½
Wood screws, flat, bronze	50
Wood screws, O. & R., bronze	47½

MILLED PRODUCTS

(Prices on unbroken packages)

	Per Cent
Set screws —20% 25 and	5
Sq. and hex. hd. cap screws	12½
Rd. and fil. hd. cap screws	plus 25
Flat but. hd. cap screws	plus 50
Fin. and semi-fin. nuts up to 1-in.	12½
Fin. and Semi-fin. nuts, over 1 in., up to 1½-in.	—5
Fin. and Semi-fin. nuts over 1½ in., up to 2-in.	+12½
Studs	+5
Taper pins	—12½
Coupling bolts	+40
Planer head bolts, without fillet, list	+45
Planer head bolts, with fillet, list plus 10 and	+55
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	+60
Collar screws	list plus 20, 30
Thumb screws	40
Thumb nuts	75
Patch bolts	add +85
Cold pressed nuts to 1½ in.	add $1 00
Cold pressed nuts over 1½ in.	add 2 00

BILLETS

	Per gross ton
Bessemer billets	$60 00
Open-hearth billets	60 00
O.H. sheet bars	76 00
Forging billets	56 00-75 00
Wire rods	52 00-70 00

Government prices.

F.O.B. Pittsburgh.

NAILS AND SPIKES

Wire nails, base	$6 10
Cut nails, base	7 00
Miscellaneous wire nails	50%

ROPE AND PACKINGS

Plumbers' oakum, per lb.	0 10¼
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 35½
British Manila rope	0 28
New Zealand hemp	0 28

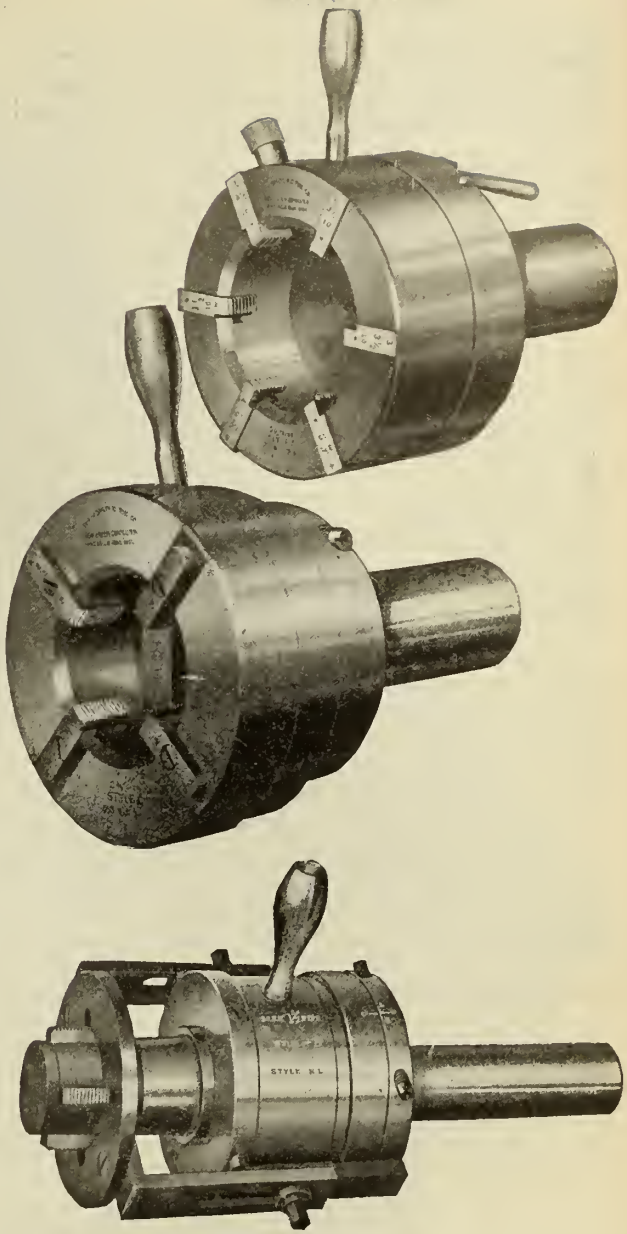
POLISHED DRILL ROD

Discount off list, Montreal and Toronto ..... net

A GOOD BOON

"Geometric Tools are a good boon in our business. Always reliable and sure of turning out a class job; in fact, I don't know how we could secure a decent output without them."

This is what the Works Inspector of a London (England) shop says. He adds that they are making screw and small parts for air craft, and have quite a lot of Geometric Dies in constant use.



Because of the fact that Geometric threading tools are "a good boon" in the thread cutting business, the majority of screw machines and turret lathes are equipped with Geometrics.

THE GEOMETRIC TOOL CO.
NEW HAVEN, CONN.

Canadian Agents:

Williams & Wilson, Ltd., Montreal

The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg and St. John, N.B.

Canadian Fairbanks-Morse Co., Ltd., Manitoba, Saskatchewan, Alberta

For any thread, any size, any pitch,—there's a Geometric Collapsing Tap or Self-Opening Die Head. Be assured there is one to meet your particular threading need—whatever it may be. Ask us.

MISCELLANEOUS

Solder, strictly	$ 0 35
Solder, guaranteed	0 39
Soldering coppers, lb.	0 62½
White lead, pure, cwt.	20 35
Red dry lead, 100-lb. kegs, per cwt.	16 00
Gasoline, per gal., bulk	0 38
Pure turp., single bbls., gal.	3 15
Linseed oil, raw, single bbls.	2 37
Linseed oil, boiled, single bbls.	2 40
Wood alcohol, per gal.	4 00
Whiting, plain, per 100 lbs.	3 00

CARBON DRILLS AND REAMERS

S.S. drills, wire sizes	32½
Can. carbon cutters, plus	20
Standard drills, all sizes	32½
3-fluted drills, plus	10
Jobbers' and letter sizes	32½
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	50
Sleeves	50
Taper pin reamers	25 off
Drills and countersinks	net
Bridge reamers	50
Centre reamers	10
Chucking reamers	net
Hand reamers	10
High speed drills, list plus	10 to 30
Can. high speed cutters, net to plus	10
American	plus 40

COLD ROLLED STEEL

[At warehouse]

Rounds and squares ..... $7 base
Hexagons and flats ..... $7.75 base

IRON PIPE FITTINGS

	Black	Galv.
Class A	60	75
Class B	27	37
Class C	18	27

Cast iron fittings, 5%; malleable bushings, 22½%; cast bushings, 22½%; unions, 37½%; plugs, 20% off list.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$8 50	$10 50
Sheets, Blue ann., No. 10	8 50	9 50
Canada plates, dull, 52 sheets	8 50	10 00
Can. plates, all bright	8 60	9 00
Apollo brand, 10¾ oz. galvanized	....	....
Queen's Head, 28 B.W.G.	11 00	....
Fleur-de-Lis, 28 B.W.G.	10 50	....
Gorbal's Best, No. 28	....	....
Colborne Crown, No. 28.	....	....
Premier, No. 28, U.S.	11 50	11 60
Premier, 10¾-oz.	11 50	12 00
Zinc sheets	16 50	20 00

PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13.00; 5-16, $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.20; ¾ in., $9.30; ⅞ in., $9.50; 1 in., $9.10; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $13.00; 5-16 in., $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.50; ¾ in., $9.30.

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

BOILER TUBES.

Size.	Seamless	Lapwelded
1 in.	$27 00	$.....
1¼ in.	29 50	.....
1½ in.	31 50	29 50
1¾ in.	31 50	30 00
2 in.	35 00	30 00
2¼ in.	35 00	29 00
2½ in.	42 00	37 00
3 in.	50 00	48 00
3¼ in.	.. ..	48 50
3½ in.	63 00	51 50
4 in.	85 00	65 50

Prices per 100 ft., Montreal and Toronto

OILS AND COMPOUNDS.

Castor oil, per lb.	
Royalite, per gal., bulk	27½
Palacine	30½
Machine oil, per gal.	54½
Black oil, per gal.	28
Cylinder oil, Capital	82½
Petroleum fuel oil, bbls., net	18

BELTING—No 1 OAK TANNED

Extra heavy, single and double	6½
Standard	6½
Cut leather lacing, No. 1	2 00
Leather in side	2 40 3 00

TAPES

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	$4 60
Polishing wheels, bull-neck	2 00
Emery in kegs, Turkish	09
Pumice, ground	06
Emery glue	30
Tripoli composition	09
Crocus composition	12
Emery composition	11
Rouge, silver	60
Rouge, powder, nickel	45

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	.08½
Grits, 80 and finer	.6

BRASS—Warehouse Price

Brass rods, base ½ in. to 1 in. rod	0 34
Brass sheets, 24 gauge and heavier, base	$0 42
Brass tubing, seamless	0 46
Copper tubing, seamless	0 48

WASTE

XXX Extra	.24
Peerless	22½
Grand	22½
Superior	22½
X L C R	.21
Atlas	.20
X Empire	19½
Ideal	.19
X Press	17½

Colored

Lion	.17
Standard	.15
No. 1	.15
Popular	.13
Keen	.11

Wool Packing

Arrow	.35
Axle	.28
Anvil	.22
Anchor	.17

Washed Wipers

Select White	.20
Mixed colored	.10
Dark colored	.09

This list subject to trade discount for quantity.

RUBBER BELTING

Standard ... 10% Best grades... 15%

ANODES

Nickel	.55 to .60
Copper	.38 to .40
Tin	.70 to .70
Zinc	.16 to .17

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	$42 50	$43 00
Copper wire, list plus 10		
Plain sheets, 14 oz., 14x60 in.	46 00	44 00
Copper sheet, tinned, 14x60, 14 oz.	48 00	48 00
Copper sheet, planished, 16 oz. base	46 00	45 00
Braziers', in sheets, 6 x 4 base	45 00	44 00

LEAD SHEETS

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$10 75	$14 50
Sheets, 3½ lbs. sq. ft.	10 50	14 00
Sheets, 4 to 6 lbs. sq. ft.	10 25	13 50

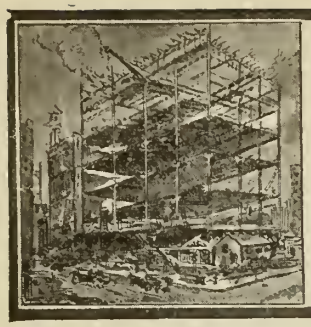
Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS

Acid, boracic	$ .23
Acid, hydrochloric	.04
Acid, nitric	.11
Acid, sulphuric	.04
Ammonia, aqua	.15
Ammonium, carbonate	.23
Ammonium, chloride	.22
Ammonium hydrosulphuret	.75
Ammonium sulphate	.30
Arsenic, white	.14
Copper, carbonate, annhy	.41
Copper, sulphate	.15
Cobalt, sulphate	.20
Iron perchloride	.62
Lead acetate	.30
Nickel ammonium sulphate	.20
Nickel carbonate	.32
Nickel sulphate	.22
Potassium sulphide (substitute)	.42
Silver chloride (per oz.)	1.30
Silver nitrate (per oz.)	1.25
Sodium bisulphate	.14
Sodium carbonate crystals	.06
Sodium cyanide, 127-130%	.38
Sodium hyposulphite per 100 lbs	8.00
Sodium phosphate	.15
Tin chloride	.80
Zinc chloride, C.P.	.30
Zinc sulphate	.10

Prices per lb. unless otherwise stated

If interested tear out this page and place with letters to be answered.



INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS PERSONAL AND TRADE NOTES

TRADE GOSSIP

Starting in Vancouver.—The Britannia Wire Rope Co., is getting in shape to operate at their plant on Granville Island, B.C. The machinery for most of the plant is now on the way from England. C. H. Gill is the British director, and Robert Gibson, managing director.

Ford Buys Mines.—Henry Ford, according to reports in Cincinnati, has purchased two coal mines in Kentucky, and is planning on joining his recently purchased railroad, the Detroit, Toledo & Ironton, with these mines to ensure coal for his factories.

Getting Them Organized.—The work of co-ordinating the various departments of the C.N.R. and G.T.R. has been concluded as far as the passenger business is concerned, and the freight departments will be unified by the end of the present month, according to the indications.

Ford Increasing.—The Ford Motor Co. is notifying the steel mills that it is planning a production of 4,000 cars per day, starting with its manufacturing year, Aug. 1, and the latter are asked to increase their allotments of steel accordingly. This plant has been on a daily basis of 3,000 to 3,500 cars recently.

Factory Taken Over.—C. W. Sherman, of the Dominion Foundries and Steel, Limited, Hamilton, stated that a new factory, affiliated with the local concern, started operations this week at Waterville, near Albany, New York. Mr. Sherman added that the new factory is a large one and affords employment to between 500 and 600 men.

Start in Victoria.—The Canadian Abrasive Co., Ltd., is starting operations at Victoria, having secured a loan of $22,000 from the Provincial Government Mr. J. L. Near, Major Martyn, Mr. Moore, of the Canadian Explosives, Ltd., Capt. D. S. Rullen, Col. Lorne Ross are among those interested in a company with a capital of $100,000. Plant and equipment cost $50,000.

Steel Prices Halted.—Prices received by the Saskatchewan Government in response to tenders for steel bridges are no higher than spring quotations, an indication to officials that a halt in steel prices has been reached. Present quotations are about 11 per cent. above those of spring, 1919. A contract was awarded to the Canadian Bridge Company of Walkerville, Ont., for four steel bridges at $9,303.40, for the four, f.o.b. shops.

Buy Steam Shovel.—At the session of the St. John, N.B., council, the need of a steam shovel for the preliminary work of the street paving was the main topic for discussion. Representatives of the Kingston Steam Shovel Company were present, and it was ultimately decided to purchase a machine, with a trench digging attachment, so it may also be used in digging trenches for sewers and water pipes. The price is $7,000

GEO. G. CUTTLE

George G. Cuttle has just purchased the entire interests of the Standard Machinery and Supplies, Limited, Montreal. The company is capitalized at $200,000, and has been successfully operated since 1916. Mr. Cuttle became connected with the company in 1917 as manager of the metal department; in January, 1918, he was appointed general manager and six months later was elected vice-president. He first entered the iron and steel trade in 1904 with the Montreal Rolling Mills, now a part of the Steel Company of Canada, and worked through various departments until 1913, when he was appointed general purchasing agent, which position he held until joining his present company.

The Standard Machinery and Supplies are the Canadian representatives of the Waltham Grinding Wheel Company of Waltham, Mass.; J. L. Goodhue Company, Limited, Danville, Que.; and the Clinton Metallic Paint Company of Clinton, N.Y., in addition to carrying large stocks of tool steels, machine tools and other supplies.

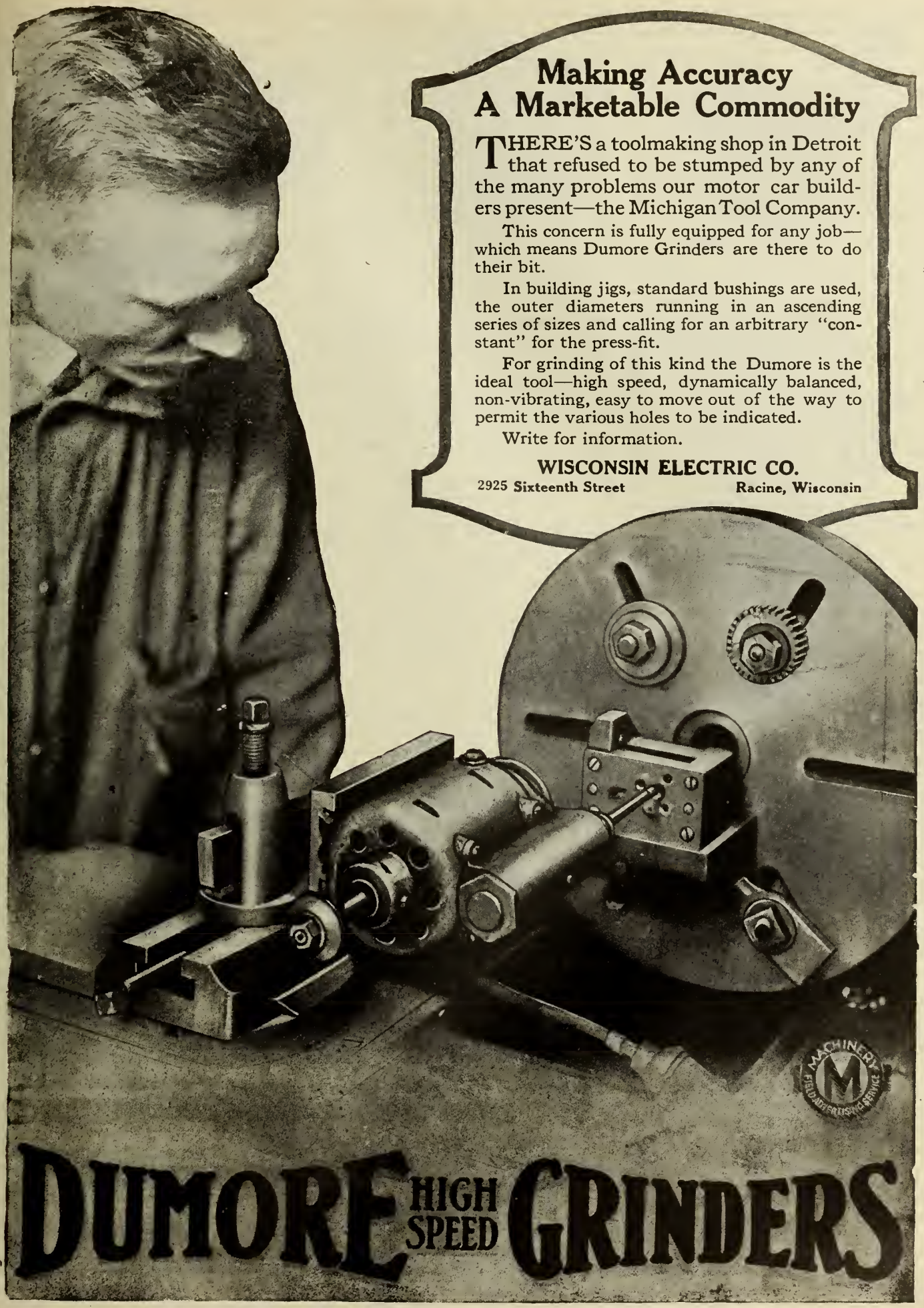
Coal Board Issues Order.—The Railway Board at Ottawa has issued an order which prohibits the exportation of coal from any Atlantic, St. Lawrence River, or Gulf port of Canada, excepting to the United States or Newfoundland. The order becomes effective on and after August 1st, and was issued after the consideration of information gained from the United States Inter Commerce Board.

New Rates Contract. — The Special Scale Committee of coal operators and miners sitting in District 18, Calgary, have completed their labors. The agreement is between the Western Canada Coal Operators' Association and District 18, of the United Mine Workers of America. The agreement provides for an all-round increase, and is in force till April next, and retroactive from March last.

Canal Work Handicapped.—Work on the Welland Ship Canal is held up on account of shortage of coal, shortage of Hydro power, and shortage of labor. While there is hope of overcoming the latter difficulty, there is not much hope for overcoming the first two. When work stopped last year there were 2,500 men working on it. There was little chance of the same number being employed this year.

Conference in Fall.—The second great Industrial Conference will be held in Canada some time in October or November. An appropriation was made by Parliament at last session to cover the expenses of the conferences, and it is expected that the experience gained at the last conference will result in making this one an even more representative gathering of labor, capital and the general public.

Conference at Welland.—The conference to be held at Niagara and Welland on August 2, 3 and 4, promises to be well attended. A large number of invitations have been accepted by business and industrial men in the United States and Canada. On August 2nd a power banquet will be given at the Clifton House at Niagara Falls, where Sir Adam Beck will deliver an address. An address will be given on August 3rd at Welland on the "Welland Ship Canal and Deep Waterways."



Making Accuracy A Marketable Commodity

THERE'S a toolmaking shop in Detroit that refused to be stumped by any of the many problems our motor car builders present—the Michigan Tool Company.

This concern is fully equipped for any job—which means Dumore Grinders are there to do their bit.

In building jigs, standard bushings are used, the outer diameters running in an ascending series of sizes and calling for an arbitrary "constant" for the press-fit.

For grinding of this kind the Dumore is the ideal tool—high speed, dynamically balanced, non-vibrating, easy to move out of the way to permit the various holes to be indicated.

Write for information.

WISCONSIN ELECTRIC CO.

2925 Sixteenth Street Racine, Wisconsin

MACHINERY FIELD AND FACTORY SERVICE

DUMORE HIGH SPEED GRINDERS

New Service Projected.—As a result of the deliberations of the West Indies Conference, a new steamship service will be inaugurated early in 1921, between Canada and the West Indies. The service will be carried on by two of the new steamers building for the Canadian Government, and will provide sailings from Halifax and St. John to Bermuda, Bahamas, British Honduras and return. The steamers will carry about 50,000 tons cargo and accommodate about 25 passengers.

Short of Material.—H. Frawley, manager of the Canadian Car and Foundry Company, at Fort William, stated that there are still over two hundred cars to be repaired before the old order is completed, and it was the shortage of material that prevented the plant from completing the order before now. Mr. Frawley also stated that the new order of the Canadian Pacific Railway's will be commenced by the end of the month. At the present time the plant is working on the sample car which, when completed, will be approved of by the officials of the Canadian Pacific Railways, and as soon as it has been approved by the officials the plant will be able to go right ahead with the order.

The Strike Over.—When Robb's Engineering Works at Amherst opened many of the moulders, whose six weeks' strike was terminated, reported for work. About half have already been taken on and the rest will be given their jobs in a few days. A committee from the moulders waited upon the management, expressing the men's appreciation of the sympathetic attitude of General Manager Newell and stated that they had no grievance and had desired only the higher rate. He in turn stated that there was no ill-feeling on the company's part. The agreement arrived at will continue in force until April of next year. After October 1st, the men now getting the 72-cent minimum are to receive 75 cents per hour.

Warns Coal Operators.—Speaking in Washington recently to the coal operators of the National Coal Association, Mr. J. D. A. Morrow, vice-president of the association, gave the members a solemn warning. Unless the coal operators of the country could meet the demands of the people for fuel, he told them, the industry was faced with a resumption of Government control, which would be very difficult to get rid of. The Northwest was short of 5,000,000 tons and a plan giving priority to coal for the Northwest had been agreed upon with the Inter State Commerce Commission. It was up to the coal operator to make this arrangement a success and fill the deficiency.

Production is Above Average.—That the coal shortage in the northwest of the U.S. and Western Canada is not due to any lack of coal itself, but of the means of distributing it, is shown by a statement compiled by W. B. Williams, vice-president of the Delaware & Hudson Railway Co. He states that the production of bituminous coal in the first six months of 1920 has exceeded the corresponding period of 1919 by 41,000,000 tons. The production for the six months of 1920 was 255,000,000 tons, and if this rate is kept up the production for the year will be some 4,000,000 tons above the average for the five years from 1914 to 1919 inclusive.

Ford-Smith Picnic.—The employees of the Ford-Smith Machine Co., Hamilton, held their annual picnic at Dundas Driving Park. About 300 of the employees and their friends left Hamilton in four special cars from the Terminal station at 11.15 a.m., arriving at the park about 12 o'clock, where lunch was prepared at tables tastefully laid out in the pavilion. Several noted features amongst the amusements kept the ball rolling and made every hour a happy one. A vaudeville competition was fruitful in bringing to light a galaxy of youthful artists. Dancing, recitations and music, in which the pipes figured, kept all in pleased surprize. Vaudeville was followed by community singing and many favorite songs, both humorous and sentimental, were heartily joined in by all. Tea was partaken of by all in the pavilion, after which a novel feature was presented by a Punch and Judy show, which was heartily enjoyed by old and young. The prizes for the various sporting events were presented by the genial head of the firm, after which the pavilion was cleared and dancing brought to a close a most enjoyable day.

Building Remodelled. — The Ruddy Building, 9 and 11 Wellington Street E., has been taken over on a long lease by the Burnside Realty Co., the president of which is Mr. E. C. Roelofson, of the Roelofson Machine Tool Co. This company on the first of July closed their Galt plant, the last of which has been disposed of to various industrial establishments in the district. The building in Galt was taken over by the McCaskey people for the manufacture of counter-check books. The Roelofson Machine Tool Co. will continue to act as distributors for the Potter & Johnson lines, and some other business may be handled as soon as arrangements are completed. The ground floor of the building is being taken over by the Roelofson Co., where they will carry in their showroom a full line of lathes, drill presses, shapers, etc. The facilities are excellent for shipping and receiving at the rear of the building. An elaborate suite of offices is being arranged on this floor for the company. The other three floors have been in the hands of the contractors for some weeks now, transforming them into offices, most of them built and finished to suit the requirements of the various firms leasing them. There are three floors above the main one being finished in this way, there being a total of some 20,000 feet of floor space in the building.

MARINE

Montreal.—The steamer "Alexandrian" sailed from Montreal bound for Dantzic, thus inaugurating a new service from Canada to Germany.

Vancouver.—The contract for the $3,000,000 dry dock to be built on Burrard Inlet by Coughlan & Sons, has now been signed, and it is understood that work will be started in sixty days from the date of signing.

London.—Lloyd's Register figures for the quarter ending June 30th, are the highest yet reached. The aggregate tonnage under construction is 3,576,000 tons, and this exceeds the United States tonnage under construction by 1,672,000 tons. No details of the figures are yet available.

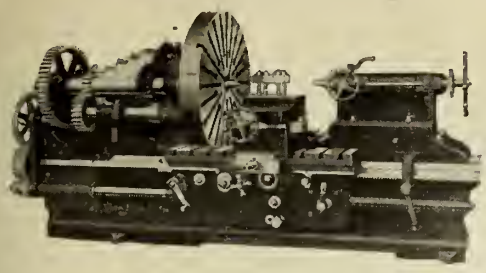
Halifax.—A fleet of four trawlers and twenty-four drifters, a portion of the 100 or more of these vessels that were sold by the Canadian Government, sailed for Scotland recently. They will call at the Azores on their way across for coal. They will be employed in the fishing service round the British coasts.

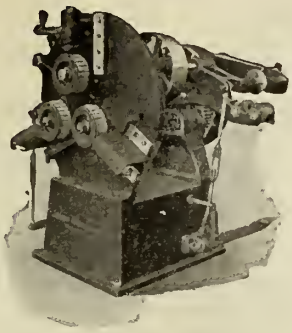
Brockville.—The raising of the sunken steamer, Keystorm, sunk in the storm of 1913, near Sister Lighthouse, is getting near the final stages. Captain Leslie, of Kingston, who is engaged on the work, is confident that the feat can be accomplished despite the numerous failures that have taken place.

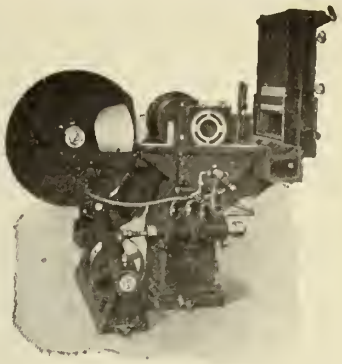
Alpena, Mich.—Two barges lost, and the steamer Charles Bradley seriously damaged, was the result of a recent storm on Lake Huron. The Bradley, which was towing two barges, the Mystic and the Blodgett, was forced to send out wireless calls for assistance, when her tow collided with her and smashed in her stern. The steamer Huron stood by the Bradley all night, and in the morning took off the crews of the barges, which were filling rapidly.

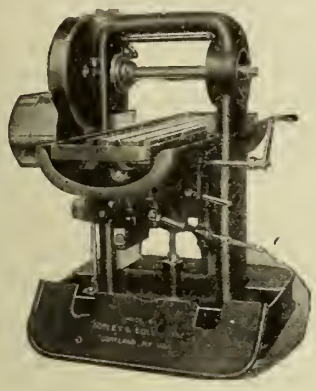
Welland.—The stern section of the steamer "Canadian Squatter" was launched from the yard of the British American Shipbuilding Company recently. After both sections have been launched, they will be towed to Montreal where they will be joined together by the Canadian Vickers Co. The "Canadian Squatter" will, when completed, be 320 feet long, 43 feet, 10 inches beam, and 25 feet deep. She will have a deadweight capacity of 4,350 tons, and a speed of 11 knots.

Montreal. — Considerable trouble is being experienced by masters of British vessels coming to Canadian and United States ports by the desertion of their crews. The men desert in order to ship in vessels under American and Canadian registry and to get the higher wages paid by them. In order to stop this epidemic of desertion, all cases will be prosecuted and the full allowable punishment will be sought for. In two days there were twenty desertions in one port alone.









Partial List of Machinery in Stock

Toronto Warehouse

3	No. 2 American Brass Lathes.
5	No. 1 National Acme Horizontal Drills.
2	Dwight Slate Graduating Machine.
1	No. 2 Langelier H.S.-B.B. Bench Drill.
2	No. 1 National Acme Automatic Slotter.
1	No. 1 Foster Plain Head Screw Machine.
1	No. 3 Foster Plain Head Screw Machine.
2	Wells Bros. Screw Machines.
1	Warner & Swasey Screw Machine.
1	Horizontal Tapping Machine.
14	Millholland Turret Lathes.
1	Prentice Screw Machine.
1	No. O. C. Errington Tapping Chuck.
1	Hydraulic Rocking Press with Pump.
2	No. 4 Modern Self-opening Die Heads.
1	No. 1-B Modern Self-opening Die Head.
2	No. 1 Errington Self-opening Die Heads.
3	Geometric Solid Adjustable Die Head.
2	Diamond Grinders, 84" Table.
250	Steel Split Pulleys—various sizes. Quantity C-I and Wood Split Pulleys, Hangers and Shafting.

We have a large number of good lathes, drills, grinders, millers, punches, shears, automatic machines, etc., etc., in our Dufferin Street warehouse.

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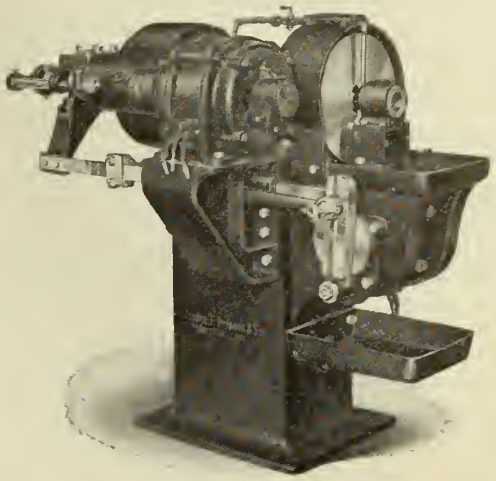

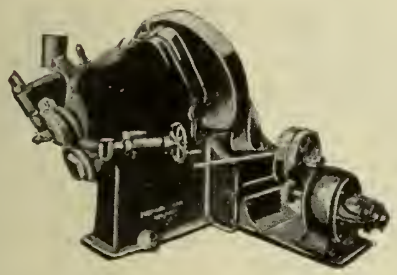

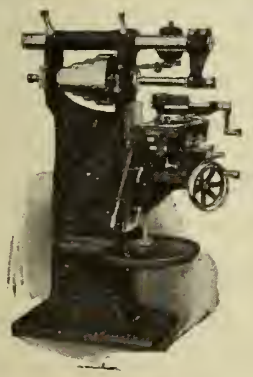

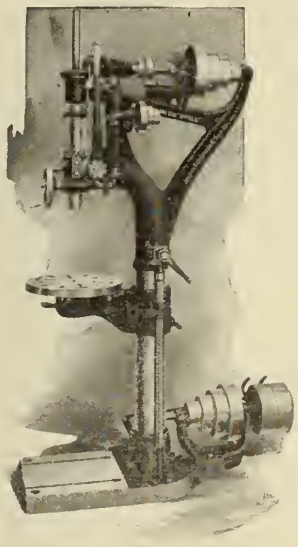

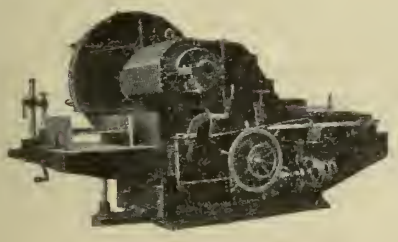

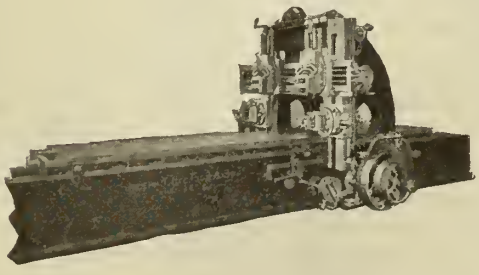

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"Everything in Woodworking and Metal Working Machinery"

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CONDITIONS IN IRON AND STEEL IN VARIOUS SECTIONS OF THE OLD COUNTRY

For the first time since the Armistice there has been a distinct falling off in the demand for tinplates, and new business has been slack during the past month. Makers in South Wales are, however, well supplied with orders, which will keep the works going until the end of the year. Only in November last standard plates could be obtained as low as 36s. per box. Then prices rose by leaps and bounds up to as high as 76s., but at the time of writing standard plates, 20 by 14, can be secured at from 72s. to 68s., according to position, with other sizes in proportion. Naturally, whilst abnormal figures prevailed makers were not slow to accept all the specifications offering, but a couple of months ago it became apparent that top prices had been reached, and that a downward tendency would soon set in. The chief indication of this change was evidenced by the decline in block tin. Prices for plates remain fairly steady, but the market is extremely dull, and it is possible that within a few weeks there will be a break, to the advantage of consumers. In the meantime the operatives are pressing demands for increased wages, which, if granted, will mean an advance of something like 300 per cent.

SCOTLAND

The first six months' trading in industrial Scotland has given bigger profits than at any time during the war years, and the outcome demonstrates the rapid manner in which Scotch firms have carried through the transition from war to peace conditions. Most of the plant is now running on original lines, and many new installations are helping to swell the ever-increasing output. However, apart from iron and steel, makers are not now having orders thrust upon them irrespective of cost and date of delivery. In point of fact, the trend is to hold out for reduced prices, which manufacturers are slow to consider so long as arrears of work are still heavy. Be that as it may, canvassing for orders is once more being resorted to. At the same time the pressure of business in iron and steel is still very heavy. From a survey of the "key" industries the opinion is formed that the highest levels have now been reached, a belief which is strengthened by the greater eagerness of Americans to export to near-hand Continental ports, and even to British centres. Malleable-iron makers have still an abundance of work in sight, but sheets are now in weaker request, and speculators are now offering their holdings.

SHEFFIELD

The reaction which made its appearance in the iron and steel industry a couple of months ago has steadily developed, and the situation is now more unsettled than at any time since the signing of the Armistice. There are numerous reasons for the pessimism with which one meets almost everywhere. The last advance in prices was followed immediately by a cessation of new business. This circumstance had little effect upon the position at the works, for as a whole they are fully booked, and are certain of disposing of the whole of their output for the present year. This situation also suffered from the collapse of the Japanese market, as a large volume of orders from Japan was cancelled. The general unwillingness on the part of consumers to place new orders was due to a fear of a break in prices. These were at the peak, and people were naturally desirous of avoiding the heavy loss that might have been entailed if a reduction set in. Buying and selling have been on a hand-to-mouth basis for more than a month. There is at present something like a famine in the supply of foundry iron and castings. The foundries of the country would be unequal to the demands of engineers even if pig iron were available, as there are not enough moulders. These skilled men were in short supply before the disastrous strike, and it is estimated that 3,000 of them drifted into other occupations and have not since returned.

Montreal.—In connection with the legislation recently enacted by the Government to aid the shipbuilding industry, the Canadian Association of Shipbuilders and Engineers is preparing an active campaign to bring orders for ships from foreign countries to Canada. Captain Gerrard, the secretary of the association, says that they have secured the accession of several strong members, and that they feel now that they can make shipbuilding a permanent industry.

Montreal.—It is stated that J. W. Norcross will be the president of the executive committee of the new British Empire steel merger. In this position he will have full charge of all the undertakings of the big corporation, and will at the same time serve as deputy chairman of the board of directors. As he will retain the presidency of the Canada Steamships Lines, which will be leased to the British Empire Steel Corporation, he will thus have full command of the shipbuilding and shipping activities of the corporation.

An Interesting Task. —Capt. W B. B. Leslie of Kingston, who is engaged on the raising of the big steel freighter Keystorm, sunk in 1913 a short distance this side of Sister Lighthouse, at Brockville, expects that all will be ready for the raising of the vessel at the end of this week. He is confident that the feat can be accomplished after many failures. It is planned to raise the boat with pontoons, tow it in a certain distance from its present position on its side and then beach it. The pontoons will then be rearranged so that the boat may be righted and brought to the surface.

The death occurred at the Moore Convalescent Home in Montreal, of Captain Elisha B. Smith, one of the oldest of the lake sailors. He had a record of service as captain of Lake Ontario, Bay of Quinte and St. Lawrence River steamers extending over a period of 53 years. Captain Smith was 88 years old at the time of his death, which followed three years suffering from acute rheumatism. Captain Smith only had one accident during his long career, and that was when his steamer was sunk in the Cedar Rapids. Happily no lives were lost, although Captain Smith was thrown from the bridge into the river when his vessel struck the rocks. Captain Smith was twice married and is survived by his second wife, whose home is in Toronto. Captain Smith's body was taken to Picton for burial.

INCORPORATIONS

Notice is received of the incorporation of The Canadian Cinch Anchoring System, Ltd., for the purpose of the manufacture, sale, export and import of the "Cinch Anchored Systems" and allied products. Capital to consist of $20,000 divided into 200 shares of $100 each. Chief place of business to be at the City of Toronto.

Notice is received of the incorporation of The Newton-Dakin Construction Co., Ltd., to take over the concern known as The Loomis Dakin Construction Co. Ltd. The company to carry on the work of Engineers and Contractors. Authorized capital to consist of $250.-000 divided into 2.500 shares of $100 each: the chief place of business to be in the City of Sherbrooke, P.Q.

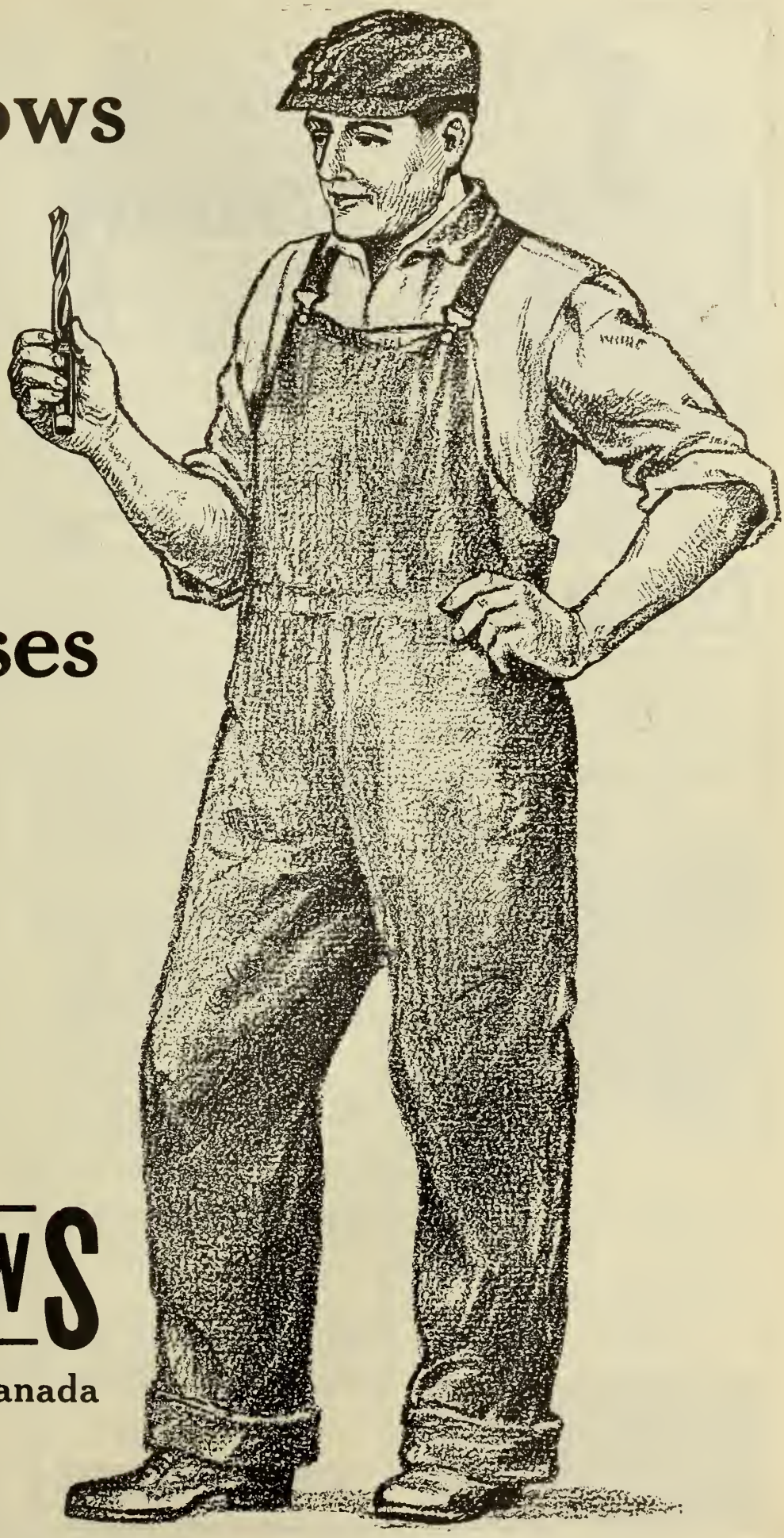
PERSONALS

W. T. Colewell has been appointed superintendent of the Canada Car plant, exclusive of the Malleable Iron Works.

Mr. Walter Lambert, naval architect and marine surveyor of 14 Place Royale, Montreal, has undertaken the Canadian agency of Messers Cochran & Co., Ltd., of Annan, Scotland, makers of the well-known Cochran donkey boiler, oil or coal-fired. Mr. Lambert has also opened an office at 408 Bower Bldg., Vancouver, to look after his interests on the Pacific Coast.

F. W. Peters has been appointed general assistant of the C.P.R. in British Columbia, in succession to the late Richard Marpole. Mr. Coleman, vice-president in charge of the company's western lines, stated: "The company feels that it has in F. W. Peters, our senior officer at the coast, one in whom the public have the greatest confidence. His connection with British Columbia is

He Knows



And Uses

MORROWS

Ingersoll Canada

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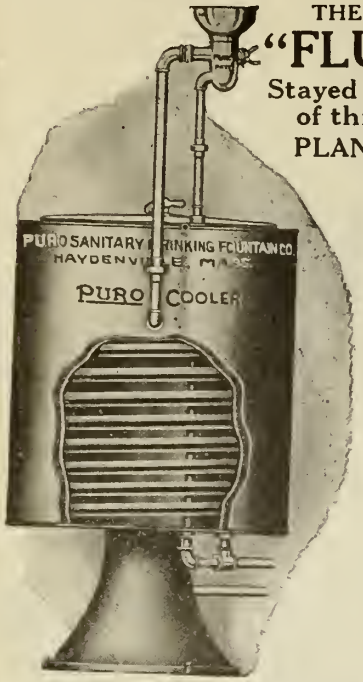
THE "FLU" Stayed out of this PLANT



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not quite as long as that of Mr. Marpole at the time of his death, but he has spent almost 15 years here of the most interesting period of the history of the province, and has always placed himself freely at the disposal of the community for the promotion of any worthy cause."

CATALOGUES

The Buffalo Forge Co., Buffalo, N.Y., have issued a new catalogue No. 721, dealing with their dyehouse and bleachery ventilation equipment. This booklet describes the dyehouse apparatus in detail and gives various illustrations of actual installations.

WILL PURCHASE THE COMPANY NOW

Canada Foundries and Forgings Likely to Take Over Mann Axe and Tool Co.

BROCKVILLE.—At the special general meeting of the shareholders of Canada Foundries and Forgings Company, held here, approval was given to the recommendation of the board of directors of the enterprise involving the acquisition of the Mann Axe and Tool Company, of St. Stephen, N.B., approximately 70 per cent. of the outstanding stock of the Brockville concern reported at the meeting either in person or by proxy.

If certain negotiations now being conducted with the municipality of St. Stephen are carried to a satisfactory conclusion, it is stated, the Mann plant at that town will be rebuilt without delay The business will be conducted under the name of the Mann Axe Company, in which Canada Forgings will own a controlling interest.

The Forgings directors also held their quarterly meeting, following which the usual preferred dividend of 1¾ per cent. and the common one of 3 per cent. were declared for the current three months. The earnings of the company, it was stated, were well in excess of the requirements in this respect, the process of working the industry into a sound post-war basis being satisfactorily accomplished.

DOCTOR AND LAWYER DIFFER

A man in a Western town was hurt in a railroad accident, and after being confined to his home for several weeks he appeared on the street walking with the aid of crutches.

"Hello, old fellow," greeted an acquaintance, rushing up to shake his hand. "I am certainly glad to see you around again."

"I see you are hanging fast to your crutches," observed the acquaintance. "Can't you do without them?"

"My doctor says I can," answered the injured party, "but my lawyer says I can't."

COAL IN NORTH?

James Price of Cobalt has an idea that coal can be found in the district between New Liskeard and Englehart, and he has suggested to the town council that the municipality should engage in the search for it at the ratepayers' expense. Mr. Price thinks the mineral would be found at from 100 to 300 feet, and wants a test bore sunk, but the council negatived the idea. A. A. Cole, mining engineer of the T. & N. O., says there is no coal in the region indicated, as the geological formation is too old. There is a slight possibility of oil there, he says.

BLOWPIPE MANIPULATION

Continued from Page 122

defects such as pinholes, etc. These results were duly checked by the Secretary of the French Acetylene Assocation.

In conclusion the process of welding backwards should appeal to all firms who are out for economy in the execution and improvement in the quality of their welds. It is only necessary to emphasize that common sense is necessary in applying the methods on the lines which have been outlined in these articles.

The United States Bureau of Mines makes the following recommendations for the prevention of spontaneous combustion of stored bituminous coal: — Piles not to be over 12 ft. deep, and no part of the interior to be over 10 ft. from the surface. Store only screened lump coal—if possible. Keep out dust as much as possible, and to do this avoid handling. Have lump and fine evenly distributed. Do not let lumps roll to the bottom and form air passages. Rehandle the screenings after two months, if possible. Store away from any sources of even moderate heat, and well away from the main buildings of the plant; never against a frame building. Allow six weeks' seasoning after mining before putting into storage piles. Avoid alternate wetting and drying. Avoid admission of air to the interior of the pile through interstices around timbers, irregular brickwork or a porous bottom such as coarse cinders. If wet coal is received, dump in small piles around the edges, where air can get to it freely to carry away moisture, and where other coal will not be packed on top of it.

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STEEL OR CAST-IRON BODY
BUILT FOR HEAVY DUTY

All Screws Are Reversible

SCREWS are made of the best grade steel. Both ends are broached and are heat treated after machining. They are reversible, so that either end may be used, are large enough in diameter to stand the torsional strains applied by operator when setting up his work. They are made to give the best service—and may be depended upon to stand up under the hardest usage.

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Engineers • Manufacturers
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HEAVY DUTY MACHINE TOOLS
Planers, Engine and Axle Lathes, Slotters, Boring and Turning Mills, Horizontal Boring and Drilling Machines
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Machine Tools
FOR SHIPBUILDERS & IRON & STEEL WORKS
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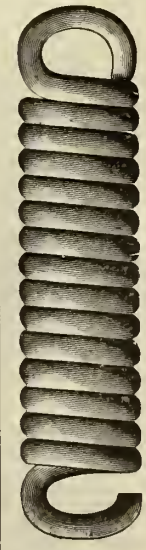

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FOR SALE—DEFIANCE AUTOMATIC HANDLE polishing machine, slightly used, good as new. Vancouver Handle Co., Vancouver, B.C. (c6m)

CLEARANCE LINE—GENUINE "SLOCOMBE" Drills are offered at a sacrifice, sizes "C," "E," "F," and "G." Wholesalers and dealers will find it of interest to communicate their requirements to Box No. 692, Canadian Machinery. (ctfm)

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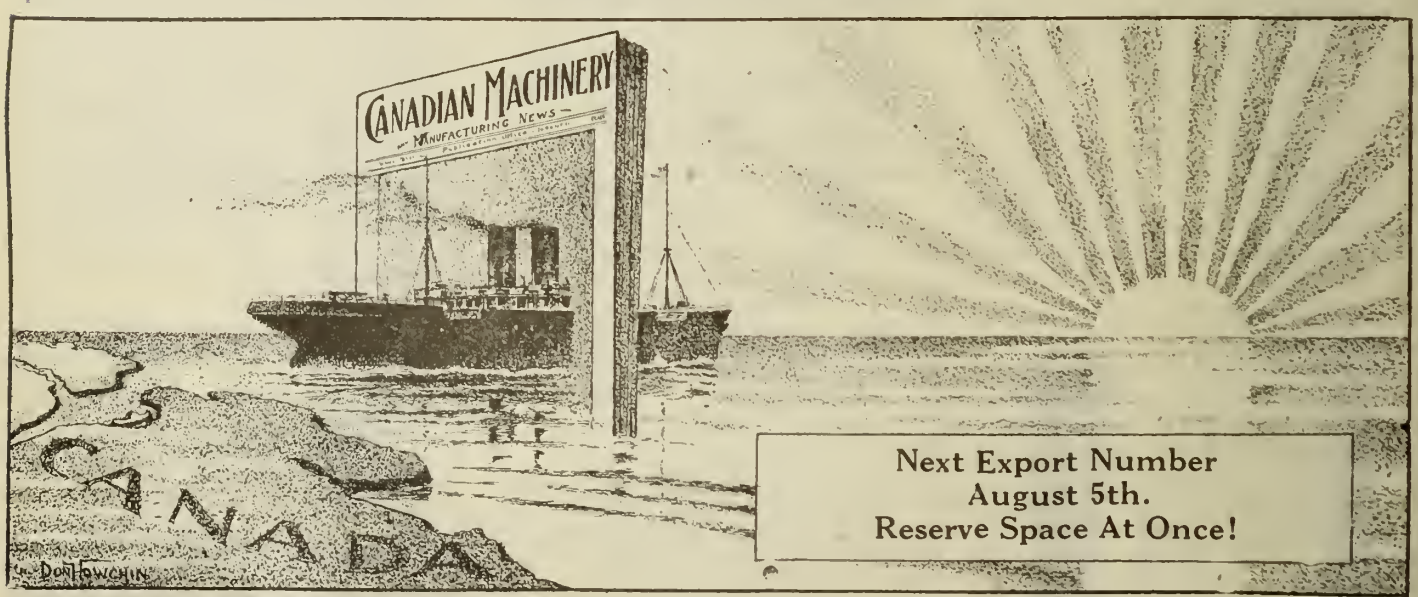

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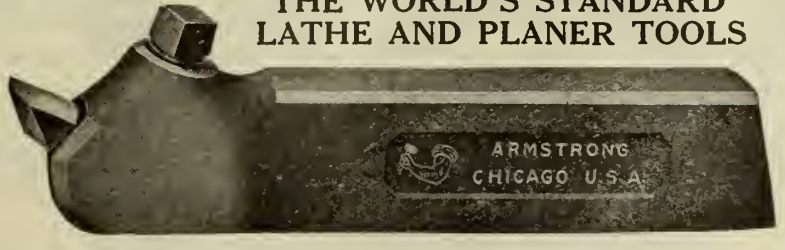

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Foundry capacity, 15 tons per day.

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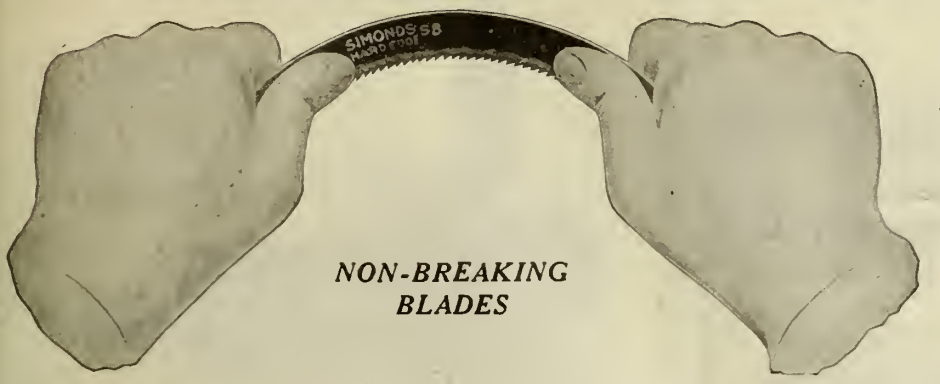

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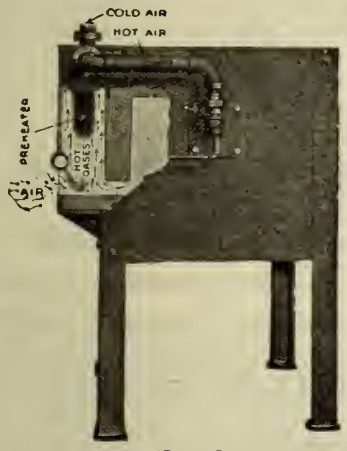

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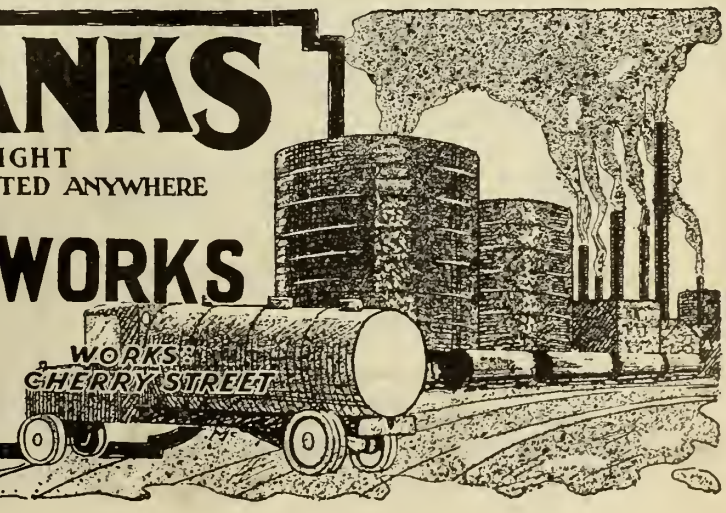

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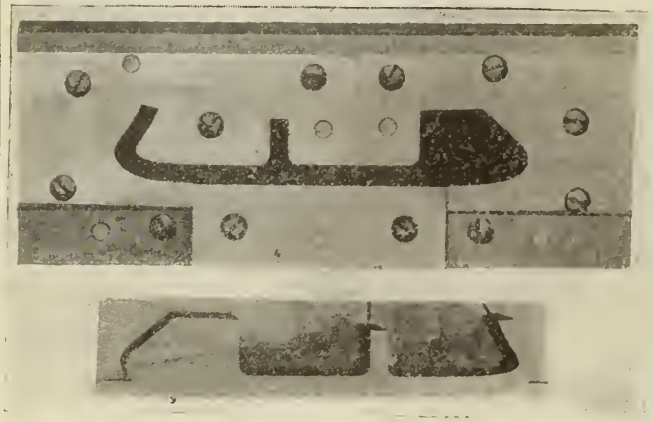

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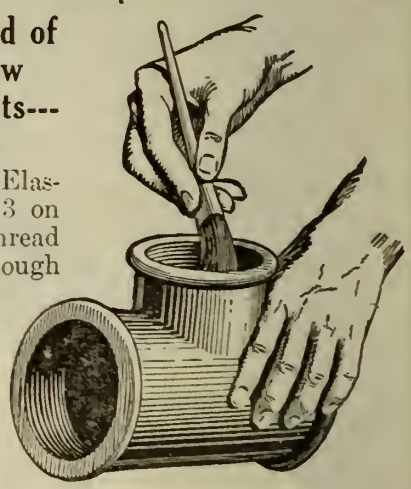

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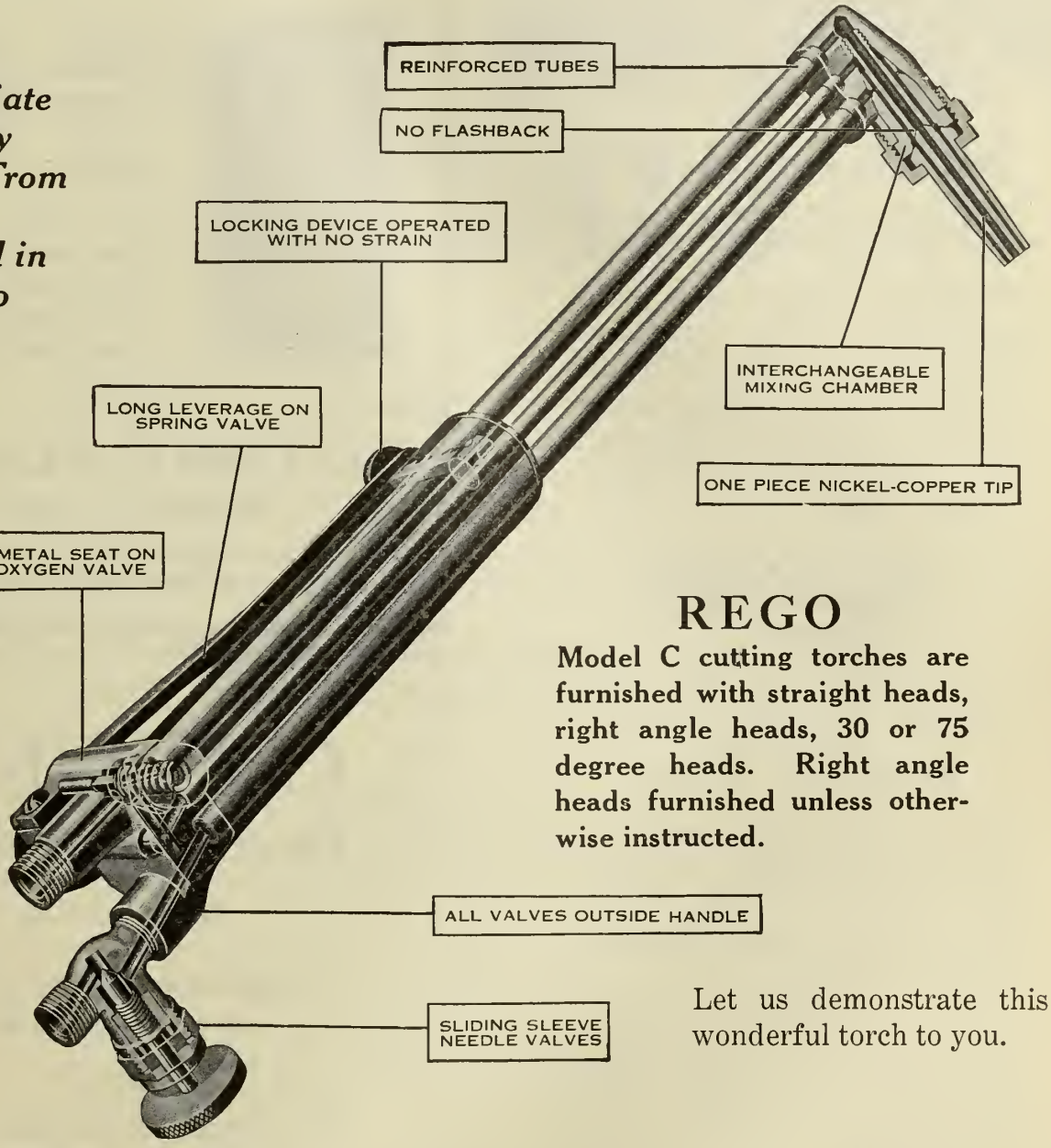
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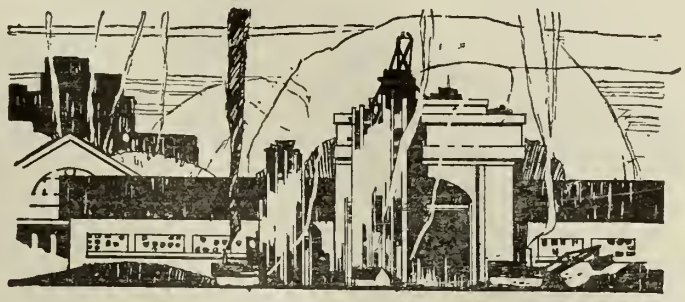

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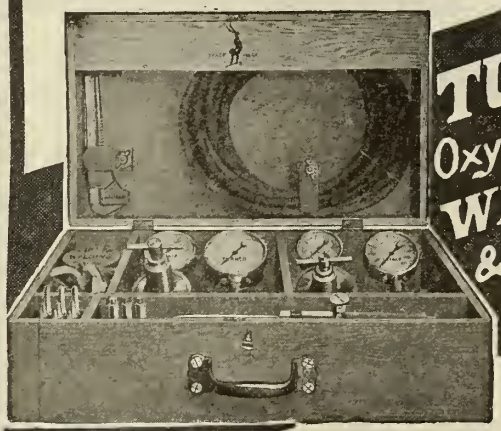

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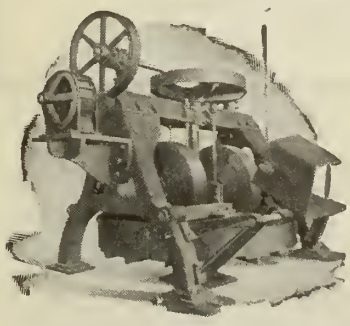

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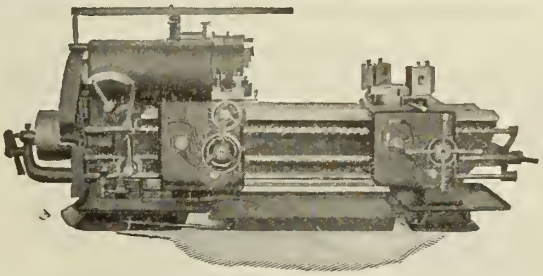

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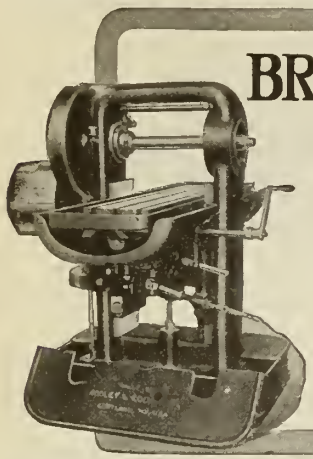

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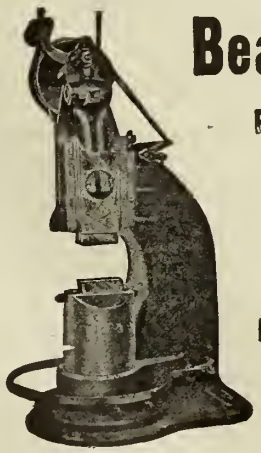

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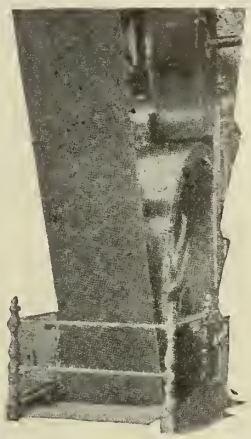

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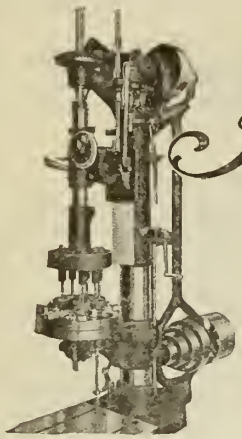

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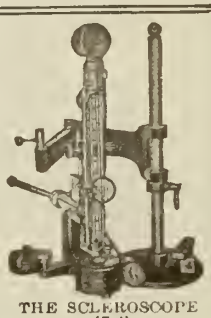

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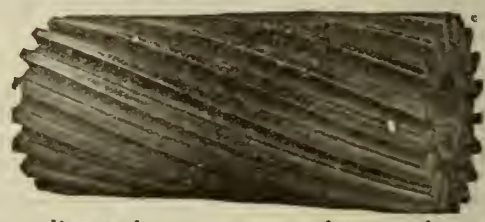

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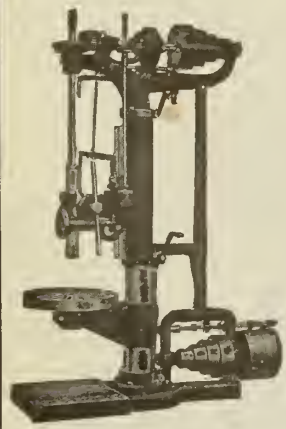

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Kennedy & Sons, Ltd., Wm., Owen Sound.
Katie Foundry, Ltd., Galt, Ont.
Hamilton Co., Wm., Peterboro.
McFarlane Engineering Ltd., G. W., Paris, Ont.

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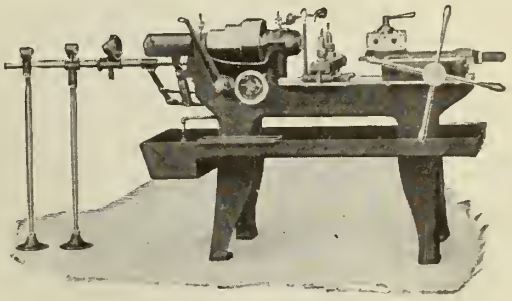

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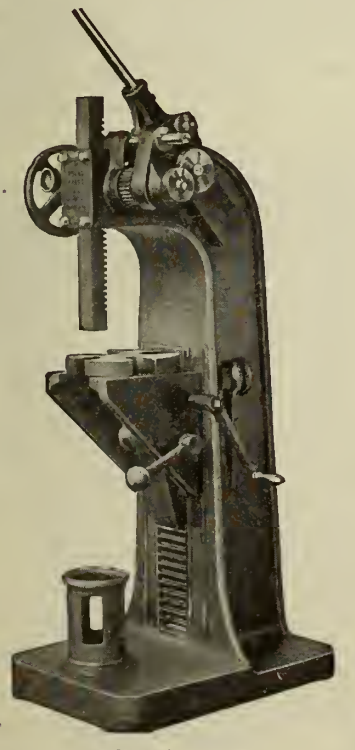

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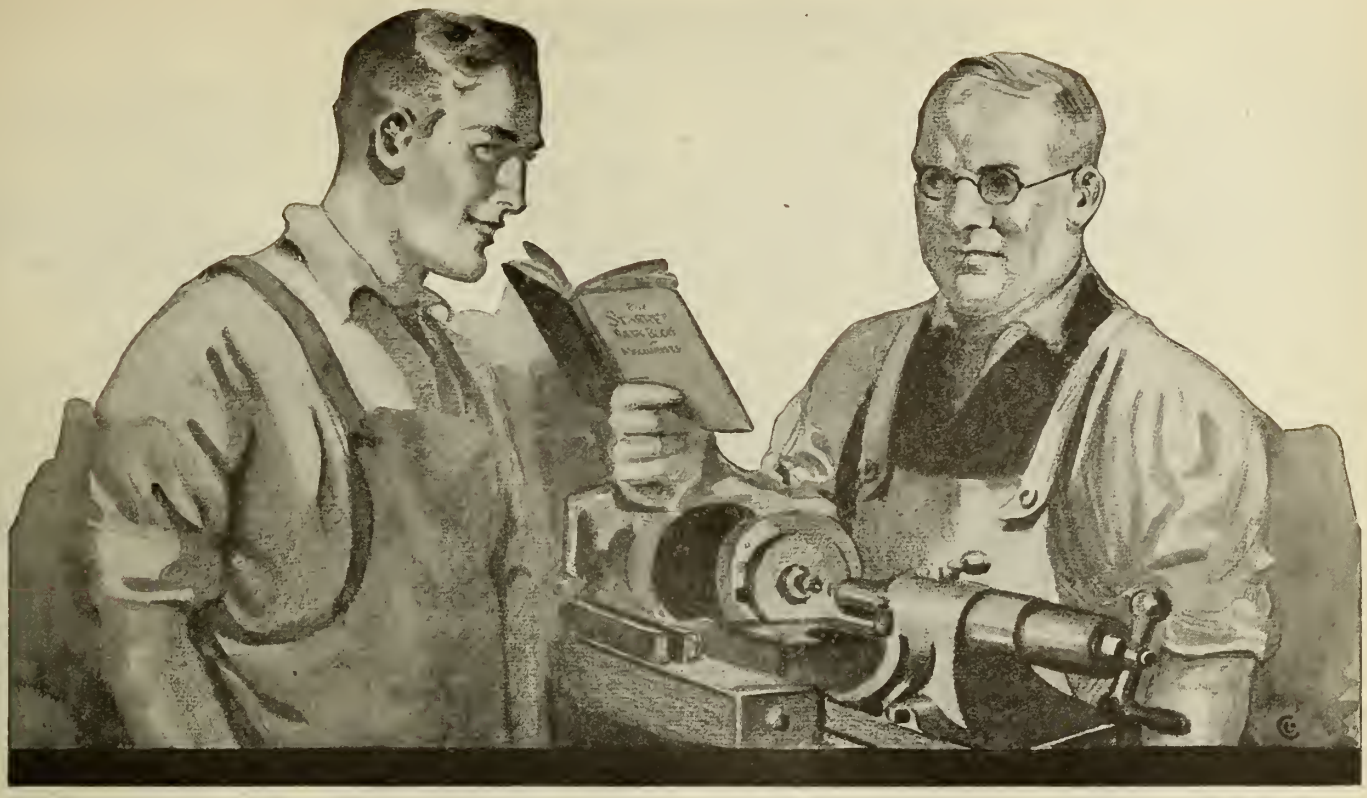

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Hamilton Co., Ltd., Wm., Peterborough,
Jones & Glassco, Montreal.
Lyman Tube & Supply Co., Montreal, Que.
Philadelphia Gear Works, Philadelphia
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Heald Machine Co., Worcester, Mass.
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Haskins & Co., R. C., Chicago, Ill.
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Atkins & Co., E. C., Hamilton, Ont.
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Gardner Machine Co., Beloit, Wis.
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Garvin Machine Co., New York.
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Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
United States Elec. Tool Co., Cincinnati.
Wells Bros. of Canada, Galt, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

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Brown & Sharpe Mfg. Co., Providence, R.I
Foss Mchy. & S'ply Co., G. F., Montreal.
Greenfield Machine Co., Greenfield, Mass.
Heald Machine Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Norton Co., Worcester, Mass.
Petrie, Ltd., H. W., Toronto.
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Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Ford-Smith Mach. Co., Hamilton, Ont.
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Garlock-Walker Machinery Co., Toronto.
Greenfield Machine Co., Greenfield, Mass.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool Co., Chicago
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
United States Elec. Tool Co., Cincinnati
Wisconsin Electric Co., Inc., Racine, Wis.
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Wilkinson & Kompass, Hamilton, Ont.

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Cleveland Pneumatic Tool Co., Toronto.
Garlock-Walker Machinery Co., Toronto.
Heald Machine Co., Worcester, Mass.
Independent Pneumatic Tool Co., Chicago
MacGovern & Co., Montreal, Que.

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Bristol Machine Tool Co., Bristol, Conn.
Manhattan Machine & Tool Co., Grand Rapids, Mich.

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W. F. & John Barnes Co., Rockford, Ill.
Blount & Co., J. G., Everet, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I
Ford-Smith Machine Co., Hamilton, Ont.
Greenfield Machine Co., Greenfield, Mass.
Greenfield Tap & Die Corp., Greenfield.
National-Acme Co., Cleveland, Ohio.
Tabor Mfg. Co., Philadelphia, Pa.
Wells Bros. of Canada, Galt, Ont.

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Barber Mchy. Co., Ltd., Toronto, Ont.
Manhattan Machine & Tool Co., Grand Rapids, Mich.
Modern Tool Co., Erie, Pa.
Norton Co., Worcester, Mass.
Williams Mchy Co, Ltd., A. R., Montreal

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Can. Fairbanks-Morse Co., Montreal.
Heald Machine Co., Worcester, Mass.
Petrie, Ltd., H. W., Toronto.
Pratt & Whitney Co., Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Norton Co., Worcester, Mass.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

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Wausau Abrasives Co., Chicago, Ill.

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Cincinnati Elec. Tool Co., Cincinnati, O.
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner & Son, Robt., Montreal.
Garvin Machine Co., New York.
Garlock-Walker Machy. Co., Toronto.
Greenfield Machine Co., Greenfield, Mass.
Haskins & Co., R. C., Chicago, Ill.
Herbert Ltd., Alfred, Toronto, Ont.
Niles-Bement-Pond Co., New York, N.Y.
Norton Co., Worcester, Mass.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
Wisconsin Electric Co., Racine, Wis.
Williams Mchy Co., A. R., Toronto, Ont.
Williams Tool Corp. of Can. Ltd., Brantford, Ont.

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Brown & Sharpe Mfg. Co., Providence, R.I
Norton Co., Worcester, Mass.

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Atkins & Co., E. C., Hamilton, Ont.
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Can. Fairbanks-Morse Co., Montreal.
Carborundum Co., Niagara Falls, N.Y.
Dominion Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Mchy. & S'ply Co. G. F., Montreal.
Norton Co., Worcester, Mass.

GRINDING WHEEL DRESSER
Dominion Abrasive Wheel Co., Ltd., Mimico, Ont.

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Canada Machinery Corp., Galt, Ont.
Canada Wire & Iron Goods Co., Hamilton
Dennis Wire & Iron Works, London, Ont.
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Page Steel & Wire Co., Adrian, Mich.

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Atkins & Co., Ltd., Wm., Sheffield, Eng.
Can. Fairbanks-Morse Co., Montreal.
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Ford-Smith Machine Co., Hamilton, Ont.
Kayser-Ellison & Co., Ltd., Montreal.
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Marshall, Son & Bunney, Toronto.
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Foss Mchy. & S'ply Co., G. F., Montreal
Plewes, Ltd., Winnipeg, Man.
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Petrie, Ltd., H. W., Toronto.
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L. S. Starrett Co., Athol, Mass.
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Wilkinson & Kompass, Hamilton.
Williams Mchy Co., A. R., Toronto, Ont.

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HANGERS, SHAFT
Can. Link-Belt Co., Ltd., Toronto, Ont.

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Atkins & Co., E. C., Hamilton, Ont.
Can. Fairbanks-Morse Co., Montreal.
Ford-Smith Machine Co., Hamilton, Ont.
Garvin Machine Co., New York City.
Victor Saw Works, Hamilton, Ont.
Rice Lewis & Son, Toronto, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
Wilkinson & Kompass, Hamilton, Ont.

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Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., E. C., Hamilton, Ont.
Can. Fairbanks-Morse Co., Montreal.
Diamond Saw & Stamping Wks., Buffalo.
Foss Mchy. & S'ply Co., G. F., Montreal.
Ford-Smith Machine Co., Hamilton.
Perfect Machine Co., Galt, Ont.
Starrett Co., L. S., Athol, Mass.
Victor Saw Works, Hamilton, Ont.
Williams Machy. Co., A. R., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

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HAMMERS, ELECTRIC
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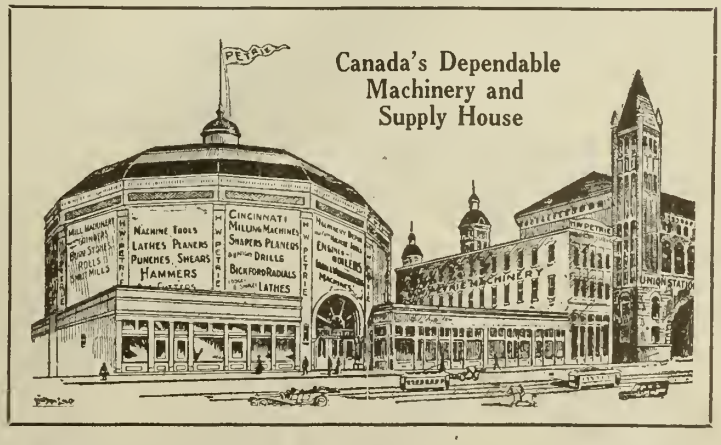

If interested tear out this page and place with letters to be answered.

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Beaudry & Co., Boston, Mass.
Bliss Co., E. W., Brooklyn, N.Y.
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Canada Machinery Corp., Galt, Ont.
High Speed Hammer Co., Rochester, N.Y.
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Niles-Bement-Pond Co., New York, N.Y.
Petrie, Ltd., H. W., Toronto.
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United Hammer Co., Boston, Mass.
Williams Mchy Co, Ltd., A. R., Montreal

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Petrie, Ltd., H. W., Toronto.
West Tire Setter Co., Rochester, N.Y.
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Nazel Eng. & Mach. Wks., Philadelphia.

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HAMMERS, POWER
Nazel Eng. & Mach. Wks., Philadelphia.

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Canada Machinery Corp., Galt, Ont.
Niles-Bement-Pond Co., New York.

HAND PLANERS
Oliver Mchry. Co., Grand Rapids, Mich.

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HAND LEATHERS OR PADS
Graton & Knight Mfg. Co., Montreal.

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Diamond State Fibre Co., Bridgeport, Pa.

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Canadian Link-Belt Co., Ltd., Toronto, Ont.

HANGERS, SHAFT
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Chapman Double Ball Bearing Co., Toronto.
Gray Ball Bearing Co., Ltd., Toronto.
Baird Machine Co., Bridgeport, Conn.
Can. S K F Co., Toronto, Ont.
Gardner & Son, Robt., Montreal.
Jones & Glassco, Montreal.
Williams Mchy Co, Ltd., A. R., Montreal

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HEAT TREATING EQUIPMENT
Chicago Flexible Shaft Co., Chicago, Ill.

HELMETS, SANDBLAST, AMMONIA
Strong, Kennard & Nutt Co., Cleveland

HIGH SPEED STEEL
See Steel.

HINGE MACHINERY
Baird Machine Co., Bridgeport, Conn.

HINGES
Butterfield & Co., Inc., Rock Island, Que.
London Bolt & Hinge Wks., London, Ont.

HOBS
Greenfield Tap & Die Co., Greenfield, Mass
Pratt & Whitney Co., Dundas, Ont.
Taylor, J. A. M., 318 Stair Bldg., Toronto
Wells Bros. of Canada, Galt, Ont.

HOISTING MACHINERY
Canadian Mead-Morrison Co., Limited, Montreal, Que.

HOISTS, AIR
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Holden Co., Ltd., Montreal, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

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Can. Ingersoll-Rand Co., Montreal, Que.
Garlock-Walker Machinery Co., Toronto.
Ford Chain Block & Mfg., Philadelphia.
Independent Pneumatic Tool Co., Chicago
Lyman Tube & Supply Co., Montreal, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Wright Mfg. Co., Lisbon, Ohio.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co, Ltd., A. R., Montreal

HOISTS, ELEC., STATIONARY, MONO RAIL
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
A. Keatty & Sons, Ltd., Welland, Can.
Oliver Engineering Co., Montreal.
Volta Mfg. Co., Welland, Ont.

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Dominion Bridge Co., Montreal, Que.
Electric Steels & Metals Ltd., Welland.
Kennedy & Sons, Owen Sound, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co, Ltd., A. R., Montreal

HOLDERS, ADJUSTABLE LENGTH
Eclipse Counterbore Co., Ltd., Walkerville, Ont.

HOLDERS, STEEL DIE FOR MARKING
Matthews & Co., Jas. H., Pittsburgh, Pa.

HOLDERS, ELECTRIC
Electric Steels & Metals, Ltd., Welland

HOOKS, BELT LACING
Clipper Belt Lacer Co., Grand Rapids.

HOPPERS
MacKinnon Steel Co., Ltd., Sherbrooke.
Dominion Bridge Co., Montreal, Que.
William Hamilton Co., Peterboro, Ont.
Toronto Iron Works, Ltd., Toronto, Ont.

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Quaker City Rubber Co, Philadelphia, Pa
International Mach. Sply, Ltd., Montreal

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Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto.
Gutta Percha & Rubber, Ltd., Toronto.
Independent Pneumatic Tool Co., Chicago.
Quaker City Rubber Co., Philadelphia, Pa.
Wells Bros. Co. of Canada, Galt, Ont.

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Goodyear Tire & Rubber Co., of Canada, Ltd., Toronto.
Gutta Percha & Rubber, Ltd., Toronto.
Quaker City Rubber Co, Philadelphia, Pa
International Mach. Sply, Ltd., Montreal
Dunlop Tire & Rubber Goods Co., Ltd., Toronto.

HOSE, SAND BLAST
Pangborn Corporation, Hagerstown, Md.
Goodyear Tire & Rubber Co. of Can., Ltd. Toronto
Quaker City Rubber Co., Philadelphia, Pa.
Intern'l. Machine Tool Co., Indianapolis.

HOSE, STEAM, SUCTION AND WATER
Gutta Percha & Rubber, Ltd., Toronto.
Quaker City Rubber Co, Philadelphia, Pa
International Mach. Sply, Ltd., Montreal
Dunlop Tire & Rubber Goods Co., Ltd., Toronto.

HUMIDIFIERS
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HYDRAULIC MACHINERY
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Dom. Steel Products Co., Ltd., Brantford.
Eastern Production Co., Detroit, Mich.
Garlock-Walker Machinery Co., Toronto.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Metalwood Mfg. Co., Detroit, Mich.
Niles-Bement-Pond Co., New York.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.
West Tire Setter Co., Rochester, N.Y.
Victoria Foundry Co., Ottawa.

HYDRAULIC TURBINES
Que.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,

HYDROMETERS, HYGROMETERS, HYGRODNIKS
Taylor Instrument Co., Rochester, N.Y.

INDICATORS, SPEED
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., E. C., Hamilton, Ont.
Brown & Sharpe Mfg. Co., Providence.
Starrett Co., L. S., Athol, Mass.

INDEX CENTRES
Brown & Sharpe Mfg. Co., Providence, R.I.
Dickow, Fred. C., Chicago, Ill.
Ford-Smith Machine Co., Hamilton, Ont.
Garvin Machine Co., New York.
Petrie, Ltd., H. W., Toronto.

INDICATING INSTRUMENTS
Taylor Instrument Co., Rochester, N.Y.

INDICATING SCALES
Can. Kron Scale Co., Montreal.

INDUSTRIAL SITES
City of St. Johns, Quebec.

INGOTS, BRASS, BRONZE, GUN METAL, PHOSPHOR
Thomas Moore & Son, Montreal.

INGOTS, FORGING AND ROLLING
Electric Steel & Metals Co., Welland.

INSULATING COMPOUNDS
Robertson Co., Ltd., H. H., Sarnia, Ont.

INSTRUMENTS, ENGINEERING
Consolidated Optical Co., Toronto.

IRON ORE
Hanna & Co., M. A. Cleveland, O.

IRON, WROUGHT, ROLLED, PIG
Swedish Steel & Impt. Co., Ltd., Montreal

JACKS
Aikenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
The Engineering Co.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Norton, A. O., Coaticook, Que.
Rice Lewis & Son, Toronto, Ont.
Petrie, Ltd., H. W., Toronto.

JACKS, PIT AND TRACK
Canadian Fairbanks-Morse Co., Montreal.
Lyman Tube & Supply Co., Montreal, Que.
Northern Crane Works, Walkerville.

JAWS, FACE PLATE
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Ltd., Brantford.
Skinner Chuck Co., New Britain, Conn.

JIGS, TOOLS, ETC.
Ackworthie Ltd., J., Birmingham, Eng.
Brown Engineering Corp., Toronto.
Crescent Mach. Co., Ltd., Montreal, P.Q.
Elliott & Whitehall Mach. & Tool Co., Galt.
Gishort Machine Co., Madison, Wis.
Globe Engineering Co., Ltd., Hamilton.
Homer & Wilson, Hamilton, Ont.
Jones & Lamson, Springfield, Vt.
Toronto Tool Co., Toronto, Ont.

JOURNAL WEDGES
Canada Foundries & Forgings, Welland.
Dominion Foundries & Steel Ltd., Hamilton, Ont.

KEY SEATERS
Garlock-Walker Machy. Co., Toronto, Ont.
Garvin Machine Co., New York.
Morton Mfg. Co., Muskegon Heights, M.
Petrie, Ltd., H. W., Toronto.
Williams Machy. Co., A. R., Toronto.

KEYS, MACHINE
Whitney Mfg. Co., Hartford, Conn.
Williams & Co., J. H., Brooklyn, N.Y.

KILNS
Can. Blower & Forge Co., Kitchener, Ont.
General Combustion Co., Ltd., Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
Sturtevant Co., B. F., Galt, Ont.

KNIVES, MACHINE
Atkins & Co., E. C., Hamilton, Ont.

LABELS AND TAGS
Matthews & Co., Jas. H., Pittsburgh, Pa.

LABORATORIES, INSPECTION AND TESTING (see Chemists)

LADLES, FOUNDRY
Northern Crane Works, Walkerville.

LACING MACHINES
Clipper Belt Lacer Co., Grand Rapids, M.

LAG SCREW GIMLET POINTERS
National Machy. Co., Tiffin, Ohio.

LATH
Robertson. Ltd., H. H., Sarnia, Ont.

LATHES, CHUCKING
Acme Machine Tool Co., Cincinnati, Ohio.
Petrie, Ltd., H. W., Toronto.
Wood Turret Machine Co., Brazil, Ind.

LATHE CHUCKS (See Chucks)

LATHE DOGS AND ATTACHMENTS
Armstrong Bros. Tool Co., Chicago.
Hendey Machine Co., Torrington, Conn.
Williams & Co., J. H., Brooklyn, N.Y.

LATHES, AUTOMATIC AND SEMI-AUTOMATIC
Gisholt Machine Co., Madison, Wis.
Wood Turret Machine Co., Brazil, Ind.

LATHES, AXLE
Barber Mchy. Co., Ltd., Toronto, Ont.
Betts Mach. Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.

LATHES, BORING
Barber Mchy. Co., Ltd., Toronto, Ont.
Bridgeford Mach. Tool Works, Rochester.
Canada Machinery Corp., Galt, Ont.
Ledge & Shipley, Cincinnati, O.
Petrie, Ltd., H. W., Toronto.

LATHES, PRECISION, BENCH
W. F. & John Barnes Co., Rockford.
J. G. Blount & Co., Everett, Mass.
Canadian Fairbanks-Morse Co., Montreal.
Geo. F. Foss Machy. & Supply Co., Montreal.
Garlock-Walker Machinery Co., Toronto.
Hardinge Bros., Chicago, Ill.
Petrie, Ltd., H. W., Toronto.
Pratt & Whitney Co., Dundas, Ont.
Seneca Falls Mfg Co., Seneca Falls, N.Y.
Strelinger Co., C. A., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

LATHES, BRASS
Ackworthie Ltd., J., Birmingham, Eng.
Acme Machine Tool Co., Cincinnati, Ohio.
Hardinge Bros., Chicago, Ill.
Wood Turret Machine Co., Brazil, Ind.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

LATHES, ENGINE
Acme Machine Tool Co., Cincinnati, O.
Barber Mchy. Co., Ltd., Toronto, Ont.
John Bertram & Sons, Co., Dundas.
Canada Machy. Corp., Galt, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cisco Machine Tool Co., Cincinnati, O.
G. F. Foss, Mchy. & S'ply Co., Montreal
Garlock-Walker Machinery Co. Toronto.
Garvin Machine Co., New York.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Kennedy & Sons, Wm., Owen Sound, Ont.
Lehman Mach. Co., St. Louis, Mo.
R. McDougall Co., Galt.
Niles-Bement-Pond Co., New York.
Perfect Machine Co., Galt, Ont.
Rae Mach. Tool Co., Hamilton.
Smalley-General Co., Inc., Bay City, Mich.
Standard Equipment & Tool Wks. Montreal, P.Q.
Seneca Falls Mfg. Co., Seneca Falls, N.Y.
Skinner Tool Co., Skiner, Ohio.
Strelinger Co., C. A., Windsor, Ont.
Webster Lathe Co., Jackson, Mich.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
Rae Mach. Tool Co., Hamilton.
A. R. Williams Machy. Co., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

LATHES, FOOT POWER
Seneca Falls Mfg. Co., Seneca Falls, N.Y.

LATHES, HORIZONTAL
Intern'l. Mchy. Supplies Ltd., Montreal.
Wood Turret Machine Co., Brazil, Ind.

LATHES, JOURNAL TRUEING
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.

LATHE MANDRELS, HARDENED AND GROUND
Elliott & Whitehall, Galt, Ont.

LATHES, PATTERNMAKERS'
J. G. Blount Co., Everett, Mass.
Can. Machinery Corp., Galt.
Wood Turret Machine Co., Brazil, Ind.
G. F. Foss Mchy. & S'ply Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.

LATHES, POLISHING
Ackworthie Ltd., J., Birmingham, Eng.
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

LATHES, SCREW CUTTING
Barber Mchy. Co., Ltd., Toronto, Ont.
Bertram & Sons Co., John, Dundas, Ont.
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Cisco Machine Tool Co., Cincinnati, O.
Foss Mchy. & Sply Co., G. F., Montreal
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Hepburn Ltd., John T., Toronto, Ont.
Lehman Machine Co., St. Louis, Mo.
Niles-Bement-Pond Co, New York.
Rae Mach. Tool Co., Hamilton.
Seneca Falls Mfg. Co., Seneca Falls, N.Y.
Strelinger Co., C. A., Windsor, Ont.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
Williams Machy. Co., A. R., Toronto.
Wood Turret Machine Co., Brazil, Ind.

LATHES, SPINNING
Bliss Co., E. W., Brooklyn, N.Y.

LATHES, TOOL ROOM
Barber Mchy. Co., Ltd., Toronto, Ont.
Cisco Machine & Tool Co., Cincinnati, O.
Canada Machinery Corporation, Galt, Ont.
Knight Metal Products, Toronto.
Lehman Machine Co., St. Louis, Mo.
Rae Mach. Tool Co., Hamilton.
Seneca Falls Mfg. Co., Seneca Falls, N.Y.

LATHES, QUICK CHANGE
Lehman Machine Co., St. Louis, Mo.

LATHE SAWS
Atkins & Co., E. C., Hamilton, Ont.

LATHES, TURRET
Acme Machine Tool Co., Cincinnati, Ohio
Hardinge Bros., Chicago, Ill.
Herbert Ltd., Alfred, Toronto, Ont.

LEAD, PIG AND BAR
British Smelting & Refining Co., Ltd., Montreal, Que.

LEAD BURNING OUTFITS
Turner Brass Works, Sycamore, Ill.

LEATHER STRAPPING
Graton & Knight Mfg. Co., Worcester, M.

LENSES FOR GOGGLES
Standard Optical Co., Geneva, N.Y.

LEVELS
Hughes, Owens Co., Ltd., Montreal, Que.

LIDS, SCREW TOP AND HINGE
Can. Winkley Co., Ltd., Windsor, Ont.

LINK BELTING
See Belting, Chain.

LIFT TRUCKS
Can. Kron Scale Co., Montreal.

LINOLEUM MILL MACHINERY
Bertrams, Ltd., Edinburgh, Scotland.

LOCKERS, STEEL WARDROBE AND STEEL MATERIAL
Canada Wire & Iron Gds. Co., Hamilton
Dennis Wire & Iron Works, London, Ont

LUBRICANTS
Cataract Refining & Mfg. Co., Toronto.
Swan & Finch, Inc., New York.

LUBRICANTS, CUTTING AND GRINDING, DRAWING, STAMPING
Oakley Chemical Co., New York, N.Y.

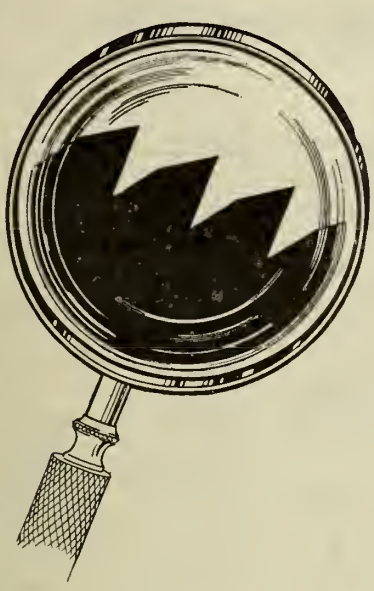
LUBRICATING, OIL FILTERING AND CIRCULATING SYSTEMS
Bowser Co., Ltd., S. F., Toronto, Ont.

LUBRICATORS
Brahers Pump Co., Rockford, Ill.

LUMBERMEN'S TOOLS
Thos. Pink Co., Ltd., Pembroke, Ont.

MACHINE COUNTER WEIGHTS
Kathe Foundry, Galt, Ont.

MACHINE TOOLS
Barber Mach. Co., F. F., Toronto, Ont.
Knight Metal Products, Toronto.



Important Points About a File

The most important points about a file are:

(1) Quality of steel
(2) Temper of steel
(3) Shape of teeth
(4) Balance

Famous Five Files are made of special alloy steel, tested for file purposes.

It is thoroughly hardened to endure much usage.

The teeth are cut to the proper shape for the work they have to do.

The whole is nicely balanced for ease in handling.

Attention to these points has made Famous Five Files the standard for over fifty years. The Famous Five brands are:

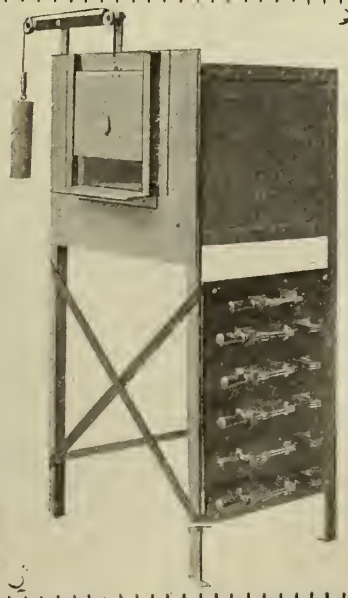
KEARNEY & FOOT
GREAT WESTERN
AMERICAN
ARCADE
GLOBE

Made in Canada by:

Nicholson File Company

Port Hope - Ontario

HOSKINS ELECTRIC FURNACES



SIMPLE
EFFICIENT
ACCURATE
ECONOMICAL

Hiram Walker & Sons Metal Products, Limited
Walkerville, Ontario

If interested tear out this page and place with letters to be answered.

MACHINERY DEALERS

Archibald & Co., Chas. P., Montreal.
Barber Mchy. Co., Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Elliott & Whitehall, Galt, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Machy. Co., A. R., Toronto.

MACHINERY GUARDS (See Guards)

MACHINERY SUPPLIES

Crescent Machine Co., Ltd., Montreal.
Globe Engineering Wks., Hamilton, Ont.
Knight Metal Products, Toronto.

MACHINERY, SPECIAL

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Crescent Machine Co., Ltd., Montreal, Que.
McClean Machine & Tool Co., Ltd., Hamilton, Ont.

MACHINISTS' TOOLS

Atkins & Co., E. C., Hamilton, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.

MAGNETIC BRAKES FOR ELECTRIC MOTORS

Volta Mfg. Co., Welland, Ont.

MANDRELS

Butterfield & Co., Inc., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Jardine & Co., A. B., Hespeler, Ont.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
McCrosky Tool Corp., Meadville, Pa., U. S. A.
Pratt & Whitney Co., Dundas, Ont.

MARKING DEVICES

Matthews & Co., Jas. H., Pittsburgh, Pa.

MARKING MACHINERY

Brown, Boggs Co., Hamilton, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal
Perrin, Wm. R., Toronto.
Petrie, Ltd., H. W., Toronto.

MATERIALS, HANDLING PLANTS

Canadian Mead-Morrison Co., Limited, Montreal, Que.

MATS, RUBBER MATTING

Quaker City Rubber Co., Philadelphia, Pa
International Mchy. Sply., Ltd., Montreal

MEASURING MACHINES

Pratt & Whitney Co., Dundas, Ont.

MEASURES, REGISTERING

Bowser Co., Ltd., S. F., Toronto, Ont.

MEASURING TAPES AND RULES

Chesterman & Co., Jas., Sheffield, Eng.

MERCHANTS, IRON AND STEEL

Samuel Osborne (Can.), Ltd., Montreal.

METALLURGISTS

See Chemists.

METAL CLEANERS

Oakley Chemical Co., New York, N.Y.

METAL CUTTING MACHINES

Atkins & Co., E. C., Hamilton, Ont.
Lyman Tube & Supply Co., Montreal, Que.

METAL SAWS

See Saws.

METAL, ANTI-FRICTION

Thos. Moore & Son, Montreal.

METAL SAWS, POWER

E. C. Atkins & Co., Inc., Indianapolis.
Hoefer Mfg. Co., Freeport, Ill.
Lyman Tube & Supply Co., Montreal, Que.

METALS

British Smelting & Refining Co., Ltd., Montreal, Que.
Brown's Copper & Brass Rolling Mills New Toronto, Ont.
Canada Metal Co., Toronto, Ont.
Deloro Smelting & Refining Co., Ltd, Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.

METAL STAMPINGS, SMALL

Can. Winkley Co., Ltd., Windsor, Ont.

METERS, OIL, GASOLINE, KEROSENE, ETC.

Bowser Co., Ltd., S. F., Toronto, Ont.
General Combustion Co., Ltd., Montreal, Que.

MICROMETERS

Taylor, J. A. M., 316 Stair Bldg., Toronto.
Petrie, Ltd., H. W., Toronto.

MILLS, BRACE AND TUBE

Elec. Steel & Metals, Welland, Ont.

MILL SPECIALTIES

Atkins & Co., E. C., Hamilton, Ont.

MILLS, SAND

Frost Mfg. Co., Chicago, Ill.

MILL MACHINERY

Alexander Fleck, Ltd., Ottawa.
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

MILLING ARBORS

Ackworthie Ltd., J., Birmingham, Eng.
Barber Mchy. Co., Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Kearney & Trecker Co., Milwaukee, Wis.
Strelinger, Chas. A. Co., Windsor, Ont.

MILLING ATTACHMENTS

Ackworthie Ltd., J., Birmingham, Eng.
Barber Mchy. Co., Ltd., Toronto, Ont.
Becker Milling Machine Co., Boston, Mass
Bertram & Sons Co., John, Dundas, Ont
Brown & Sharpe Mfg. Co., Providence
Canada Machinery Corp., Galt, Ont.
Cincinnati Milling Machine Co., Cincinnati
Ford-Smith Mach. Co., Hamilton, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal
Hardinge Bros., Inc., Chicago, Ill.
Hendey Mach. Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.

MILLING CUTTERS

Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Milling Machine Co., Cleveland.
Delore Smelting & Refining Co., Ltd, Toronto, Ont.
Herbert, Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Marshall, Son & Bunney, Toronto.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

MILLING MACHINES, HAND

Bristol Machine Tool Co., Bristol, Conn.

MILLING MACHINES, THREAD

Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Inc., Chicago, Ill.
Gray Ball Bearing Co., Ltd., Toronto.
United States Mach. Tool Co., Cincinnati.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Smalley Gen. Co., Inc., Bay City, U.S.A.
Standard Equipment & Tool Wks., Montreal, P.Q.
Strelinger, Chas. A. Co., Windsor, Ont.

MILLING MACHINES, HORIZONTAL AND VERTICAL

Barber Mchy. Co., Ltd., Toronto, Ont.
Becker Milling Machine Co., Boston, Mass
Bristol Machine Tool Co., Bristol, Conn.
Brown & Sharpe Mfg. Co., Providence.
Bertram & Sons Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Cochrane-Bly Co., Rochester, N.Y., U.S.A.
Ford-Smith Mach. Co., Hamilton, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Knight Metal Products, Toronto.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Rockford Milling Mach. Co., Rockford, Ill
Strelinger, Chas. A. Co., Windsor, Ont.
United States Mach. Tool Co., Cincinnati.
Whitney Mfg. Co., Hartford, Conn.
Williams Machy. Co., A. R., Toronto.

MILLING MACHINES, PLAIN, BENCH AND UNIVERSAL

Barber Mchy. Co., Ltd., Toronto, Ont.
Becker Milling Machine Co, Boston, Mass.
Bilton Mach. Tool Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence.
Canada Machinery Corp., Galt, Ont.
Cleveland Milling Machine Co., Cleveland.
Cincinnati Milling Machine Co., Cincinnati
Ford-Smith Mach. Co., Hamilton, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Garvin Machine Co., New York.
National Machy. Co., Tiffin, Ohio.
Gooley & Eklund, Inc., Cortland, N.Y.
Hardinge Bros., Inc., Chicago, Ill.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Knight Metal Products, Toronto.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Standard Equipment & Tool Wks., Montreal, P.Q.
Strelinger, Chas. A. Co., Windsor, Ont.

MILLING MACHINES, PROFILE

Barber Mchy. Co., Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

MILLING TOOLS

Aikenhead Hardware Co., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence.
Ford-Smith Mach. Co., Hamilton, Ont.
Geometric Tool Co., New Haven, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
Rice Lewis & Son, Toronto, Ont.
Fabor Mfg. Co., Philadelphia, Pa.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

MINE CARS

Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Dominion Bridge Co., Montreal, Que.
Elec. Steel & Metals, Welland, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.

MINING MACHINERY

Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Elec. Steel & Metals, Welland, Ont.
Holden Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto.
Williams Machy. Co., A. R., Toronto.
Williams Mchy Co., A. R., Toronto, Ont

MIXERS, SAND

Frost Mfg. Co., Chicago, Ill.

MORTISING CHAINS

Renold of Canada Ltd., Montreal.

MORTISING MACHINES

Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.
Gray Ball Bearing Co., Ltd., Toronto.

MOTORS, ELECTRIC

Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
Lincoln Electric Co. of Canada, Ltd., Toronto, Ont.
MacGovern & Co., Montreal, Que.
Northern Elec. Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Sturtevant Co., B. F., Galt, Ont.
U. S. Ordinance, Toronto, Ont.
Volta Mfg. Co., Welland, Ont.
Williams Mach'y Co., A. R., Toronto.

MOTOR SPRINGS

The Dunbar Brothers Co., Bristol, Conn.

MOTORCYCLE FRAME AND FORK

The Dunbar Brothers Co., Bristol, Conn.

MOTORS, PNEUMATIC

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto.
Holden Co., Ltd., Montreal, Que.

MOULDS, RUBBER

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

MULTIPLE INDEX CENTRES

Garvin Machine Co., New York.
Graton & Knight Mfg. Co., Worcester, M.

MULTI-DRILLING, MULTI-BORING, MULTI-TAPPING MACHINERY,

Nat. Automatic Tool Co., Richmond, Ind.

MUNICIPALITIES

City of St. John, Quebec.

NAIL SETS

Morrow Screw & Nut Co., J., Ingersoll, Ont

NAME PLATES, BRONZE, ETCHED AND STAMPED

Matthews & Co., Jas. H., Pittsburgh, Pa.
Turner Brass Works, Sycamore, Ill.

NICHROME CASTINGS

Can. Driver-Harris Co., Ltd., Walkerville.

NICKEL

Pilot Steel & Tool Co., Montreal, Que.

NICKEL STEEL

See Steel.

NICKEL SILVER—SHEETS, ROLLS, PLATES and RODS

Brown's Copper and Brass Rolling Mills, New Toronto.

NIPPLE THREADING MACHINES

Landis Machine Co., Waynesboro, Pa.
Williams Tool Corp. of Can. Ltd., Brantford, Ont.

NITROGEN

Carter Welding Co., Toronto, Ont.

NUTS, STEEL, CASTELLATED AND COLD PRESSED

Galt Machine Screw Co., Ltd., Galt, Ont.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Williams & Co., J. H., Brooklyn, N.Y.

NUTS, SEMI-FINISH AND FINISHED

Galt Machine Screw Co., Galt, Ont.
National-Acme Co., Cleveland, Ohio.
Wilkinson & Kompass, Hamilton.

NUT LOCKS

Edw. W. Robinson Co., Ltd., Montreal.

NUT BURRING AND NUT MACHINES (HOT)

National Machy. Co., Tiffin, Ohio.

NUT FACING AND BOLT SHAVING MACHINES

Garvin Machine Co., New York.
National Machinery Co., Tiffin, Ohio.
Petrie, Ltd., H. W., Toronto.
Victor Tool Co., Waynesboro, Pa.

NUT TAPPERS

Bertram & Sons Co., John, Dundas, Ont
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
Jardine & Co., A. B., Hespeler.
Landis Machine Co., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
Petrie Ltd H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Tool Corp. of Can. Ltd., Brantford, Ont.

OILERS

All-Way Oiler Mfg. Co., Toronto, Ont.

OIL SEPARATORS

Can. Fairbanks-Morse Co., Montreal.

OIL STONES

Aikenhead Hardware Co., Toronto, Ont.
Carborundum Co., Niagara Falls, N.Y.
Norton Co., Worcester, Mass.
Rice Lewis & Son, Toronto, Ont.

OIL STONE GRINDERS

Oliver Machy. Co., Grand Rapids, Mich

OIL STORAGE SYSTEMS

Bowser Co., Ltd. S. F., Toronto, Ont.
St. Lawrence Welding Co., Ltd., Montreal.

OPENING DIE HEADS

Greenfield Tap & Die Corp, Greenfield
Wells Bros. of Canada, Galt, Ont.

OPTICAL SUPPLIES

Consolidated Optical Co., Toronto, Ont.

ORE HANDLING EQUIPMENT

Brown Hoisting Machinery Co., Cleveland, Ohio.
Canadian Link-Belt Co., Ltd., Toronto, Ont.
Canadian Mead-Morrison Co., Limited, Montreal, Que.

OSCILLATING VALVE GRINDERS (PNEUMATIC)

Cleveland Pneumatic Tool Co. of Canada, Toronto.

OVENS FOR BAKING, BLUING, DRYING, ENAMELING, JAPANNING AND LACQUERING

Brantford Oven & Rack Co., Brantford

OVEN TRUCKS, STEEL

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MacKinnon Steel Co., Sherbrooke, Que.

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Welding & Supplies Co., Montreal, Que.
Brantford Oven & Rack Co., Brantford.

OXY-ACETYLENE WELDING AND CUTTING AND OUTFITS

Carter Welding Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
L'Air Liquide Society, Toronto, Ont.
Prest-o-Lite Co., Inc. Toronto, Ont.
Davis-Bournonville Co. Toronto, Ont.

OXYGEN

Carter Welding Co., Ltd., Toronto, Ont.
Dominion Oxygen Co., Ltd., Toronto, Ont.
Nat. Electro Products Ltd., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.

OXYGEN PLANTS (ELECTROLYTIC)

Davis-Bournonville Co., Toronto, Ont.

PACKINGS, ASBESTOS

Cleveland Wire Spring Co., Cleveland.

PACKING, ROD AND SHEET

Dunlop Tire & Rubber Goods Co., Ltd. Toronto.
Goodyear Tire & Rubber Co., Can., Ltd., Toronto
Gutta Percha & Rubber, Ltd., Toronto.
International Mach. Spls., Ltd., Montreal
Petrie, Ltd., H. W., Toronto.
Quaker City Rubber Co., Philadelphia, Pa

PANS, WET AND DRY

Frost Mfg. Co., Chicago, Ill.

PAPER MILL CONVEYORS AND DRIVES

Bertrams, Ltd., Edinburgh, Scotland.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Gutta Percha & Rubber, Ltd., Toronto.
MacKinnon Steel Co., Sherbrooke, Que.

PARTITIONS, WIRE

See Guards

PAPER MILL MACHINERY

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Machinery Co., Toronto.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

PATTERN SHOP EQUIPMENT

Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Oliver Machy. Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.

PATTERN MAKERS' LATHES

See Lathes.

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Fetherstonhaugh & Co., Ottawa.
Marion & Marion, Montreal.
Ridout & Maybee, Toronto.

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Can. Link-Belt Co., Toronto, Ont.

PENSTOCKS

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PHOSPHOR TIN, COPPER AND BRONZE

British Smelting & Refining Co., Ltd., Montreal, Que.

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Commercial Camera Co., Providence, R.I.

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Hanna & Co., M. A., Cleveland, O.
Steel Co. of Canada, Ltd., Hamilton, Ont.

PINS, TAPER

Morrow Screw & Nut Co., J., Ingersoll, Ont

PINS, BELT-LACING

Clipper Belt Lacer Co., Grand Rapids.

PIPE, BLACK & GALVANIZED

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PIPE FITTINGS, MALLEABLE AND CAST IRON

International Malleable Iron Co., Guelph.

PIPE CUTTING AND THREADING MACHINES

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Can. Fairbanks-Morse Co., Montreal.
Curtis & Curtis Co., Bridgeport, Conn.
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
McDougall Co., R., Galt.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Wells Bros. Co. of Canada, Galt, Ont.
Williams Tool Co., Erie, Pa.
Williams Machy. Co., A. R., Toronto.
Williams Tool Corp. of Can. Ltd., Brantford, Ont.

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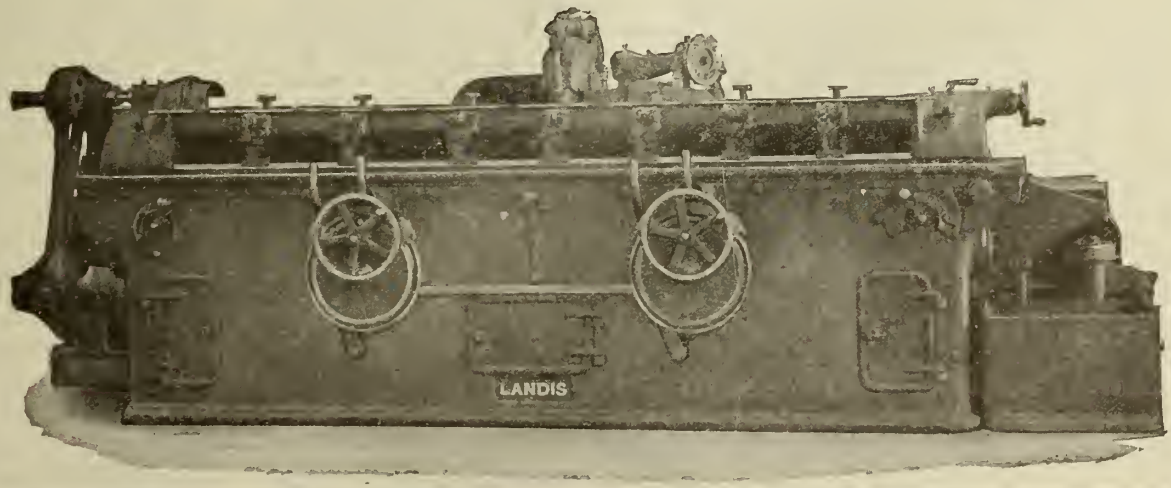

If interested tear out this page and place with letters to be answered.

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Bertram & Sons Co., John, Dundas.
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Can. Billings & Spencer, Ltd., Welland.
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Garlock-Walker Machy. Co., Toronto.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool Co., Chicago.
Int. Mach. & Supply Co., Ltd., Montreal.
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Ford-Smith Machine Co., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto.

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Petrie, Ltd., H. W., Toronto.
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Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co, Toledo.

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Bertram & Sons Co., John, Dundas.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Dom. Steel Products Co., Ltd., Brantford.
Eastern Production Co., Detroit, Mich.
Lourie Manufacturing Co., Springfield, Ill.
Metalwood Mfg. Co., Detroit, Mich.
Niles-Bement-Pond Co., New York.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.
Toledo Machine & Tool Co., Toledo.
Stoll Co., Inc., D. H., Buffalo, N.Y.
Williams Mchy Co., A. R., Toronto.

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Eastern Production Co., Detroit, Mich.

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Brown, Boggs Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machinery Co., Toronto.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
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Williams Mchy. Co., A. R., Toronto.

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Petrie, Ltd., H. W., Toronto.
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Bliss Co., E. W., Brooklyn, N.Y.
Manhattan Machine & Tool Co., Grand Rapids, Mich.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.

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Bernard Industrial Co., Fortierville, Que.
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Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
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Petrie, Ltd., H. W., Toronto.

PULLEYS, STEEL SASH, STEEL BELT
American Pulley Co., Philadelphia. Pa

PULLEYS, FRICTION, CLUTCH
American Pulley Co., Philadelphia, Pa.
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Bernard Industrial Co., A., Fortierville, Q
Can. Link-Belt Co., Toronto, Ont.
Carlyle Johnson Mch. Co., Manchester, Ct.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Jones & Glassco, Montreal.
Positive Clutch & Pulley Works, Toronto.
Petrie, Ltd., H. W., Toronto.

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Hamilton Co., Ltd., Wm., Peterborough, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

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Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Holden Co., Ltd., Montreal, Que.

PUMPS, BOILER FEED
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Can. Ingersoll-Rand Co., Montreal, Que.
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Hamilton Co., Ltd., Wm., Peterborough, Ont.
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Globe Engineering Co., Hamilton, Ont.

PUMPS, HIGH PRESSURE
Perrin, Ltd., William R., Toronto.

PUMPS, HYDRAULIC
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Garlock-Walker Machinery Co., Toronto.
Darling Bros., Ltd., Montreal, Que.
Elec. Steel & Metals, Welland, Ont.
Metalwood Mfg. Co., Detroit, Mich.
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Petrie, Ltd., H. W., Toronto.
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Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
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Holden Co., Ltd., Montreal, Que.
Niles-Bement-Pond Co., New York.
Petrie Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

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Atkins & Co., Ltd., Wm., Sheffield, Eng.
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Pilot Steel & Tool Co., Montreal, Que.
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Pratt & Whitney Co., Dundas, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

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Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Inc., Rock Island, Que.
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Ackworthie Ltd., J., Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Elliott & Whitehall, Galt, Ont.
Greenfield Tap & Die Corp., Greenfield.
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Wells Bros. of Can., Galt, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

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Ackworthie Ltd., J., Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield.
Morrow Screw & Nut Co., John, Ingersoll
Wells Bros. of Can., Galt, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

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Taylor Instrument Co., Rochester, N.Y.

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Taylor Instrument Co., Rochester, N.Y.

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Steel Co. of Canada Ltd., Hamilton.

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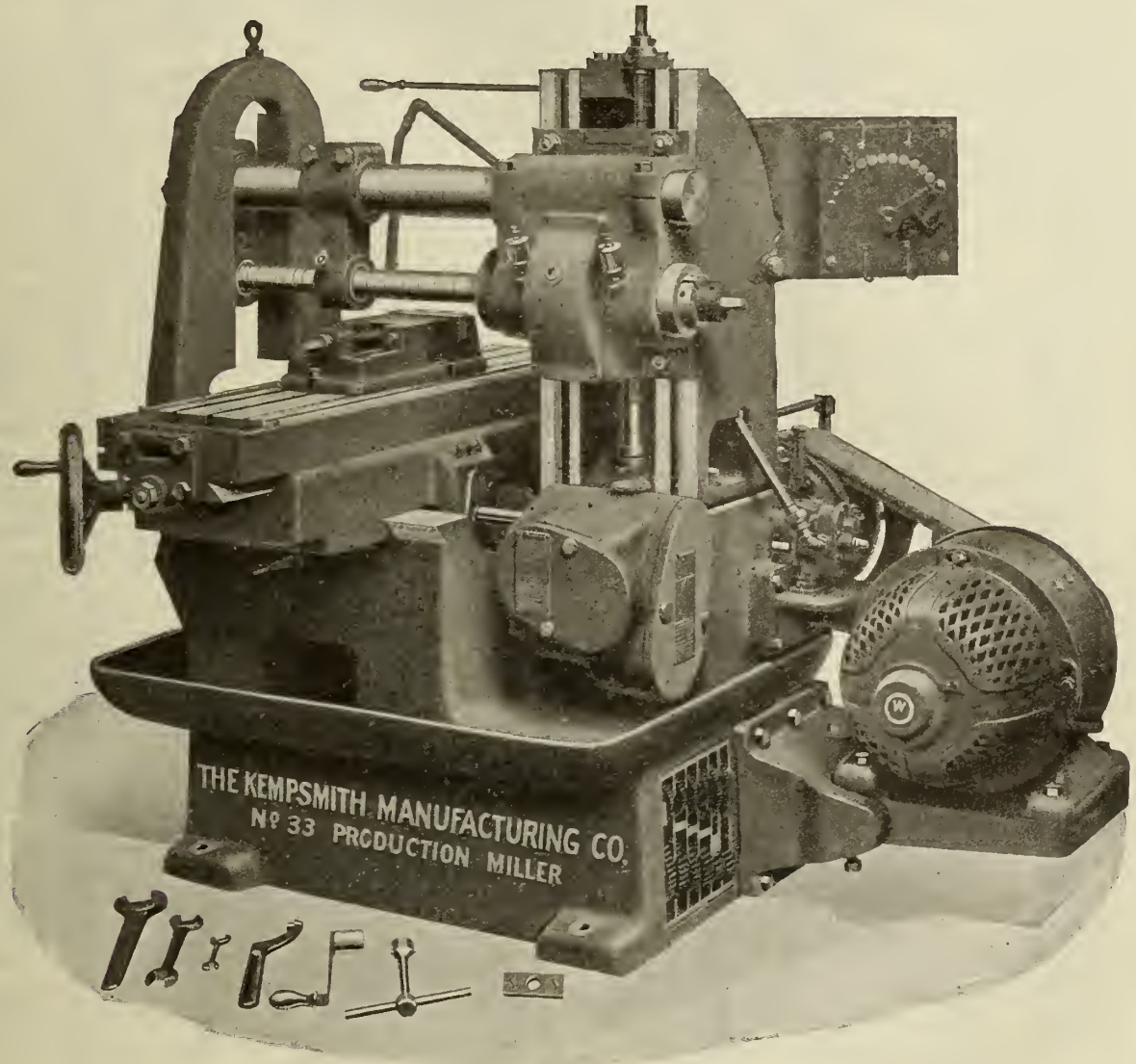
KEMPSMITH



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Canada Machinery Corp., Galt.

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Garlock-Walker Machy. Co., Ltd., Toronto
Garvin Machine Co., New York.
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Warner & Swasey Co., Cleveland, O.
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National Acme Co. Montreal.
Rice Lewis & Son, Toronto.
Steel Co. of Canada, Ltd., Hamilton.
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Strelinger Co., C. A., Windsor, Ont.
Standard Equipment & Tool Wks., Montreal.
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Knigh Metal Products, Toronto.

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Garlock-Walker Machy. Co., Ltd., Toronto
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Niles-Bement-Pond Co., New York.
Can. Drawn Steel Co., Hamilton.
Peekovers, Ltd., Toronto, Ont.
Petrie, Ltd., H. W., Toronto.
Pratt & Whitney Co., Dundas.
Rice Lewis & Son, Toronto.
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A. R. Williams Machy. Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

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Canada Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machy. Co., Ltd., Toronto
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Long & Allstatter Co., Hamilton, Ohio.
Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co, Toledo, O.

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Can Blower & Forge Co, Kitchener.
Canada Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machy. Co., Ltd., Toronto
Long & Allstatter, Hamilton, Ohio.
A. B. Jardine & Co., Hespeler, Ont.
National Machy. Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
H. D. Stoll Co. Inc., Buffalo, N.Y.
Strelinger, Chas. A. Co., Windsor, Ont.
Toledo Machine & Tool Co, Toledo, O.
Williams, White & Co., Moline, Ill.
Williams Mchy Co., A. R., Toronto, Ont.

SHEARS, ROTARY
The Quickwork Co., St. Mary's, Ohio.

SHEARS, PNEUMATIC
Toledo Machine & Tool Co., Toledo, Ohio

SHEARS, PLATE CUTTING, SLITTING
Dom. Steel Products Co., Ltd., Brantford.
Quickwork Co., St. Mary's, Ohio.

SHEARS, SPLITTING
Dom. Steel Products Co., Ltd., Brantford.

SHEARS, IRREGULAR AND CIRCLE CUTTING
The Quickwork Co., St. Mary's, Ohio.
D. H. Stoll Co., Inc., Buffalo, N.Y

SHEARS, SERPENTINE
The Quickwork Co., St. Mary's, Ohio.

SHEARS, SQUARING
Brown, Boggs & Co., Hamilton, Ont.
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Wilkinson & Kompass, Hamilton, Ont

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Katie Foundry, Galt, Ont.

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Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
Herbert, Ltd., Alfred, Toronto, Ont.
National-Acme Co., Cleveland, Ohio.
Niles-Bement-Pond Co., New York.

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Keystone Mfg. Co., Buffalo, N.Y.
Modern Tool Co., Erie, Pa.
J. Morrow Screw & Nut Co., Ingersoll, Ont
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.

SOIL PIPE FITTINGS, CAST IRON
Katie Foundry, Galt, Ont.

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Aikenhead Hardware Co., Toronto, Ont.
Brown, Boggs & Co., Hamilton, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.

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Aikenhead Hardware Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.
Tallman Brass & Metal Co., Hamilton.

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SPROCKETS, SPRING
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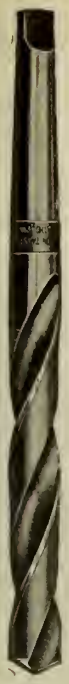

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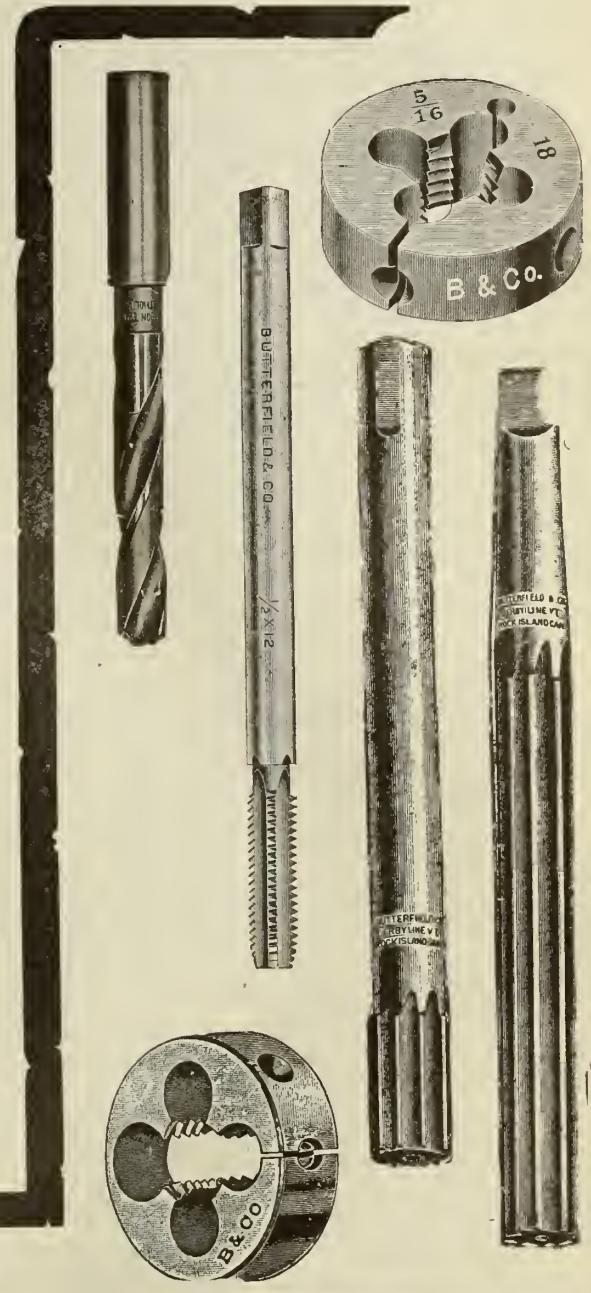
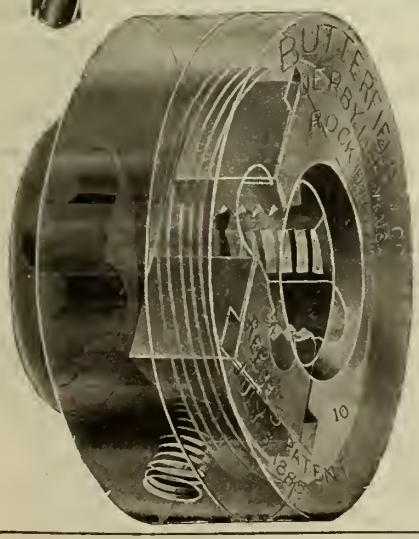
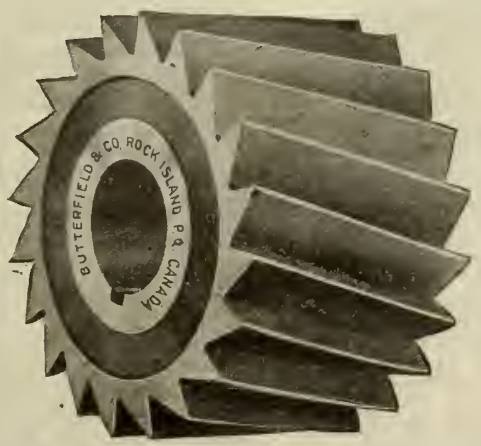


Butterfield & Company Division
Union Twist Drill Co.
ROCK ISLAND, QUE., CANADA
Toronto Office: 220 King St. West





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SANDERS
Oliver Mach. Co., Grand Rapids, Mich.

SAW BENCHES
Oliver Mach. Co., Grand Rapids, Mich.

SAW GUARDS
Oliver Mach. Co., Grand Rapids, Mich.

SAWING MACHINES
Herbert Ltd., Alfred, Toronto, Ont.

SAWS SWING
Oliver Mach. Co., Grand Rapids, Mich.

SMALL TOOLS
Herbert Ltd., Alfred, Toronto, Ont.

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Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield, Mass.
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Matthews, Jas. H & Co., Hartford, Conn.

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Marshall, Son & Bunney, Toronto.

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Marshall, Son & Bunney, Toronto.
Peckovers, Ltd., Toronto, Ont.
Samuel Osborne (Can.), Ltd., Montreal.
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Atkins & Co., Ltd., Wm. Sheffield, Eng.
Marshall, Son & Bunney, Toronto.
United Alloy Steel Corp., Canton, Ohio.

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Kayser-Ellison & Co., Ltd., Montreal.
Lyman Tube & Supply Co., Ltd., Montreal
Norton, Ralph B., Agent, Montreal.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall, Son & Bunney, Toronto.
United Alloy Steel Corp., Canton, Ohio.

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Kennedy & Sons, Wm., Owen Sound.
Electric Steel & Metals Co., Welland.
Nova Scotia Steel & Coal Co., Windsor.
Swedish Crucible Steel Co., Windsor.

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STEEL, COLD ROLLED
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Kayser-Ellison & Co., Ltd., Montreal.
Rice Lewis & Son, Toronto, Ont.
Swedish Steel & Importing Co. Ltd., Montreal.
Union Drawn Steel Co., Hamilton, Ont.

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United Alloy Steel Corp., Canton, Ohio.

STEEL FJAB
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STEEL, NICKEL
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Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.
United Alloy Steel Corp., Canton, Ohio.

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Baines & David, Toronto.
Wm. Atkins & Co., Sheffield, Eng.
Can. Fairbanks-Morse Co., Montreal
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H. A. Drury Co., Ltd., Montreal.
Firth & Sons, Thos., Montreal, Que
Illingworth Steel Co., J., New York.
Kayser Ellison & Co., Sheffield, Eng.
Latrobe Electric Steel Co., Latrobe, Pa
Marshall, Son & Bunney, Toronto, Ont
Osborne, Samuel, Montreal, P.Q.
Plewes, Ltd, Winnipeg, Man.
Pilot Steel & Tool Co., Montreal, Que.
Ralph B. Norton, Montreal, Que.
Rice Lewis & Son, Toronto, Ont.
Swedish Steel & Importing Co., Ltd., Montreal.
Vanadium-Alloys Steel Co., Pittsburgh.

STEEL, CHROME, MANGANESE
Joliette Steel Co., Montreal, Que.

STEEL, OPEN HEARTH
Illingworth Steel Co., John, New York
United Alloy Steel Corp., Canton, Ohio.

STEEL PLATES
Dominion Foundries & Steel Ltd., Hamilton, Ont.

STEEL PRODUCTS AND MACHINERY
Dom. Steel Products Co., Ltd., Brantford

STEEL, ROCK DRILL
Armstrong, Whitworth of Canada, Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.
Lincoln Electric Co. of Canada, Ltd., Toronto, Ont.

STEEL, SPECIAL ANALYSIS
United Alloy Steel Corp., Canton, Ohio.

STEEL, SPRING AND REINFORCING
Peckovers, Ltd., Toronto, Ont.
United Alloy Steel Corp., Canton, Ohio.

STEEL, STRUCTURAL
Algoma Steel Corp., Sault Ste. Marie
Dom. Iron & Steel Co., Sydney, N.S.
MacKinnon Steel Co., Sherbrooke, Que.
Peckovers, Ltd., Toronto, Ont.

STEEL, TOOL
Armstrong, Whitworth of Can., Montreal
Atkins & Co., Wm., Sheffield, Eng.
Baines & David, Toronto.
Can. Fairbanks-Morse Co., Montreal.
Drury Co., H. A., Montreal, Que.
Deloro Smelting & Refining Co., Ltd, Toronto, Ont.
Firth & Sons, Thos., Montreal, Que.
Hawkridge Bros. Co., Boston, Mass.
Kayser-Ellison & Co., Ltd., Montreal.
Lincoln Electric Co., of Canada, Ltd., Toronto, Ont.
Lyman Tube & Supply Co., Ltd., Montreal
Marshall, Son & Bunney, Toronto, Ont.
Latrobe Electric Steel Co., Latrobe, Pa.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son Toronto, Ont.
Vanadium-Alloys Steel Co., Pittsburgh.

STEEL TUBING
Tube Co. of Canada, Ltd,, Toronto, Ont.

STEEL, VANADIUM
Wm. Atkins & Co., Ltd., Sheffield, Eng.
Armstrong, Whitworth of Can., Montreal.
Dominion Foundries & Steel Ltd., Hamilton, Ont.
Drury, H. A., Co., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.
Vanadium-Alloys Steel Co., Pittsburgh.
Wells Bros. of Can., Galt, Ont.

"STELLITE"
Deloro Smelting & Refining Co., Ltd, Toronto, Ont.

STOCK RACKS FOR BARS, PIPING, ETC.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

STOCKS AND DIES
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros., of Can., Galt, Ont.

STOCKS, PIPE
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Rice Lewis & Son, Toronto, Ont.
Wells Bros., Co., of Canada, Galt, Ont.

STONES, COMMUTATORS
Lyman Tube & Supply Co., Ltd., Montreal

STRAIGHTENING MACHINERY
Baird Machinery Co., Bridgeport, Conn.
Bertrams, Ltd., Edinburgh, Scotland.

STRAND
Dom. Steel Products Co., Ltd., Brantford.
Page Steel & Wire Co., Adrian, Mich.

SURFACE PLATES
Brown & Sharpe Mfg. Co., Providence, R.I.

STRUCTURAL STEEL WORKS
William Hamilton Co., Peterboro, Ont.

SWITCHBOARDS
Northern Electric Co., Ltd., Montreal Que

SWITCHES, RAILWAY
Can. Steel Foundries, Ltd., Montreal.

TABLES, DRAWING
Boomsay Drawing Table Co., Adrian, Mich.

TABLES, SAND-BLAST
Pangborn Corporation, Hagerstown, Md.

TAPPING MACHINES (PNEUMATIC)
Cleveland Pneumatic Tool Co., Toronto.

TANKS, AIR, EXPANSION
Can. John Wood Mfg. Co., Ltd., Toronto

TANKS, GASOLINE, KEROSENE AND OIL
Bowser Co., Ltd., S. F., Toronto, Ont.
Can. John Wood Mfg. Co., Ltd., Toronto
Dominion Bridge Co., Montreal, Que.
Dom. Forge & Stamping Co., Walkerville.
MacKinnon Steel Co., Sherbrooke, Que.
Marshall, Son & Bunney, Toronto.

TANKS, LEAD LINED
Can. Hanson Van Winkle Co., Ltd.,

TANKS, LUBRICATING, OIL STORAGE
Bowser Co., Ltd., S. F., Toronto, Ont.
Can. John Wood Mfg. Co., Ltd., Toronto

TANKS, PNEUMATIC AND CLOSET
Can. John Wood Mfg. Co., Ltd., Toronto

TANKS, RUBBER CEMENT
Bowser Co., Ltd., S. F., Toronto, Ont.

TANKS, STEEL, WATER PRESSURE
Bowser Co., Ltd., S. F., Toronto, Ont.
Dominion Bridge Co., Montreal, Quebec.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
MacGovern & Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Toronto Iron Works, Ltd, Toronto.

TANK WAGONS
MacKinnon Steel Co., Sherbrooke, Que.
Toronto Iron Works, Ltd., Toronto.

TANKS, WELDED
Can. John Wood Mfg. Co., Ltd., Toronto
Can. Hanson Van Winkle Co., Ltd.,
Lincoln Electric Co. of Canada, Ltd., Toronto, Ont.

TANKS
Can. Ingersoll-Rand Co., Ltd., Sherbrooke
Elec. Steel & Metals, Welland, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
William Hamilton Co., Peterboro, Ont.

TAPER PINS
Galt Machine Screw Co., Ltd., Galt, Ont.

TAPES, MEASURING
James Chesterman & Co., Ltd., Sheffield, Eng.
Rice Lewis & Son, Toronto, Ont.

TAPPING MACHINES AND ATTACHMENTS
Bertram, John & Sons Co., Dundas.
Canada Machinery Corp., Galt, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garvin Machine Co., New York.
The Geometric Tool Co., New Haven.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchy Machine & Tool Co., Detroit.
Niles-Bement-Pond Co., New York.
Rickert-Shafer Co., Erie, Pa.
National-Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto.
L. S. Starrett Co., Athol, Mass.
Strelinger, Chas. A. Co., Windsor, Ont.
Whitney Mfg. Co., Hartford, Conn.
Williams Tool Corp. of Can. Ltd., Brantford, Ont.

TAPS, ADJUSTABLE
Butterfield & Co., Rock Island, Que.
Geometric Tool Co., New Haven.
Ingersoll Mach. Co., Ingersoll, Ont.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Pilot Steel & Tool Co., Montreal, Que.
Victor Tool Co., Waynesboro, Pa.

TAPS, GUN, HAND, BOILER
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

TAPS, MACHINE RELIEVED
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

TAPS, MACHINE SCREW
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

TAPS, PIPE
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield.
Ingersoll Mach. Co., Ingersoll, Ont.
Marshall, Son & Bunney, Toronto.
Wells Bros. of Can., Galt, Ont.

TAPS, SPECIAL
Elliott & Whitehall, Galt, Ont.

TAPS, STAYBOLT, TAPPER
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

TAPS, DIES AND WRENCHES
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Foss Mchy. & Sply. Co., G. F., Montreal.
Geometric Tool Co., New Haven.
Greenfield Tap & Die Corp., Greenfield.
Ingersoll Mach. Co., Ingersoll, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Morse Twist Drill & Mchy. Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Rice Lewis & Son, Toronto, Ont.
Starrett Co., L. S., Athol, Mass.
Strelinger, Chas. A. Co., Windsor, Ont.
Taylor, J. A. M., 318 Stair Bldg., Toronto.
Wells Bros. of Canada, Galt, Ont.

TAP EXTRACTORS
Walton Co., The, Hartford, Conn.

THERMOMETERS, INDUSTRIAL ENGRAVED TEMPERATURE AND PRESSURE
Taylor Instrument Co., Rochester, N.Y.

THERMOMETERS, RECORDING AND INDEX
Bristol Co., Waterbury, Conn., U.S.A.
Taylor Instrument Co., Rochester, N.Y.

TESTING INSTRUMENTS, METALLURGICAL
Shore Instrument & Mfg. Co., New York.

TENOVERS
Oliver Machy. Co., Grand Rapids, Mich.

TESTING LABORATORIES
Toronto Testing Laboratory, Toronto.

THREAD-CUTTING MACHINES
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Mach. Co., Ltd., Toronto.
Geometric Tool Co., New Haven.
Jardine & Co., Ltd., A. B., Hespeler.
Landis Machine Co., Waynesboro, Pa.
National-Acme Co., Cleveland, Ohio.
National Machy. Co., Tiffin, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Wells Bros. Co. of Canada, Galt., Ont.

THREADING TOOLS
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield.
Landis Machine Co., Waynesboro, Pa.
Pratt & Whitney Co., Dundas, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
Wells Bros. of Canada, Galt, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

THREADING MACHINES FOR BOLTS, NUTS AND PIPES
Greenfield Tap & Die Corp., Greenfield.
Petrie, Ltd., H. W., Toronto.
Wells Bros. Co. of Canada, Galt., Ont.

THREAD MILLING MACHINES
Taft-Pierce Mfg. Co., New York, N.Y.
Smalley-General Co., Bay City, Mich.

THUMB SCREWS AND NUTS
See Screws.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

TIN—PIG AND BAR
British Smelting & Refining Co., Ltd., Montreal, Que.

TINSMITHS' TOOLS
Brown, Boggs & Co., Hamilton, Can.
Petrie, Ltd., H. W., Toronto.

TIRE BENDERS
Jardine & Co., Ltd., A. B., Hespeler.

TIRE SETTING MACHINES, HYDRAULIC
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Perrin, Ltd., William R., Toronto.
West Tire Setter Co., Rochester, N.Y.

TOOL CASES
Rice Lewis & Son, Toronto, Ont.

TOOL HOLDERS
Aikenhead Hardware Co., Toronto, Ont.
Armstrong Bros. Tool Co., Chicago.
Cleveland Twist Drill Co., Cleveland.
Deloro Smelting & Refining Co. Ltd Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

TOOL MAKERS
Samuel Osborne (Can.), Ltd., Montreal.

TOOL POSTS, LATHE
Armstrong Bros. Tool Co., Chicago.
Williams & Co., J. H., Brooklyn, N.Y.

TOOL ROOM EQUIPMENT
Herbert Ltd., Alfred, Toronto, Ont.

TOOL ROOM PARTITIONS
Canada Wire & Iron Goods Co., Hamilton.

TOOLS, BLACKSMITHS'
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Rice Lewis & Son Toronto, Ont.

TOOLS, ADJUSTABLE BORING
Kelly Reamer Co., Cleveland, O.
Petrie, Ltd., H. W., Toronto.

TOOLS, ELECTRIC
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool Co., Chicago.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Machy. Co., A. R., Toronto.
U. S. Electrical Tool Co., Cincinnati, O.

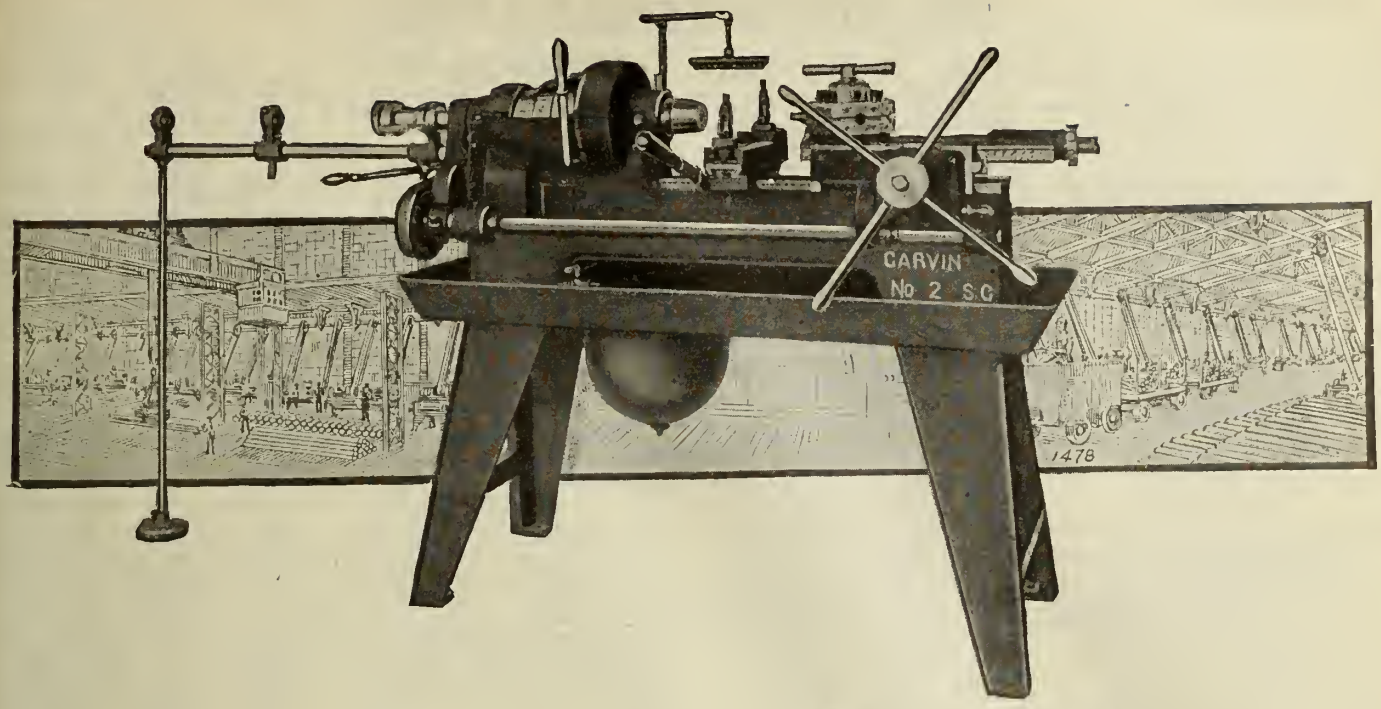
TOOLS, FORMING
Davidson Tool Mfg. Co., New York, N.Y.
Deloro Smelting & Refining Co., Ltd. Toronto, Ont.

TOOLS, LUMBERING
Thos. Pink & Co., Pembroke, Ont.

TOOLS, LATHE, PLANER, SLOTTER
Armstrong Bros. Tool Co., Chicago.
Gisholt Machine Co., Madison, Wis.
Williams & Co., J. H., Brooklyn, N.Y.

TOOLS, SCREW MACHINE
Foster Machine Tool Co., Hibbard, Ind.

TOOLS, SHOP
Strelinger Co., C. A., Windsor, Ont.



One or a Battery, Their Work Capacity Distinguishes Garvin Screw Machines

Simple, sturdy, easy to operate and always on the job.

The operator gets in the swing of things and rolls up a record for pieces per hour. And every piece to its proper dimensions and of evenly fine finish. Rejects are always fewest when good tools do the work.

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Before you invest in screw machine equipment you will surely want to look over the fine points of Garvin design — exclusive features that make these machines most desirable.

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GARVIN

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If interested tear out this page and place with letters to be answered.

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Crescent Machine Co., Ltd., Montreal, Que.
McClean Machine & Tool Co., Ltd., Hamilton, Ont.
McCrosky Tool Corp., Meadville, Pa., U. S. A.

TORCHES, BLOW
Ist. Mach. & Supply Co., Ltd., Montreal.

TORCHES, GASOLINE, KEROSENE AND ALCOHOL
Turner Brass Works, Sycamore, Ill.

TORCHES, STEEL
Armstrong, Whitworth of Can., Montreal.
Prest-O-Lite Co., Inc., Toronto, Ont.

TRACK SYSTEMS
Brown Hoisting Machinery Co., Cleveland, Ohio.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.

TRAM RAIL SYSTEMS (Overhead)
Brown Hoisting Machinery Co., Cleveland, Ohio.

TRAMWAYS, BRIDGE
Brown Hoisting Machinery Co., Cleveland, Ohio.

TRANSFORMERS
Can. General Electric Co., Toronto, Ont
MacGovern & Co., Montreal, Que.
Northern Electric Co., Ltd., Montreal.

TRANSITS
Hughes, Owens Co., Ltd., Montreal, Que.

TRANSMISSION CHAIN
Lyman Tube & Supply Co., Ltd., Montreal
Morris Chain Co., Ithaca, New York.
Renold of Canada Ltd., Montreal.

TRANSMISSION MACHINERY
American Pulley Co., Philadelphia, Pa.
Can. Link-Belt Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Coventry Chain Co., Coventry, England.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Hamilton Gear & Machine Co., Toronto.
Jones & Glassco, Montreal.
Kennedy & Sons, Wm., Owen Sound, Ont.
Morse Chain Co., Ithaca, N.Y.
Petrie, Ltd., H. W., Toronto.
Renold of Canada Ltd., Montreal.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Machinery Co., A. R., Toronto.

TRANSMISSION ROPE
Jones & Glassco, Montreal, Que.
MacKinnon Steel Co., Ltd., Sherbrooke.

TRANSMISSION TOWERS
Curtis Pneumatic Machy. Co., St. Louis.
Dominion Bridge Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Northern Crane Works, Walkerville.
Tallman Brass & Metal Co., Hamilton.

TROLLEYS
Brown Hoisting Machinery Co., Cleveland, Ohio.
Lyman Tube & Supply Co., Ltd., Montreal
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

TRUCKS, FACTORY, FREIGHT, ETC
Canada Machinery Corp., Galt, Ont.
Chapman Double Ball Bearing, Toronto.
Cowan Truck Co., Holyoke, Mass.
Holyoke Truck Co., Holyoke, Mass.
MacKinnon Steel Co., Sherbrooke, Que.
Rice Lewis & Son, Toronto, Ont.

TRUCKS, ELECTRIC
Cowan Truck Co., Holyoke, Mass.
Good Engineering Co., Toronto, Ont.

TRUCKS, FLOOR
Cowan Truck Co., Holyoke, Mass.
Holyoke Truck Co., Holyoke, Mass.

TRUCKS, HAND
Can. Kron Scale Co., Montreal, P.Q.
Cowan Truck Co., Holyoke, Mass.

TRUCKS, LUMBER AND KILN
Holyoke Truck Co., Holyoke, Mass.
Swedish Steel & Importing Co., Montreal.
Northern Crane Works, Walkerville.

TRUCKS, LIFT, ELEVATING & TRANSFER
Cowan Truck Co., Holyoke, Mass.
Holyoke Truck Co., Holyoke, Mass.

TUBES, BOILER
Lyman Tube & Supply Co., Montreal, Que.

TUBING ELECTRIC WELDED OR OXYACETYLENE WELDED
Tube Co. of Can., Ltd., Toronto, Ont.

TUBE PROUCTS
Tube Co. of Can., Ltd., Toronto, Ont.

TUBING, SEAMLESS, BRASS AND COPPER
Lyman Tube & Supply Co., Montreal, Que.
Standard Tube & Fence Co., Woodstock.
Tallman Brass & Metal Co., Hamilton.

TUBING, FLEXIBLE METALLIC
Lyman Tube & Supply Co., Montreal, Que.

TUBING, SEAMLESS STEEL
Tube Co. of Can., Ltd., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.

TUBING, WELDED STEEL
Lyman Tube & Supply Co., Montreal, Que.
Tube Co. of Can., Ltd., Toronto, Ont.

TURRET MACHINES, LATHES
Acme Mach. Tool Co., Cincinnati, Ohio
Brown & Sharpe Mfg. Co., Providence.
Garlock-Walker Machinery Co., Toronto
Greenfield Tap & Die Corp., Greenfield
Hardinge Bros., Chicago, Ill.
Oliver Mchy. Co., Grand Rapids, Mich
Pratt & Whitney, Hartford, Conn.
Petrie, Ltd., H. W., Toronto.
Steinle Turret Mach. Co., Madison, Wis
Strelinger, Chas. A. Co., Windsor, Ont.
Warner & Swasey Co., The, Cleveland, O

TURBO GENERATOR UNITS
Garvin Machine Co., New York.
Holden Co., Ltd., Montreal, Que.
MacGovern & Co., Montreal, Que.
Warner & Swasey, Cleveland, O.

TURNBUCKLES
Canada Fdrs. & Forg. Ltd., Welland.
, Morrow Screw & Nut Co., Ingersoll, Ont.
Rice Lewis & Son, Toronto, Ont.

TURNTABLES
Can. Link-Belt Co., Toronto, Ont.
Dom. Bridge Co., Ltd., Montreal, P.Q
Elec. Steel & Metals, Welland, Ont.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

TWIST DRILLS
Butterfield & Co., Inc., Rock Island, Que

UPSETTING AND BENDING MACHINERY
Bertram & Sons Co., John, Dundas.
Brown, Boggs Co., Ltd., Hamilton, Can.
Ford-Smith Machine Co., Hamilton, Ont
Garlock-Walker Machinery Co., Toronto.
Jardine & Co., A. B., Hespeler, Ont.
National Machy. Co., Tiffin, O.
Canada Machinery Corp., Galt, Ont.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Williams Machy. Co., A. R., Toronto.

VACUUM PUMPS
Holden Co., Ltd., Montreal, Que.

VALVE LEATHERS
Graton & Knight Mfg. Co., Montreal.

VALVES, MIXING
Crane, Ltd., Montreal, Que.

VALVES (IRON) STANDARD AND EXTRA HEAVY
Crane, Ltd., Montreal, Que.

VALVE GRINDERS (PNEUMATIC)
Cleveland Pneumatic Tool Co., Toronto.

VALVES, HYDRAULIC
Metalwood Mfg. Co., Detroit, Mich.

VALVES, RUBBER PUMP
International Mach. Spls., Ltd., Montreal
Quaker City Rubber Co., Philadelphia

VENTILATORS
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Brantford Oven & Rack Co., Brantford.
Can. Blower & Forge Co., Kitchener, Ont.
Petrie, Ltd., H. W., Toronto.
Sturtevant Co., B. F., Galt, Ont.
Williams Machy. Co., A. R., Toronto.

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Williams & Co., J. H., Brooklyn, N.Y.

VISES, BENCH
Aikenhead Hardware Co., Toronto, Ont.
Becker Milling Machine Co., Boston, Mass.
Foss Machy. & Spty. Co., G. F., Montreal.
Petrie, Ltd., H. W., Toronto.
Chicago Flexible Shaft Co., Chicago, Ill.
Strelinger, Chas. A. Co., Windsor, Ont.
Superior Machinery Co., London, Ont.

VISES, DRILL
Superior Machinery Co., London, Ont.

VISES, PIPE
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Rock Island, Que.
Marshall, Son & Bunney, Toronto.
Petrie, Ltd., H. W., Toronto.
Wells Bros. Co. of Canada, Galt, Ont.
Williams & Co., J. H., Brooklyn, N.Y.
Strelinger, Chas. A. Co., Windsor, Ont.

VISES, MILLING MACHINE
Brown & Sharpe Mfg. Co., Providence, R.I.
Superior Machinery Co., London, Ont.

VISES, PLANER AND SHAPER
Aikenhead Hardware Co., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Petrie, Ltd., H. W., Toronto.
Superior Machinery Co., London, Ont.

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Northern Electric Co., Ltd., Montreal Que

WASHER MACHINES
National Machy. Co., Tiffin, Ohio.

WASHERS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Barnes, Wallace, Co., Bristol, Conn.
Graton & Knight Mfg. Co., Worcester.
Kayser-Ellison & Co., Ltd., Montreal.
London Bolt & Hinge Wks., London, Ont.
Marshall, Son & Bunney, Toronto.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Norton, Ralph B., Agent, Montreal.
Steel Co. of Canada, Ltd., Hamilton, Ont.

WASTE
Wilkinson & Kompass, Hamilton, Ont.
Wood Turret Machine Co., Brasil, Ind.

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Oakley Chemical Co., New York, N.Y.

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Can. Link-Belt Co., Toronto, Ont.

WATER TOWERS
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Toronto Iron Works, Ltd., Toronto.

WATER WHEELS
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Hamilton Co., Ltd., Wm., Peterborough.

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Can. John Wood Co., Toronto, Ont.
Lincoln Electric Co. of Canada, Ltd., Toronto, Ont.

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Knight Metal Products, Toronto.

WELDERS, ELECTRIC ARC
Lincoln Electric Co. of Canada, Ltd., Toronto, Ont.

WELDING, ELECTRIC, SPOT, BUTT, ETC.
McClean Machine & Tool Co., Ltd., Hamilton, Ont.
Tabor Mfg. Co., Philadelphia, Pa.

WELDING MASKS
Carter Welding Co., Ltd., Toronto, Ont.
Davis-Bournonville Co., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.

WELDING GOGGLES
Carter Welding Co., Ltd., Toronto, Ont.
Davis-Bournonville Co., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.
Willson Goggles Inc., Reading, Pa.

WELDING RODS AND WIRE
Carter Welding Co., Ltd., Toronto, Ont.
Davis-Bournonville Co., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.
Lincoln Electric Co. of Canada, Ltd., Toronto, Ont.
Page Steel & Wire Co., Adrian, Mich.

WELDING SUPPLIES
Carter Welding Co., Ltd., Toronto, Ont.
Davis-Bournonville Co., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.
Lincoln Electric Co. of Canada, Limited, Toronto, Ont.
Nat. Electro Products Ltd., Toronto, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
Union Carbide Co. of Can. Ltd., Welland Ont.

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Carter Welding Co., Ltd., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
L'Air Liquide Society, Toronto, Ont.

WELDLESS BOILER TUBES
Furniss, Clarke & Co., Montreal, Que

WHEELS, BALL BEARING
Lyman Tube & Supply Co., Montreal, Que

WHEELS, CAR, STEEL
Dominion Foundries & Steel Ltd., Hamilton, Ont.
Elec. Steel & Metals, Welland, Ont.

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Can. Link-Belt Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto

WHEELS, TURBINE, WATER
Elec. Steel & Metals, Welland, Ont

WHEELS, PRESSED STEEL
American Pulley Co., Philadelphia, Pa.

WHEEL TRUEING TOOLS
Petrie, Ltd., H. W., Toronto.
Wheel Trueing Tool Co., Windsor, Ont

WINCHES
Can. Ingersoll-Rand Co., Sherbrooke, Que
Canadian Mead-Morrison Co., Limited, Montreal, Que.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Kennedy & Son, Wm., Owen Sound, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Williams Tool Corp. of Can. Ltd., Brantford, Ont.

WINCHES, MOTOR TRUCK
Canadian Mead-Morrison Co., Limited, Montreal, Que.

WINCHES, POWER DRIVEN
Canadian Mead-Morrison Co., Limited, Montreal, Que.
Hamilton Co., Ltd., Wm., Peterborough, Ont.

WIRE, CAST STEEL AND MUSIC
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.

WIRE COILING AND POINTING MACHINERY
Baird Machine Co., Bridgeport, Conn

WIRE STRAIGHTENERS AND CUTTERS
Shuster Co., he F. B., New Haven, Conn.

WIRING MACHINES
Quickwork Co., St. Marys, Ohio.

WIRE GUARDS
B. Greening Wire Co. Hamilton, Ont.
WIRE CLOTH AND PERFORATED METALS
Canada Wire & Iron Goods, Hamilton.
Page Steel & Wire Co., New York, N.Y.

WIRE FENCING
WIRE, COPPER, CLAD STEEL
WIRE, LINK FABRIC
Page Steel & Wire Co., Adrian, Mich.

WIRE FORMING AND STAMPING MACHINERY
Baird Machine Co., Bridgeport, Conn.
Brown, Boggs Co., Ltd., Hamilton, Can.

WIRE GUARDS
Can. Wire & Iron Goods Co., Hamilton, Ont.

WIRE NAILS
Page Steel & Wire Co., New York, N.Y.
Parmenter & Bulloch Co., Gananoque.
Steel Co. of Canada, Ltd., Hamilton, Ont.

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Samuel Osborne, Ltd., Montreal, P.Q.

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National Machy. Co., Tiffin, Ohio.
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WIRE, SPARK PLUG, MANGANESE NICKEL, COPPER NICKEL, MONEL METAL
Can. Driver-Harris Co., Ltd., Walkerville.

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Cowan Truck Co., of Galt, Galt, Ont.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto.
Petrie, Ltd., H. W., Toronto.
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Shuster Co., F. B., New Haven, Conn.

WOOD BORING MACHINES
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Holden Co., Ltd., Montreal, Que.

WOODWORKING MACHINERY
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Cowan Truck Co., of Galt, Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Oliver Machy. Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto.
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Silver Mfg. Co., Salem, Ohio.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Machy. Co., A. R., Toronto.

WOOD MILLING MACHINES AND SHAPERS
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Armstrong Bros. Tool Co., Chicago, Ill.
Butterfield & Co., Rock Island, Que.
Canada Fdrs. & Forg., Ltd., Welland
Keystone Mfg. Co., Buffalo, N.Y.
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Morrow Screw & Nut Co., Ingersoll, Ont.

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CANADIAN MACHINERY AND MANUFACTURING NEWS
143 UNIVERSITY AVE., TORONTO, CANADA

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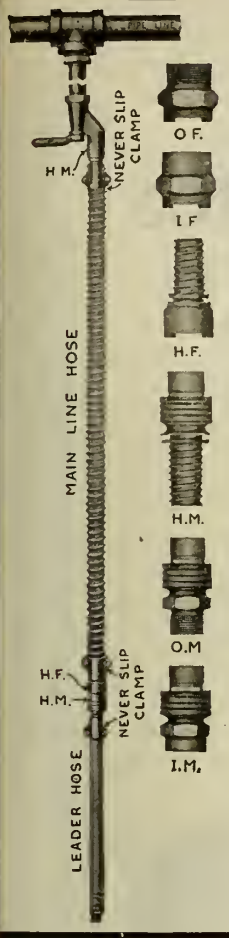
CLEVELAND HOSE SPECIALTIES



Bowes Automatic Air Hose Couplings

Standard Equipment Everywhere

STYLE O.F. is an Outside Thread Female Pipe End. Made in sizes ⅜-inch to 1½-inch.
STYLE I.F. is an inside Thread Female Pipe End. Made in sizes ¼-inch to 1½-inch.
STYLE H.F. is a Female Hose End with spiral shank to insert into the hose and has groove for the Never Slip Hose Clamp. Made in sizes ¼-in. to 1½-in.
STYLE H.M. is a Male Hose End with spiral shank to insert into the hose and has groove for the Never Slip Hose Clamp. Made in sizes ¼-in. to 1½-in.
STYLE O.M. is an Inside Thread Male Pipe End Made in sizes ¼-in. to 1½-in.
STYLE I.M. is an Inside Thread Male Pipe End. Made in sizes ⅜-in. to 1½-in.
The Male and Female Ends of Bowes Couplings interchange in sizes ¼-in. to ¾-in. Sizes 1-in. and 1¼-in. interchange. The 1½-in. ends interchange only with themselves.

BOWES COUPLINGS

Are instantly connected or disconnected.
They are absolutely air-tight under all pressures.
They quickly pay for themselves by stopping costly leaks.
They interchange in sizes most commonly used.
They have no loose parts to be mislaid or lost.
They are made of brass and will not rust.
The U-shaped Gasket interchanges in couplings ¼-inch to ¾-in.

The Cleco Never Slip Hose Clamp

Made in same sizes as Bowes Couplings

The adjoining cut of Cleco Never Slip Hose Clamp shows the "Flanges" which engage the groove provided in all hose ends of Bdwes Couplings. The "Model Hose Line" illustrated shows correct styles of couplings and valve to use and proper way to attach the clamps.

CLECO GROOVED HOSE NIPPLE

Grooved Nipples when attached to hose with the wire clamp cannot "blow-out," as one-half of the Wire Clamp lies in Nipple Groove, and the other half on the hose, uniting nipple and hose permanently.

WIRE CLAMP TOOL

To apply Wire Clamps to Grooved Hose Nipples you need the Wire Clamp Tool illustrated, a small hand-operated tool at moderate cost which we carry in stock for immediate delivery. In Stock:

Use Annealed Wire No. 14

Riveting and Chipping Hammers, Four-piston Air Drills, Corner Drills, Emery Grinders, Sand Rammers, Holder Ons, etc.

Write for Bulletin 38 illustrating Cleco Hose Fittings, Couplings, Valves, etc.

IMPORTANT:—The Small Leaks in your "AIR LINE" mean serious loss in DOLLARS. Have you any idea of the amount of "Air" wasted in small leaks at your connections? Air Leakage through 1-16 in. opening equals 5.32 cu. ft. per minute at 80 lbs. It will pay you to install Bowes Couplings and stop costly leaks.

Write for Bulletin 34A, 41 and 43.

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A. R. WILLIAMS MACHINERY CO., TORONTO, 337 Craig St., W., MONTREAL. WILLIAMS & WILSON, MONTREAL

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"Hendey Lathes Are the Very Best of Engine Lathes"

Brunswick Refrigerator Co.
New Brunswick, New Jersey.

When deciding which lathe is best suited for **your** work, you will naturally desire to know the production records of each.

The illustration shows the capability of the Hendey in handling heavy jobs, and the owners of the lathe —The Brunswick Refrigerator Co.—tell the quality of its work. This particular job consists of turning, facing and corrugating semi-steel compression cylinders. Depth of stock removed, ¼ in. Depth of cut, 3/16 in. Limits of accuracy required, .001 in. Production, five cylinders per day.

When considering the purchase of lathes, remember the reputation of the Hendey among its users.

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Torrington, Conn., U.S.A.

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If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

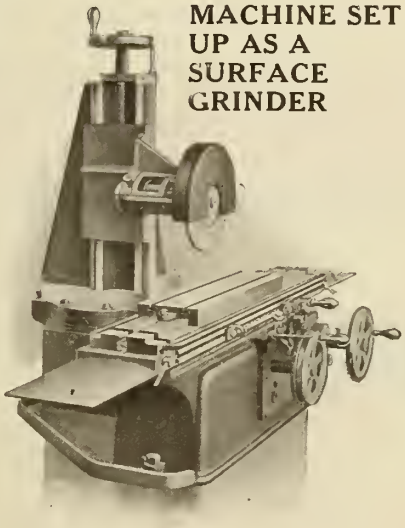
Foss QUALITY Foss SERVICE Foss

FRASER No. 1 Universal Convertible Grinder

(Patented May 28, 1918)

MACHINE SET UP AS AN INTERNAL GRINDER

MACHINE SET UP AS A SURFACE GRINDER



By the change of heads the machine can be converted into an efficient high-speed internal grinder; also a surface grinder of considerable range

PATENTED APRON CONSTRUCTION. All the springs on this machine are enclosed and can be removed or replaced without disturbing any other part of the machine.

Capacity: Cylindrical work 8 in. x 2 in.
Surface work, 6 in. x 20 in.
and up to 8 in. in height.

May we send you the fullest details?

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And many others.

The Geo. F. Foss Machinery & Supply Co., Limited

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Foss QUALITY Foss SERVICE Foss

GREAT DRIVING POWER

characterizes the

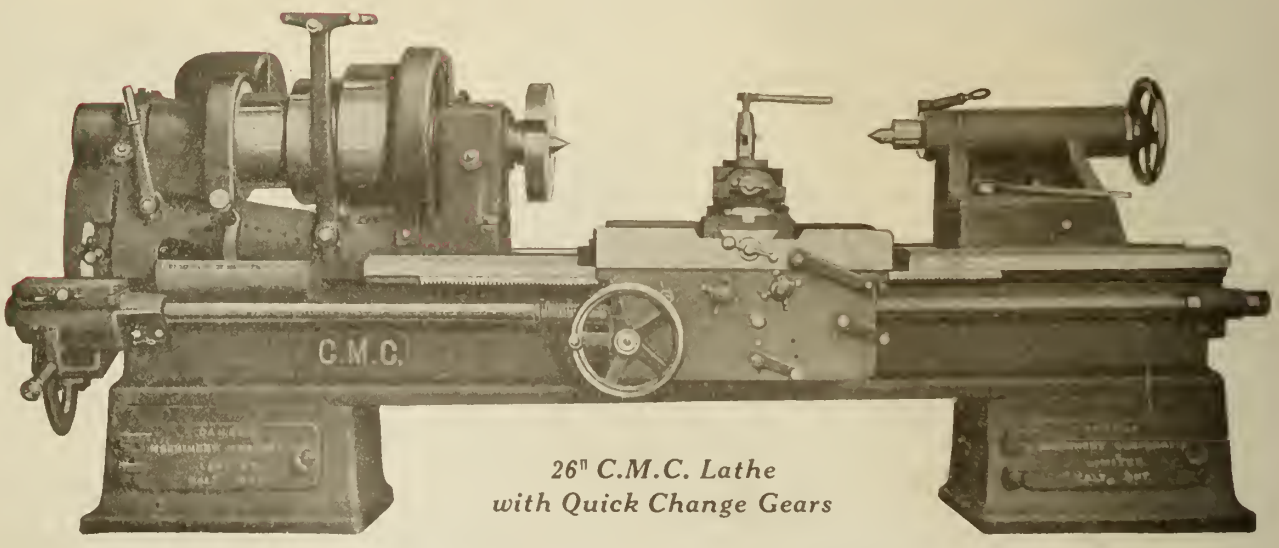
C.M.C. LATHE HEADSTOCK

C.M.C.

The C.M.C. headstock is of the three step cone, double back geared type, which arrangement permits the use of a cone pulley with extra wide faces and consequently of wider belts. Wide belts give great power, great production and great profits. The machine illustrated carries 5½″ belts.

The double back gears in combination with the three step cone pulley gives ample spindle speeds for all practical purposes.

No intending lathe purchaser can afford to overlook the C.M.C.



26" C.M.C. Lathe with Quick Change Gears

CANADA MACHINERY CORPORATION LIMITED

GALT ONTARIO

Toronto Office and Warerooms: Brock Avenue Subway

CANADIAN MACHINERY AND MANUFACTURING NEWS

Vol. XXIV., No. 6 | Published by the MacLean Publishing Company, Limited, Toronto | August 5, 1920 | $4.00 a Year Subscription Price

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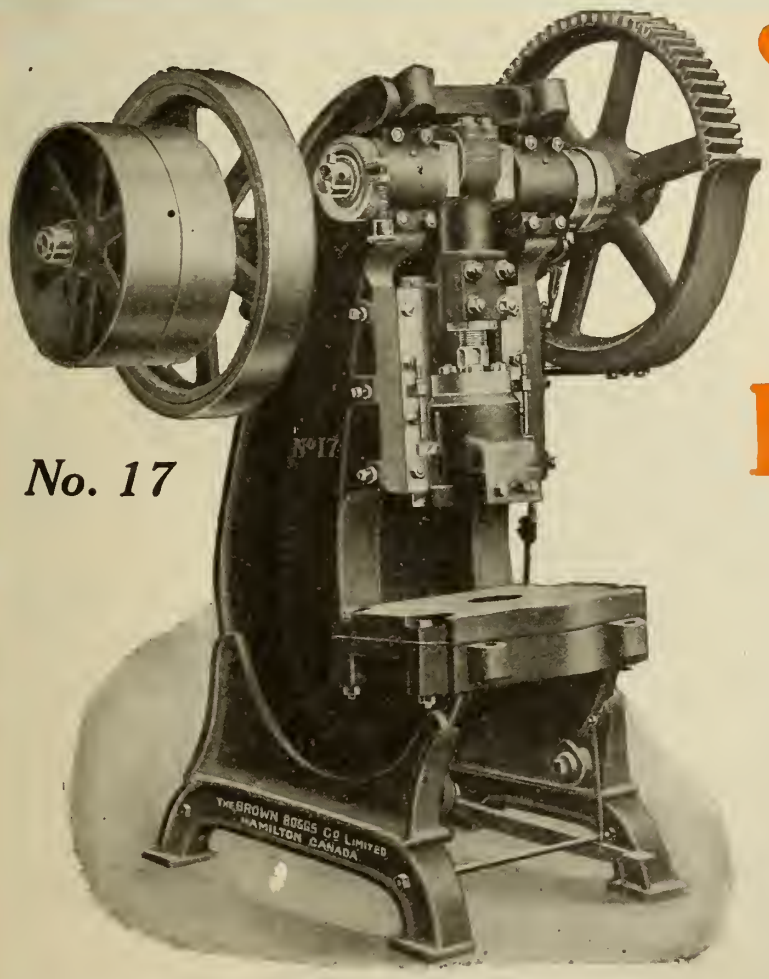

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OUR Power Presses possess several new features which place them in advance of any other machine tool of their kind for general efficiency.

The Pitman connection is of the ball type, made *from High Carbon Steel* carefully heat-treated so as to give *Maximum Service.*

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We manufacture a full line of Power Presses for blanking, forming, punching, trimming, etc., in many different types, also Shears, Bending Rolls, Brakes, etc.

The Brown-Boggs Co., Limited

Hamilton Canada

Manufacturers of Sheet Metal Working Machinery, Presses, Shears, Rolls, etc.

You Need a Good Die Stock Set

if you need one at all.

Because a **GOOD** Die Stock Set embodies:

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2. Adjustment for wear.
3. Free cutting qualities.
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5. Ample adjustment for oversize or undersize.

P. & W. Die Stock Dies **ARE GOOD DIES.**

BETTER than most because of the interchangeable feature in their chasers. A broken chaser in a P. & W. Die doesn't mean a new set of chasers. You can get a new chaser to replace a breakage and the new one "fits in" perfectly in your old set. That's the 6th point, **"ECONOMY IN OPERATION."**

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the BERTRAM Page

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	R.P.M	Volts	Phase	Cycle	PRICE EACH F.O.B. Dundas
1—75 H.P. Type C.C.L.	700	550	3	25	$910
1—50 H.P. Type H.S.	720	550	3	25	900
1—40 H.P. Type C.C.L.	710	550	3	25	925
3—30 H.P. Type C.C.L.	715	550	3	25	965
1—20 H.P. Type C.C.L.	710	550	3	25	400
1—15 H.P. Type C.C.L.	720	550	3	25	550

Canadian General Electric Motors

2—30 H.P. 1 Form K	750	550	3	25	440
1— 2 H.P. A 20/2	1,435	550	3	25	85

Canadian Crocker Wheeler Motors

2—75 H.P. Size 123 FQ	750	550	3	25	1,205
1—50 H.P. Size 124 AQ	500	550	3	25	885
2—50 H.P. Size 122 AQ	750	550	3	25	900
1—40 H.P. Size 122 Q	750	550	3	25	525
6—30 H.P. Size 120 Q	750	550	3	25	660
1—25 H.P. Size 119 Q	750	550	3	25	610
3—20 H.P. Size 118 Q	750	550	3	25	560
*1—10 H.P. Size 116 Q	750	550	3	25	445
*4— 5 H.P. Size 114 AQ	750	550	3	25	245

*NEW

All these motors are in first class condition. Motors over 5 H.P. are complete with oil-immersed auto starters, and all are equipped with Base and Pulley.

The John Bertram & Sons Co., Limited

DUNDAS. ONTARIO. CANADA.

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CUTLER-HAMMER — Control Apparatus, Magnetic Clutches, Lifting Magnets

Wagner, Quality — Single Phase Motors

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Northern Electric Company LIMITED

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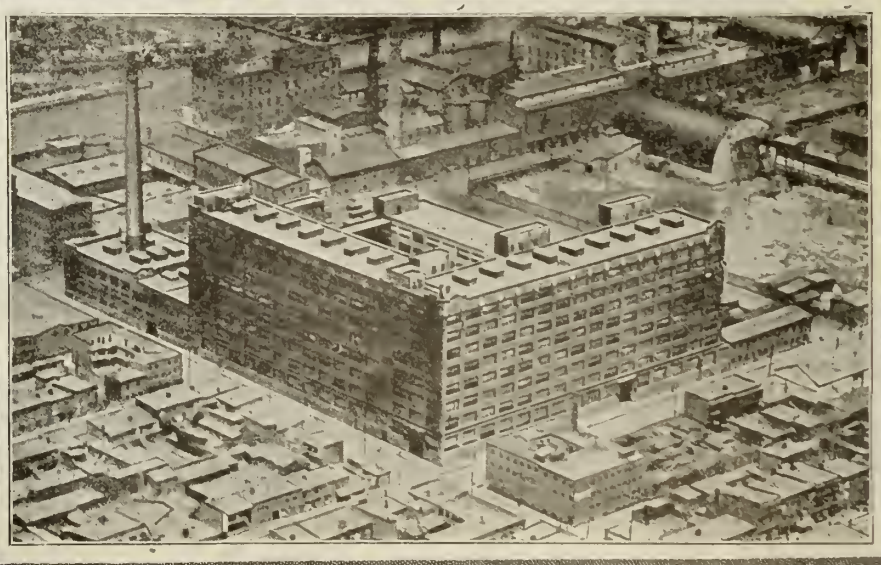
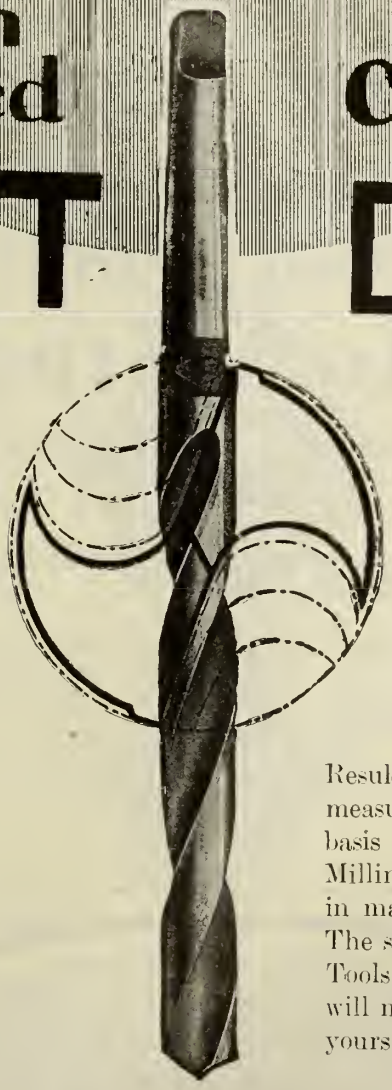


WILT

High Speed and Carbon

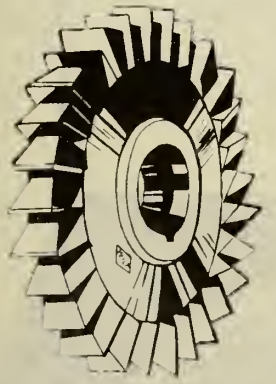
TWIST DRILLS



Where there's a WILT—

There's the Way.

REAMERS AND MILLING CUTTERS



Results constitute the only adequate measure of worth of any tool—and on this basis Wilt Twist Drills, Reamers and Milling Cutters have been made standard in many of Canada's largest shops.

The satisfaction and economy which Wilt Tools have brought about in other plants will naturally follow their introduction in yours.

TRY THEM FOR RESULTS

Wilt Tools tend to greatest production per man, per machine, per minute. Make Wilt Tools standard throughout your shop.

WILT TWIST DRILL COMPANY
OF CANADA, LIMITED

Walkerville Ontario

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ALGOMA STEEL CORPORATION, LTD.

SAULT STE. MARIE, ONT., CANADA

STEEL RAILS
Open Hearth Quality
(All Sections from 12 lbs. to 100 lbs. per yard)

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STEEL
TIE PLATES

PIG IRON
BASIC, FOUNDRY—
MALLEABLE

SULPHATE OF
AMMONIA

BLOOMS, BILLETS

SLABS

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MERCHANT BARS

CONCRETE
REINFORCING BARS

IRON, BRASS AND
BRONZE CASTINGS

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HOT ROLLED BARS

We also furnish in
BLOOM, BILLET AND
SLAB FORM.

SULPHURIC ACID
NITRE CAKE

MARK OF ALGOMA OH QUALITY

MARK OF ALGOMA OH QUALITY

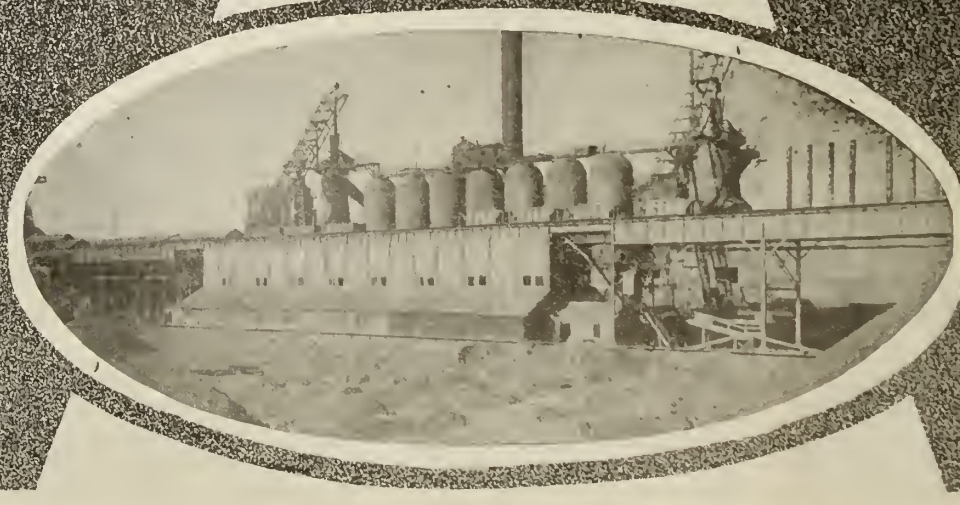
Open Hearth
Alloy Steel

Chrome-Vanadium Chrome-Nickel
Nickel

All of these steels we supply in **Hot Rolled Bars.** We also furnish in **Bloom, Billet** and **Slab** form.

The quality of our product is of the very best—and is exclusively steel made by the Open Hearth Process, and can be furnished in all grades, from the softest rivet stock to high carbon special spring material.

Order from us and you'll get both quality and prompt service. A trial is convincing.



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Supplies Everything for the Machine Shop

THE position held by H. W. Petrie, Limited, among the machinery trade in Canada didn't just happen. Consistently good service extending over half a century is accountable.

This service consists mainly in being able to fill every need of the machine shop in dealing in quality lines and in making prompt shipments.

TWO heads are better than one. So when you have any machinery problems why not let our engineering department co-operate with you?

Our long and varied experience places us in a position to render worth while service. When you ask our help you are not placed under any obligation. Our services are gratis.

H. W. Petrie, Limited

Toronto and Hamilton

CANADA'S DEPENDABLE

MACHINERY

AND SUPPLY HOUSE

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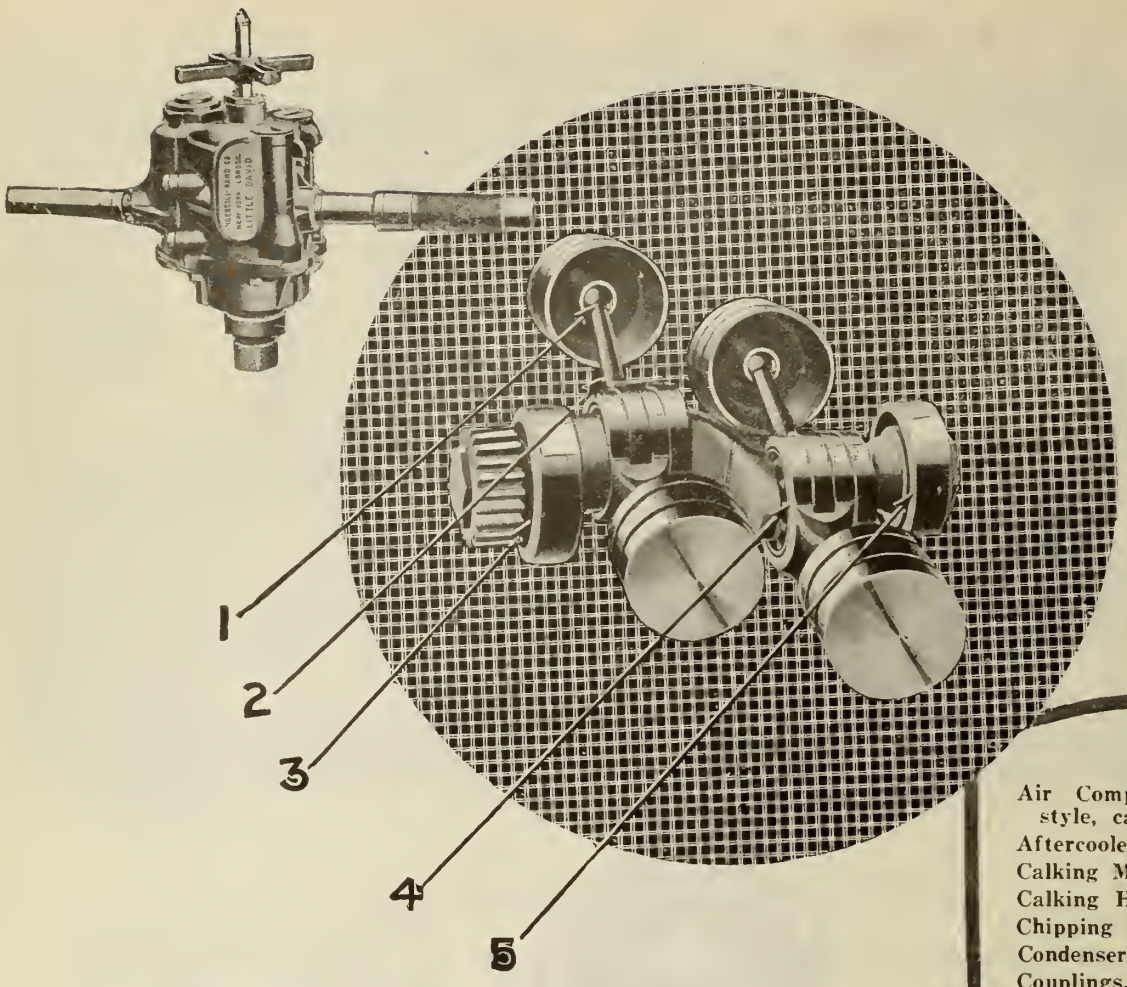

Five Vital Reasons Why LITTLE DAVID Drills Are Long on Service and Short on Repair Costs

1. **Ball and socket joins between pistons and connecting rods—simple and strong.**
2. **Solid drop-forged-connecting rods, no nuts to work loose, threads to strip, or cotter pins to shear.**
3. **Ball bearing takes up thrust and relieves outside frame from stresses and strains.**
4. **Roller bearings between connecting rods and crank pins reduce friction and make an easy running tool.**
5. **Ball bearing provides large bearing surface, reduces friction and minimizes wear.**

Air Compressors, any style, capacity or drive
Aftercoolers, Air
Calking Machines
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Hoists, Air, Steam and Electric
Hose, Pneumatic
Pumps, Air Lift
Pumps, Hydraulic
Pumps, Vacuum
Receivers, Air
Reheaters, Air
Riveting Hammers
Saws, Pneumatic
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All four pistons and connecting rods are interchangeable. Valves are also interchangeable and being of the rotary type are geared direct without the use of straps or eccentrics. Due to their extreme simplicity individual parts have greater strength and stand up longer and when repairs do become necessary they can be made easily and quickly.

These are only a few of many exclusive features that make Little Davids most desirable, features that appeal particularly to the user and repair man. They are more durable and efficient, cheaper to maintain, and will stand a greater overload without stalling than any other drill on the market.

Drills and other members of the Little David Family are described bulletin series 8000 —copies of which are yours for the asking.

Canadian Ingersoll-Rand Company Limited

SYDNEY COBALT SHERBROOKE WINNIPEG MONTREAL NELSON TORONTO VANCOUVER

Goggles for Chippers

STOCO

SAFETY GOGGLES

"CELOGLAS"

SHATTER-PROOF LENS

STOCO Safety Goggles because of their broad smooth surfaces bearing on the face and their remarkably light weight—when their strength and durability are considered—may be worn for hours at a stretch without discomfort.

This feature coupled with the fact that they protect between the eyes makes STOCO Safety Goggles—when equipped with Celoglas Shatter-Proof Lenses—the ideal protection glass for wear by operators on chipping and similar work where the eye hazard is high and continuous.

We are always glad to send a sample STOCO Safety Goggle without charge to interested responsible people on receipt of request on letterhead.

STOCO SAFETY GOGGLES

Price per Hundred (F.O.B. Geneva, N.Y.)

With Celoglas Shatter-Proof Lenses $115.00
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Adjustable black elastic headbands or easy cable temples at the same price.

Discounts for quantity orders.

STANDARD OPTICAL CO.
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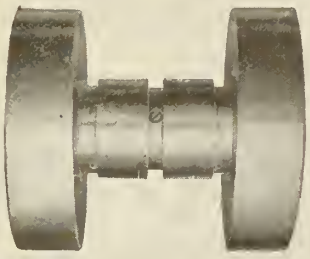
THE JOHNSON FRICTION CLUTCH

A Clutch of Known Quality Built to Your Own Requirements



That's what you get in the Johnson Clutch. A clutch that you can rely on — that has proven its merits—and still one that can be applied to your own requirements, just as well as if you built it yourself. If your drive comes within the rating of Johnson Clutches, we can develop the most satisfactory clutch to handle it.

Johnson Clutches are adaptable to high speed and low speed, to all conditions of service, from the most delicate to the most strenuous. They are exceptionally serviceable in machine installations. Our booklet, "Clutches as Applied to Machine Building" shows what they are accomplishing in this line.

Write for our Yellow catalog.

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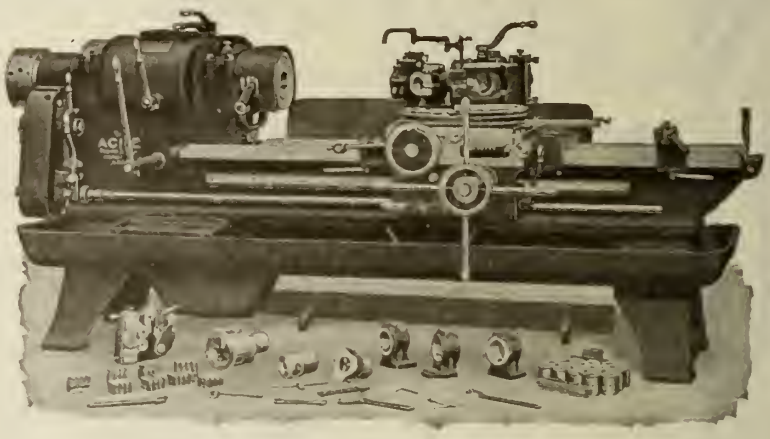
THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.

Efficiency Demanded! not Merely Desired

In those wonderfully organized shops where every machine is made to do its best, where the slightest increase in established production cost is rigidly guarded against, where efficiency in every sense of the word is obtained: it is in these shops you will find Cincinnati Acme Turret Lathes and Screw Machines.

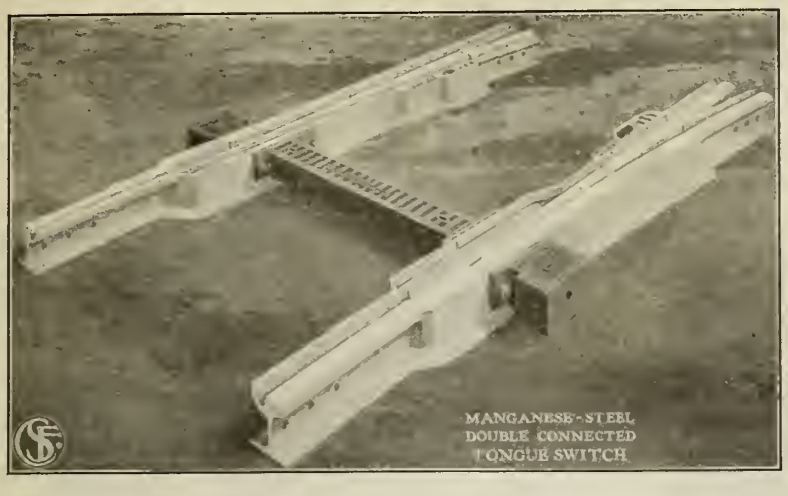
Indifferent machines may serve their purpose in shops of the same type. But—*are they good enough for you?* Send for our catalog and decide with the facts before you.



The Acme Machine Tool Co.

Cincinnati, Ohio, U.S.A.

Canadian Agents: Rudel-Belnap Machinery Company, of Montreal and Toronto



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CANADIAN STEEL FOUNDRIES LIMITED

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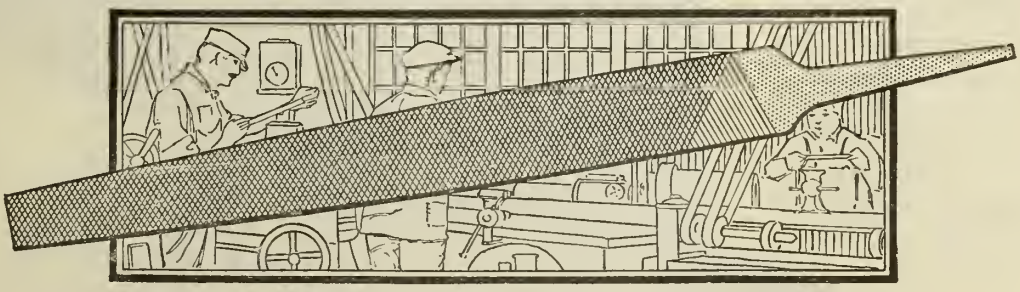

Dull Files Mean Poor Work

As soon as a file has lost its original sharpness, it is an inefficient file.

Every hour you keep a file in use after this keen edge is gone, means that much poorer work.

It will pay you to discard a file as soon as it begins to get dull, and buy a new one.

If you get Famous Five Files, you can be sure of getting long efficient service.

They are specially fabricated, cut and hardened. They are the standard of file quality.

Specify them when ordering.

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GREAT WESTERN
AMERICAN
ARCADE
GLOBE

MADE IN CANADA BY

Nicholson File Company

PORT HOPE - ONTARIO

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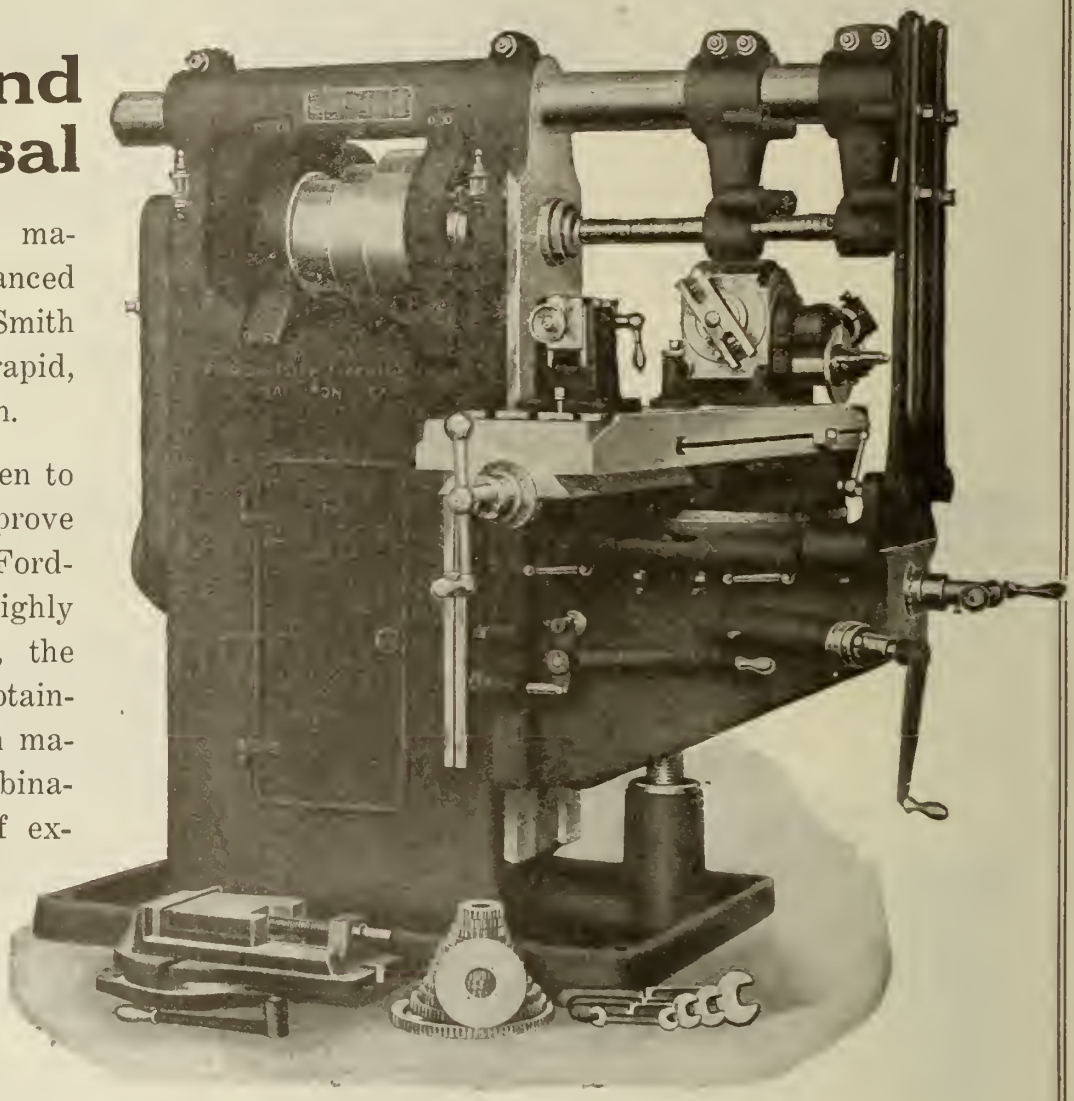
FORD-SMITH
MILLING - MACHINES

Plain and Universal

Strong, accurate machines of well balanced design, Ford-Smith Millers insure rapid, quality production.

Every care is taken to maintain and improve the standard of Ford-Smith quality. Highly skilled workmen, the best materials obtainable, and modern machinery is a combination conducive of exceeding merit.



A catalog fully describing Ford-Smith Millers will be forwarded upon request.

The Ford-Smith Machine Co., Ltd.

HAMILTON, ONTARIO, CANADA

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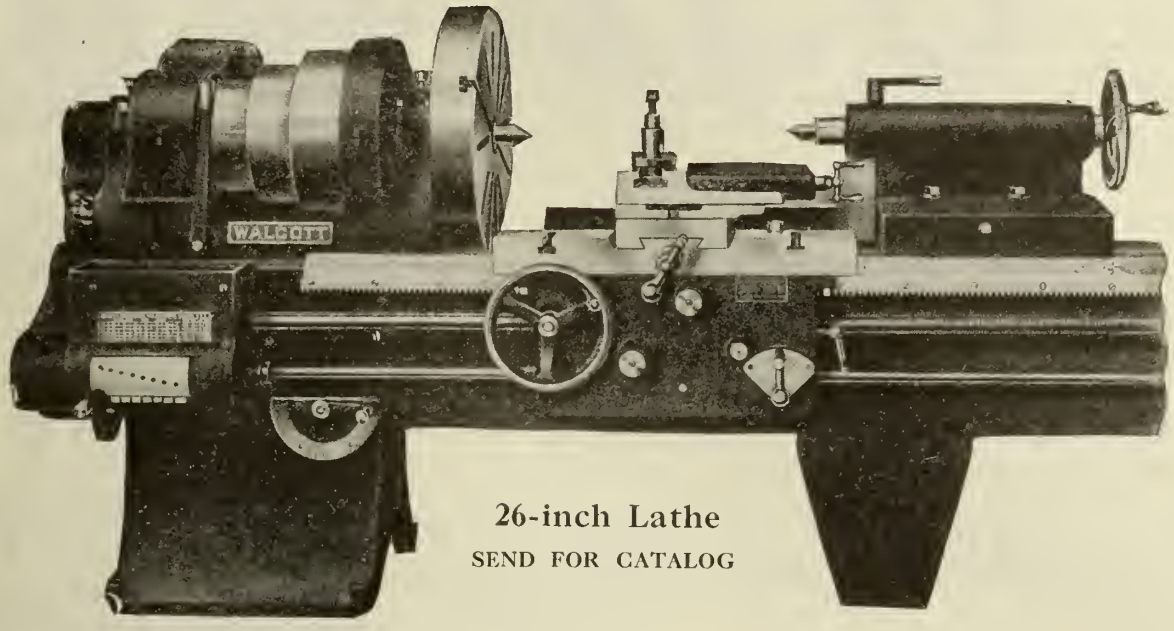
WALCOTT



26-inch Lathe

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Carrying the Burden of Heavy Production

without showing any ill effects, is an efficient test to ascertain the productive value of your lathes.

Walcott Lathes are the result of 39 years' experience in the manufacture of machinery that gives satisfactory results.

Our Walcott Catalog will give you all details.

WALCOTT LATHE COMPANY

125 Calhoun Street

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EASTERN UNIVERSAL HYDRAULIC PRESS. Supplied in 20-35 and 50-ton capacities, full hydraulic depending on no springs or weight for return of ram, delivering pressure instantly at a speed of 1½ in. per second return of ram 3 in. per second.

Length of Ram Travel.....6 in.
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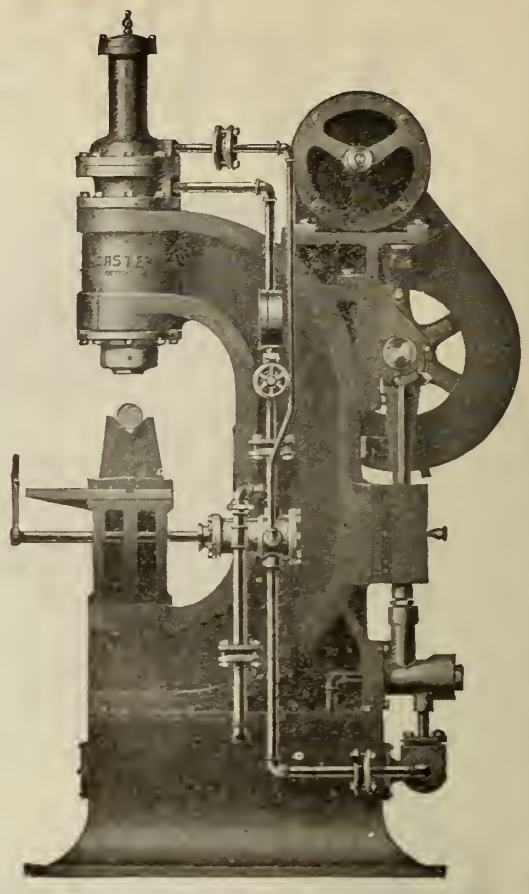
Table to Ram .....10 to 14 in.

EASTERN UNIVERSAL PRESSES are tested before leaving our plant at 33 1/3% overload. They are furnished with rolling centres and are unexcelled for straightening of motor crankshafts, heavy wheel shafts, broaching splines in drive plate, differential gears, and others. Straightening front axles and spindles.



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Manufacturers:
The Sheffield Twist Drill & Steel Co.
LIMITED
Works: Summerfield St., Sheffield

Telephones: London City 2660. Sheffield - 712. 710. Code ABC 5th. Edition
LONDON OFFICE: Suffolk House, 5, Laurence Pountney Hill, London, E.C. 4.
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HIGH SPEED TWIST DRILLS

High-class Drills with IRRESISTIBLE PIERCING FUNCTIONS that stand the WEAR and TEAR—in other words, the DRILLS that are EFFICIENT and ECONOMICAL—are the DRILLS with the "DORMER" Brand.

We are manufacturing SPECIALISTS—Carry large STOCKS—Give PROMPT deliveries, and rely upon our products for REPEATS.

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Sizes 180, 160, 140, 120, 110, 100, 90, 80, 70, 60, 54, 46, 40, 36, 30, 24, 20, 18, 16, 14, 12, 10, 9, 8, hole.

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THE HIGH-SPEED STEEL

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ALL SIZES
IN STOCK

Crucible
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"ARGO" BRAND *HIGH-SPEED* STEEL

The John Illingworth Steel Co.
1856

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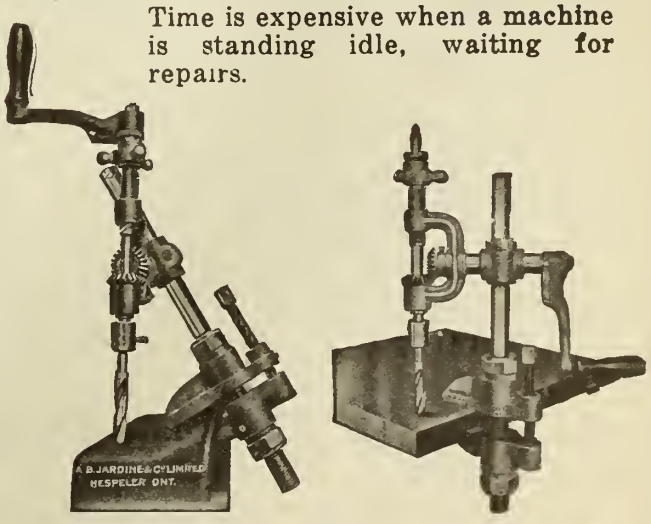
RALPH B. NORTON, AGENT
124 Craig St. W.
Montreal, Canada

Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.



On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, $26.50 net.
Sold by all Machinery and Supply Houses

A. B. JARDINE & CO., Limited
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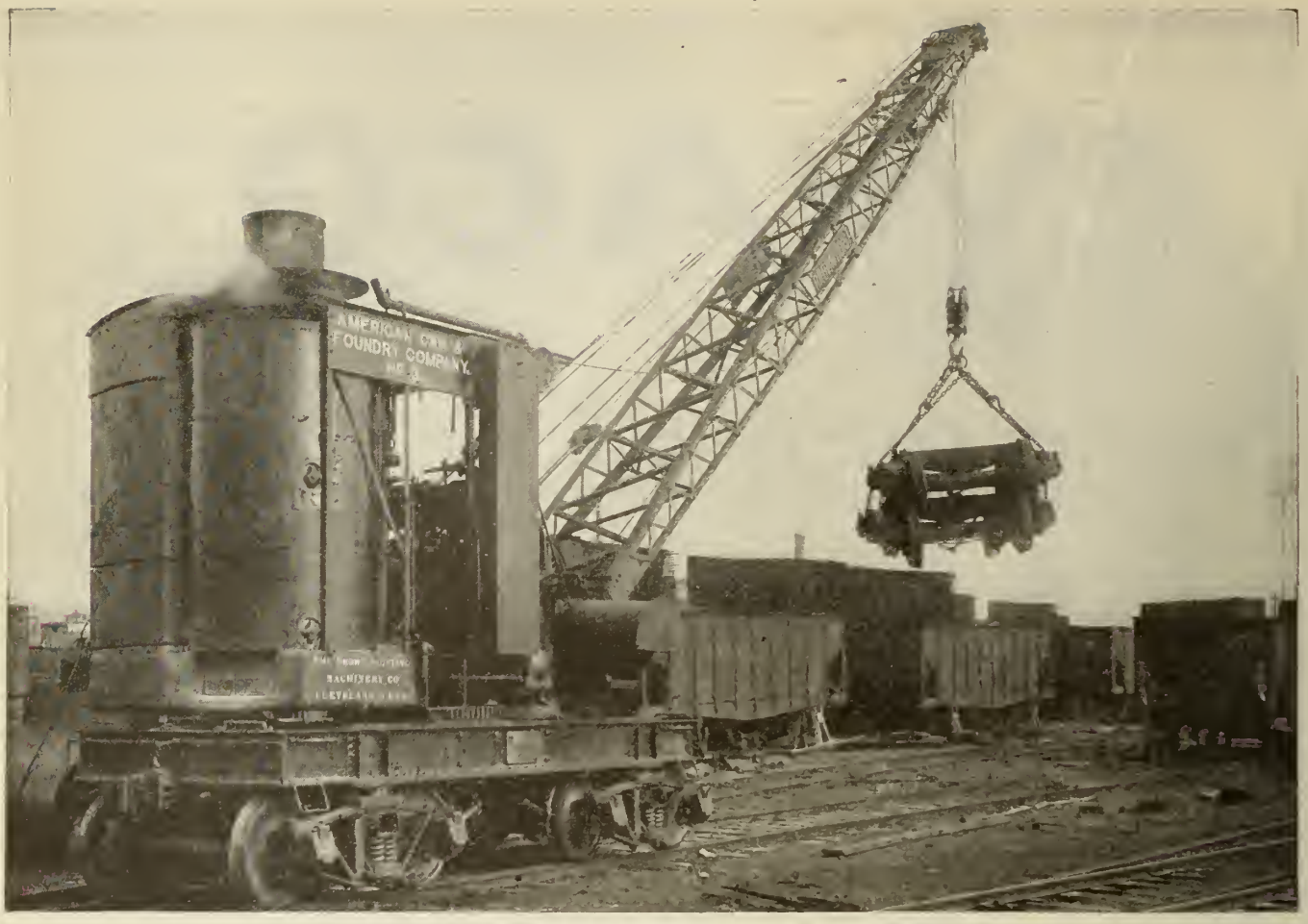

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Products include :

Locomotive Cranes
Grab Buckets
Dragline Buckets
Electric Hoists
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Overhead Tr. Cranes
Pillar and Jib Cranes
Heavy Dock Machinery
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Helping Meet the Car Shortage

A nation-wide car shortage is holding back transportation and production. While this shortage lasts, it is your duty to keep ready for service as many cars as possible. This is necessary for your own good as well as for business in general.

Where speed and economy in handling are necessary, the Brownhoist locomotive crane shows to best advantage. It is built to handle materials constantly and rapidly. With the present shortage of labor, a machine you can depend upon to handle practically all of your materials is a big help. The Brownhoist handles coal, stone, rails, ties, scrap and other materials which you have to handle. And it handles them rapidly and well.

If your work requires the handling of materials in the yard or on the road, it will pay you to look up the Brownhoist. Catalog K shows Brownhoists doing many kinds of work, some probably similar to your own. We will be glad to send you a copy if you are interested.

The Brown Hoisting Machinery Company

40 Years in Crane Business

Engineers and Manufacturers of Heavy Dock Machinery, Bridge Cranes, etc., as well as smaller Cranes and Hoists

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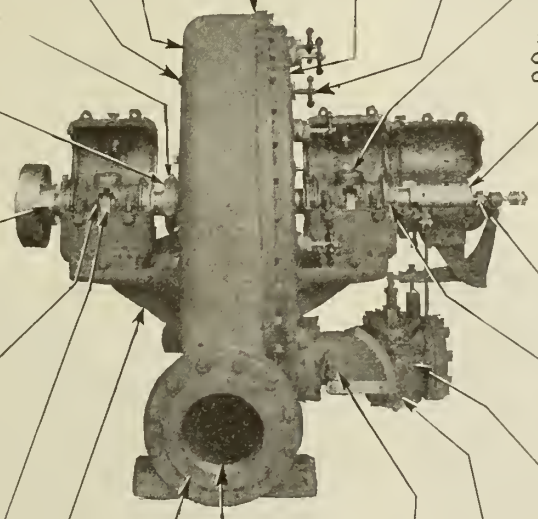
THE PRODUCT OF THIRTEEN YEARS REFINEMENT

Designed especially for driving fans, blowers, generators and pumps.
Made ranging in horsepower from one to five hundred.

Sturtevant
TRADE MARK

TYPE 6 TURBINE


SIMPLICITY IN ALIGNING ROTOR AND NOZZLES THROUGH THESE INSPECTION HOLES
ALL JOINTS AT POINTS OF CONTACT ARE SCRAPED AND GROUND WITHOUT THE USE OF GASKETS OR PACKING
INDIVIDUAL NOZZLE CONTROL VALVES FOR HIGH EFFICIENCY CORRESPONDING TO LOAD
EXHAUST CASING
STEAM CASING
FLOATING STUFFING BOX ACTS AS A RELIEF VALVE
SPHERICALLY SEATED SELF ALIGNING BEARINGS
NO OIL NOR COOLING WATER NEEDED ON METALIC PACKING
SIMPLE BUT POWERFUL GOVERNOR OF THE CENTRIFUGAL TYPE
TAPER FIT ON ROTOR AND COUPLING HUBS
BALL BEARING SELF ALIGNING FOR GOVERNOR SPINDLE
SPLIT BEARINGS ARE EASILY REMOVED WITHOUT DISTURBING SHAFT
THREADED THRUST COLLARS HOLD ROTOR IN PLACE
LARGE SOLID OIL RING FURNISHING AMPLE LUBRICATION
INDEPENDENT EMERGENCY TRIPPER, AN EXTRA SAFETY CONTROLLING DEVICE
EXHAUST CAN BE ON EITHER END
EMERGENCY BUTTERFLY VALVE
BEARING BRACKETS CAST INTEGRAL WITH CASING, ELIMINATING TROUBLES ARISING FROM UNEQUAL EXPANSION
RELIEF VALVE ON OPPOSITE END OF EXHAUST, RELEASES STEAM IN CASE EXHAUST IS CLOSED
BALANCE CONTROLLING VALVE OPERATES VERTICALLY THEREBY ASSURING A PERFECT CONDITION OF ACTION

WRITE FOR 3-PART CATALOG 256U

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B. F. STURTEVANT COMPANY OF CANADA, LIMITED

Head Office and Works: GALT, ONTARIO
Sales Offices: TORONTO and MONTREAL

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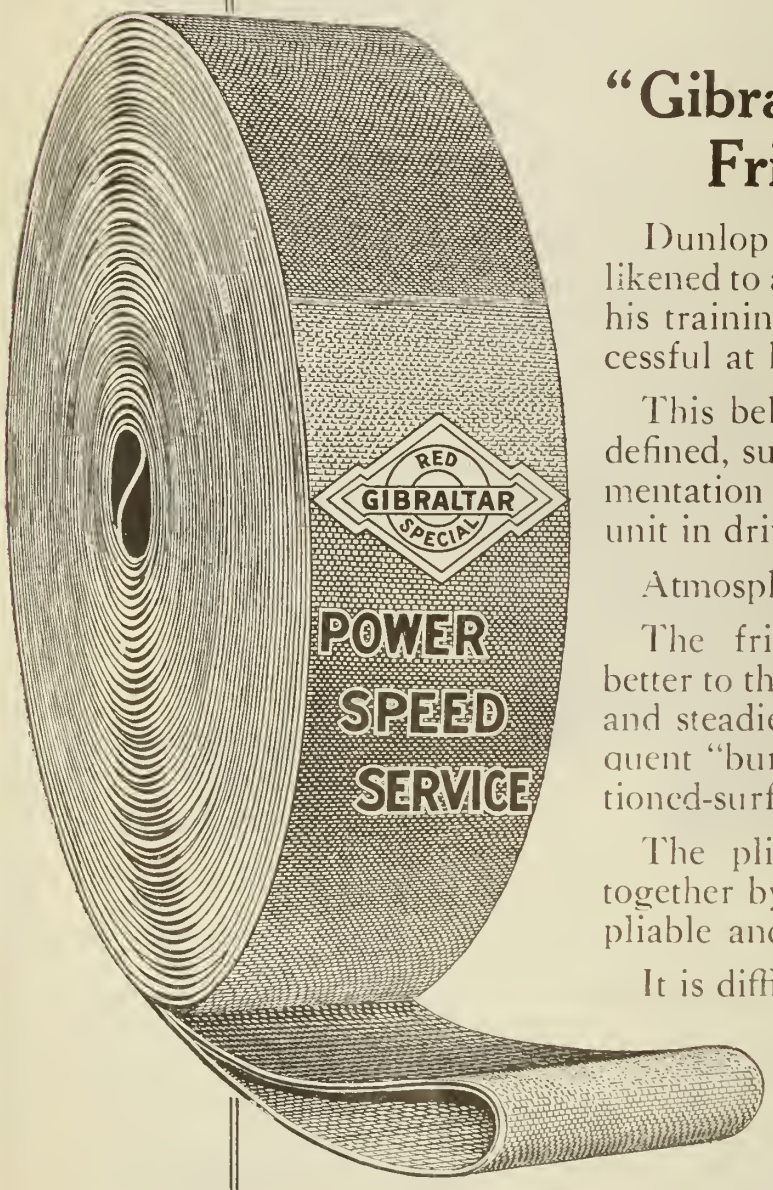
A Supreme Belt—The Master of Its Job

SEAL OF QUALITY
DUNLOP
RUBBER PRODUCTS



Dunlop "Gibraltar RedSpecial"—Frictioned-Surface

Dunlop "Gibraltar RedSpecial" may be likened to a trained man. The man received his training to make him efficient and successful at his work.

This belt was built along certain well-defined, successful lines, after much experimentation to make it a successful, efficient unit in driving the wheels of Industry.

Atmospheric changes do not affect it.

The frictioned-surface makes it cling better to the pulleys, and this produces more and steadier power. Slipping and consequent "burning" are nullified by this "frictioned-surface" feature.

The plies of the belt are firmly welded together by a class of friction that remains pliable and excludes moisture.

It is difficult for you to practise economy unless you use a type of belt such as "Gibraltar RedSpecial." It costs more initially, but less finally; also saves all along the way.

DUNLOP TIRE & RUBBER GOODS CO.,

LIMITED

HEAD OFFICE AND FACTORIES: TORONTO.

BRANCHES IN THE LEADING CITIES

Makers of High-Grade Tires, Hose and Packings for All Purposes

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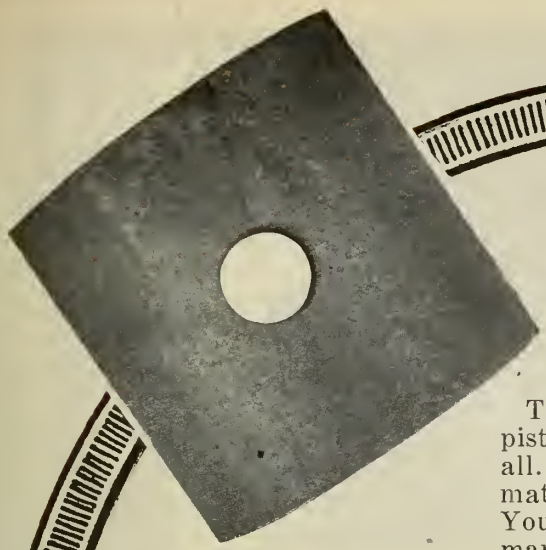
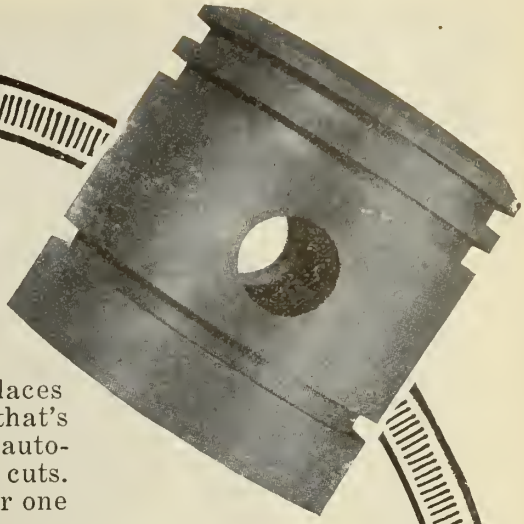




Rough and Finished Pistons

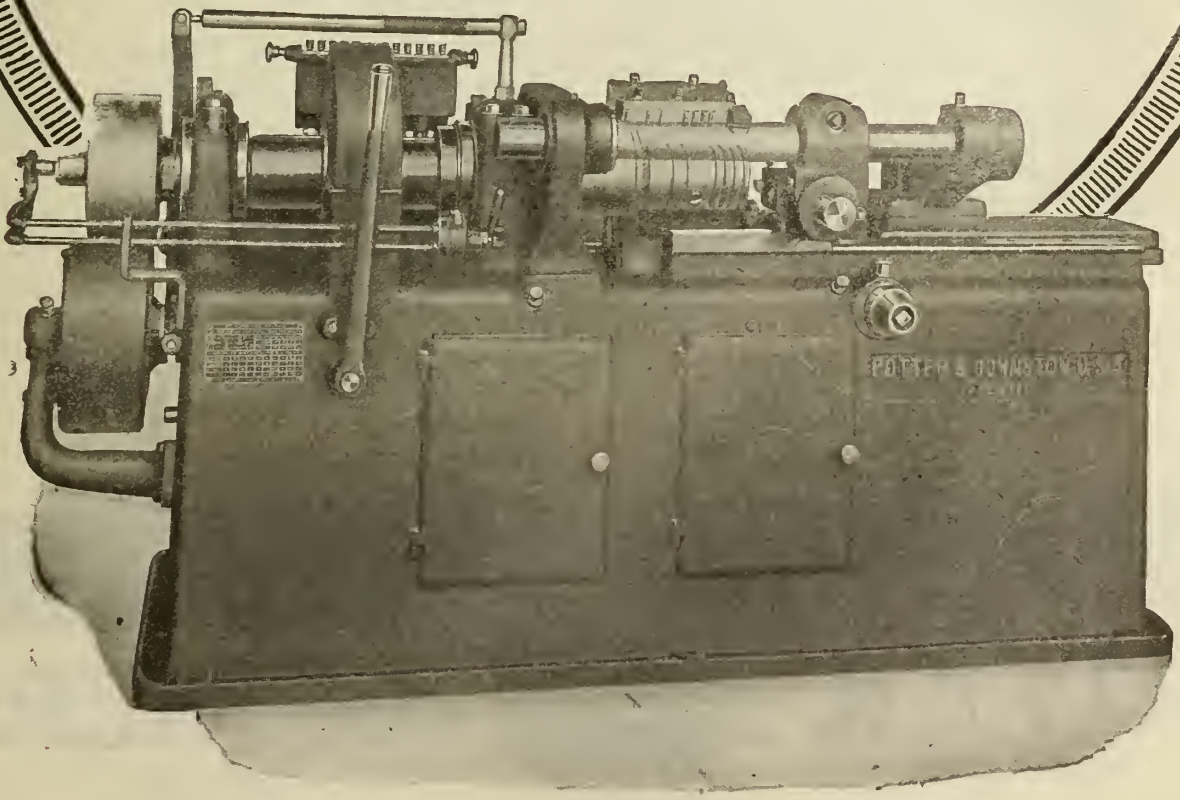
The operator simply places piston on the drawback—that's all. The feed knocks off automatically at the end of the cuts. You can see how easy it is for one man to handle more than one P & J.

BIG AND LITTLE PISTONS

This is the P & J "Special"—for piston and piston ring making.

It is made to turn out pistons up to 8½ inches diameter and 12 inches long, and piston rings up to 8½ inches diameter and the length of sleeve not more than 7 inches long.

Send for Bulletin 44



Canadian Offices: POTTER & JOHNSTON MACHINE CO.

ROELOFSON MACHINE & TOOL CO., LIMITED

Head Office: 11 Wellington Street East, Toronto, Canada

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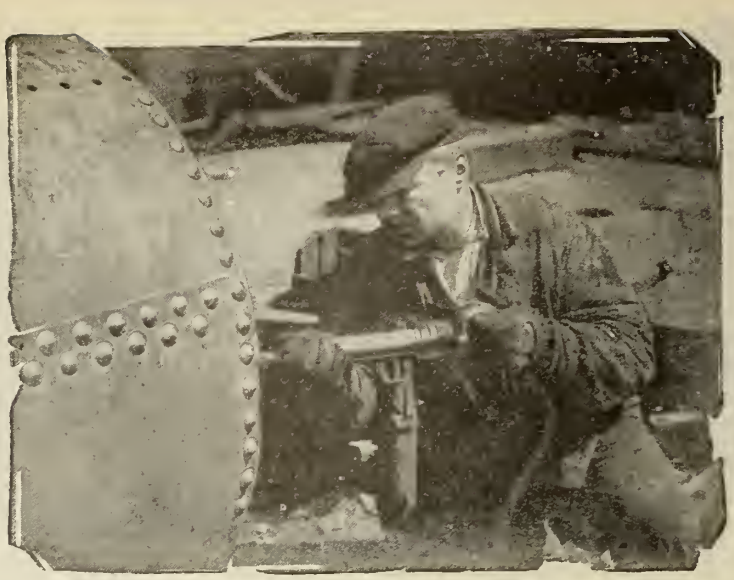

Calking high-pressure tank seams with a Type B Boyer

A chip off the old block

EVERY Boyer Chipping and Calking Hammer embodies the every-day dependability and built-in long-wearing construction of Boyer Riveting Hammers.

Freedom from vibration in Boyer Chipping and Calking Hammers is due to their perfect balance and smooth, frictionless operation.

Simple, sturdy design popularizes Boyer Chippers on and off the job. On the job they deliver powerful, clean-cut blows with telling effect. Off the job their simplicity permits quick assembly and disassembly for inspection and cleaning.

Long-wearing parts prevent air power loss and lessen upkeep cost. Boyer users have something to show in "black and white"—for each day is a day of performance.

Complete line of Boyer Chipping, Calking, Beading and Scaling Hammers, available from stock at all Company Branches insures prompt delivery of any required type.

Ask for new complete Pneumatic Tool Catalog No. 560.

Sales Representatives

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Sales and Service Branches: TORONTO, 342 Adelaide Street, West WINNIPEG, 150 Princess Street VANCOUVER, 81 Pender Street

Canadian Factory: Canadian Pneumatic Tool Company, Montreal P-77-H

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CHICAGO PNEUMATIC AIR COMPRESSORS · · VACUUM PUMPS · · PNEUMATIC HOISTS,
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BOYER CHICAGO CP PNEUMATIC **HAMMERS**

Depend upon *that Name*

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

GOODELL-PRATT
1500 GOOD TOOLS

Hack-Saw Blades

IT is on the job that Goodell-Pratt Hack-Saw Blades prove their true worth. Thousands of mechanics know how well they stand the grind of severe work day in and day out. This is because Goodell-Pratt Hack-Saw Blades are made to meet actual working conditions — not to pass freak tests.

Only the finest hot-rolled tool steel goes into Goodell-Pratt Hack-Saw Blades. This steel is tempered with the greatest care. For general use they are made with 14 teeth to the inch for sawing iron or steel rods or bars; with 20 or 24 teeth to the inch for sawing brass or heavy tubing; with 32 teeth to the inch for sawing thin steel tubing; and with 8, 10, or 12 teeth to the inch for use in heavy power machines.

These hack-saw blades live up to the Goodell-Pratt standard of quality. Just as in the manufacture of every other one of the 1500 Goodell-Pratt Tools, nothing is spared which would in any way improve these hack-saw blades.

A complete pocket catalog showing these hack-saw blades and the other 1500 Goodell-Pratt Tools will be sent on request.

GOODELL-PRATT COMPANY *Toolsmiths* Greenfield, Mass., U.S.A.

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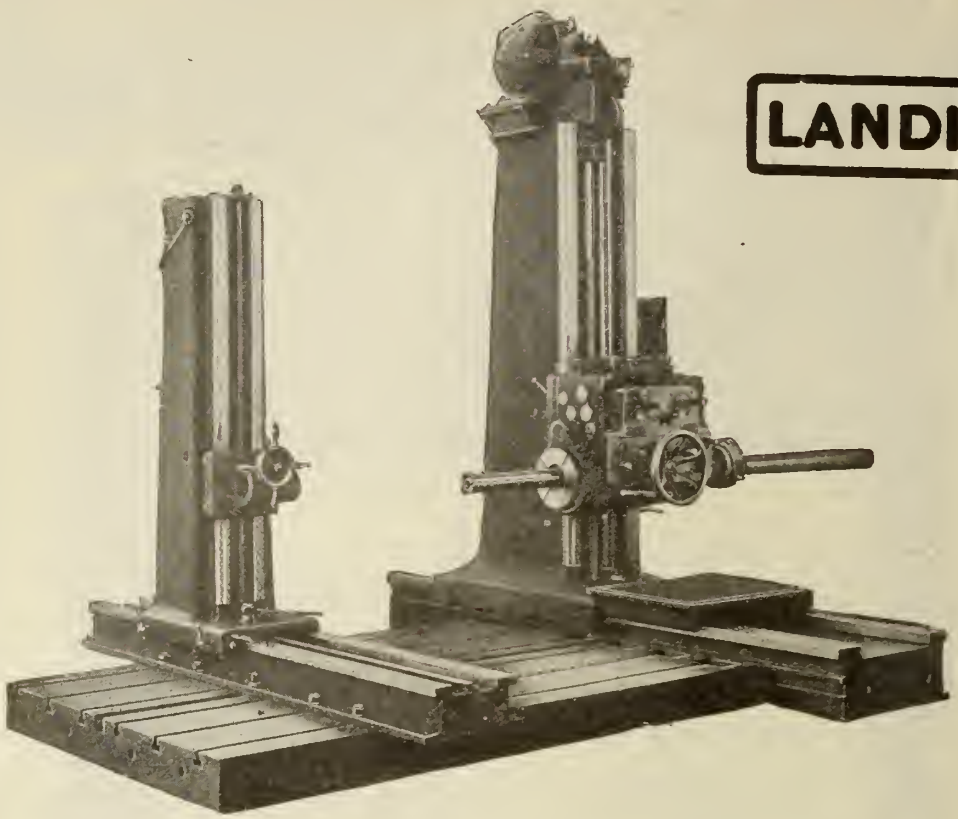


Scroll Feed to the Bar Counts on Production

The Landis will shorten your machining operations by reason of its versatility. It is as ready for the single piece as for the long run. In machining parts requiring a series of boring, milling and drilling or reaming operations it is a mighty big time saver because these varied machinings can be accomplished with a single set up of work. This feature likewise assures accuracy of alignment between the various cuts.

Ease of operation allows close attention to tool travel at all times and shortens machining time.

The Landis looms large in the progress procession and you should be versed in its many features. Ask us to mail you a copy of our catalogue.

LANDIS TOOL CO., Waynesboro, Pa.

NEW YORK, 50 CHURCH STREET

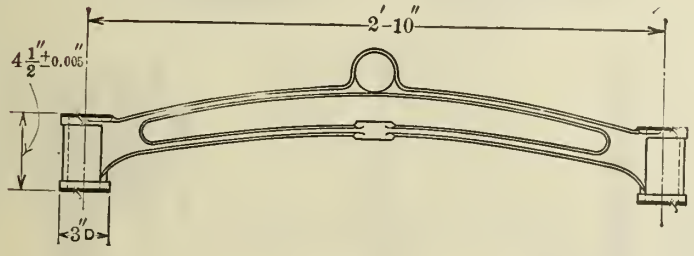
Canadian Agents:

A. R. Williams Machinery Co., Toronto

Williams & Wilson, Montreal

GARVIN MACHINE TOOLS

Cutting Down Floor to Floor Time With the GARVIN NO. 3 DUPLEX MILLER



Fundamentally correct in design, made with extreme accuracy and of best materials, Garvin Millers are production units of proved efficiency. Have you written for your copy of the 340-page Garvin catalogue?

THIS Garvin Duplex Miller in the plant of the Minneapolis Steel & Machinery Co., Minneapolis, Minn., is used for milling drop-forged steel front axles for the Twin City Tractor. Two milling cutters finish two surfaces at one pass. The floor to floor time for milling each axle (four surfaces) is only eight minutes or two minutes per surface!

The first Garvin Miller this concern purchased some three years ago proved so satisfactory that it wasn't very long before the company was again in the market for another Garvin Miller.

The Garvin Machine Company, Spring and Varick Sts., New York City

GARVIN

BUILDER OF BETTER MACHINE TOOLS

Milling Machines | Automatic Tapping Machines | Duplex Horizontal Drills | Screw Machines

G-49

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JAMES SMART PLANT

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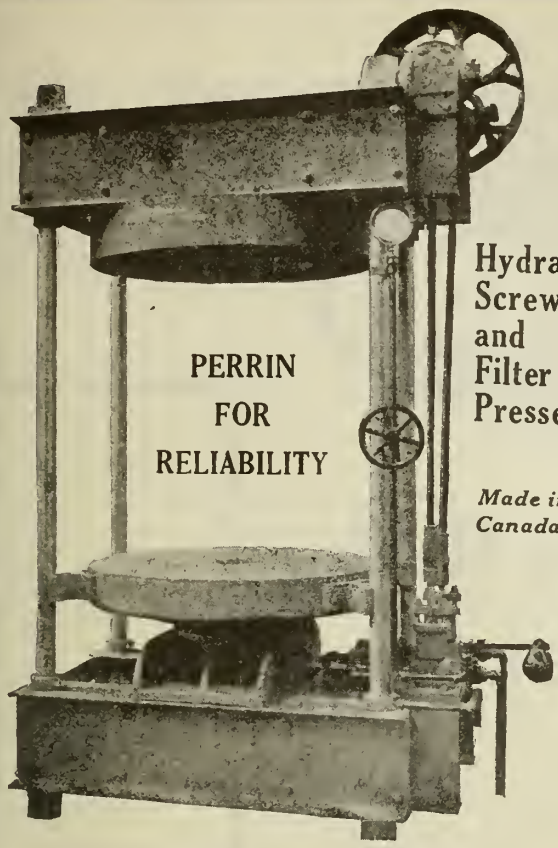

Hydraulic Screw and Filter Presses

Made in Canada

Hydraulic Truck Tire Press

WILLIAM PERRIN LIMITED - TORONTO

Harris Heavy Pressure

The Babbitt Metal that's at the Front in Efficiency and Economy

Order a Box from our nearest Factory

Our Guarantee is Back of Every Pound of Babbitt Metal We Make

Manufactured by

The Canada Metal Company, Limited

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STAR LATHES

Simple, Sturdy Construction

Long experience has shown that every material used in the construction of "Star" Lathes is best, each for its own particular work.

Every workman contributing to its manufacture is highly skilled and takes pride in maintaining the "Star" standard.

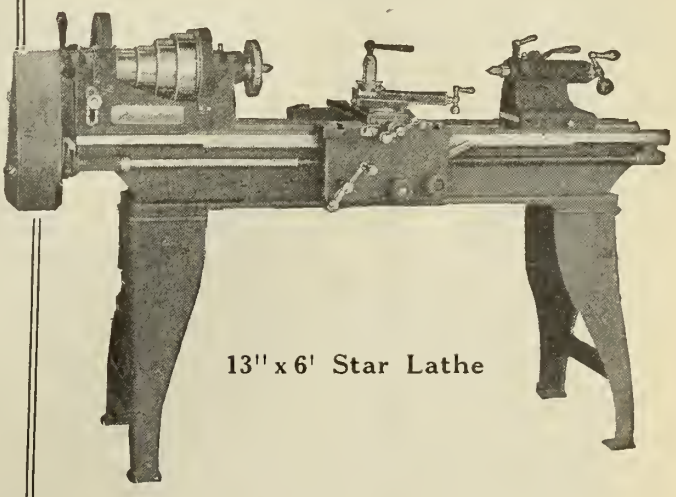
The design of the 13 in. x 6 ft. "Star" is extremely simple and sturdy.

These three factors—quality materials, workmanship and design, have resulted in producing an accurate, durable lathe, simple in operation, suitable for production or tool room work.

The Seneca Falls Mfg., Co.

Incorporated

366 W. Falls St., Seneca Falls, N.Y.



13" x 6' Star Lathe

For high standard products which must be manufactured within close limits of accuracy, no better lathe than the 13 in. x 6 ft. "Star" can be found. Full details of this and other "Star" lathes will be found in our catalog. Shall we send you a copy?

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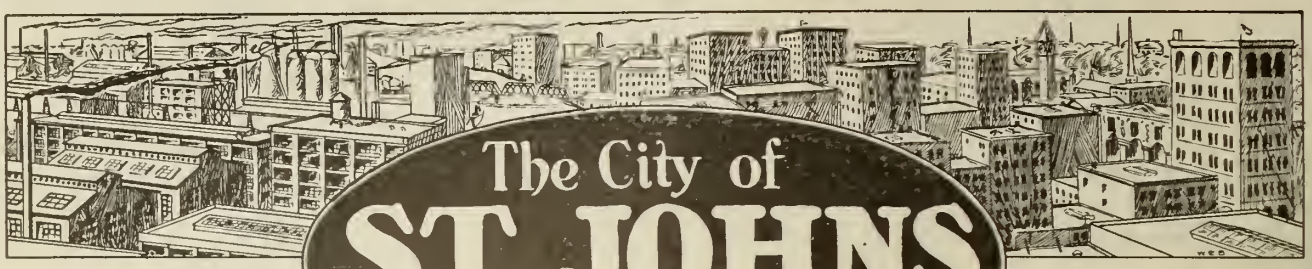


The City of
ST. JOHNS
QUEBEC

Locate in this Real Transportation Centre

St. Johns is a nerve centre of the network of railways connecting Central and Western Canada with the Maritime Provinces and with the Eastern States. Seven railways, including the C.P.R. and G.T.R., run through the city and are interconnected in the St. Johns yards by a terminal switching company. The manufacturer locating in St. Johns enjoys the advantages of competitive freight rates and dispatch in the assembling of raw materials and distribution of the finished product. The city in fact commands lower freight rates and a cheaper coal supply than any other centrally located manufacturing city on the North American continent.

St. Johns is directly connected by rail with the Montreal docks, 27 miles distant, affording first-class facilities for foreign trade. The city is an ideal location for the American manufacturer opening a branch plant in Canada; having direct connections by water with New York, the St. Lawrence and Great Lakes and the Eastern Seaboard of the United States.

Unlimited electric power is developed at Chambly, eleven miles north-east of the city, and distributed at prices that will compete with any city or town in the Dominion.

Cheap living conditions and low rents and taxes have resulted in cheap labor and an abundant supply of both skilled and unskilled workers is always available. Labor troubles are quite unknown.

In addition to the natural advantages of St. Johns as an industrial site the city also offers extraordinary inducements, such as: Tax exemptions; street extensions; bonus of five per cent. on your payroll for five years, making it an unusual industrial opportunity.

Without a knowledge of your business or the conditions affecting it, we do not claim that St. Johns is rationally your location; but we know that St. Johns possesses extraordinary advantages, that in all probability it is the best site for your plant from every point of view, that you will be running the risk of serious mistake if you do not include this city in your investigations.

Seven railroads, including Canada's great transcontinental lines.
Finest ocean shipping facilities.
Canal connections with New York, the Eastern States, and the Great Lakes.
Cheapest labor market in Canada.
Plentiful supply of skilled and unskilled labor.
Cheap and abundant electric power.
Cheap coal and lower freight rates.
Desirable factory sites with all public conveniences immediately available.
Extraordinary inducements to new industries.

For more specific information write

The Secretary, City Council
ST. JOHNS, QUE., CAN.

WALTHAM ALOWALT GRINDING WHEELS

for Grinding Manganese Steel

ALOWALT

CARBOWALT

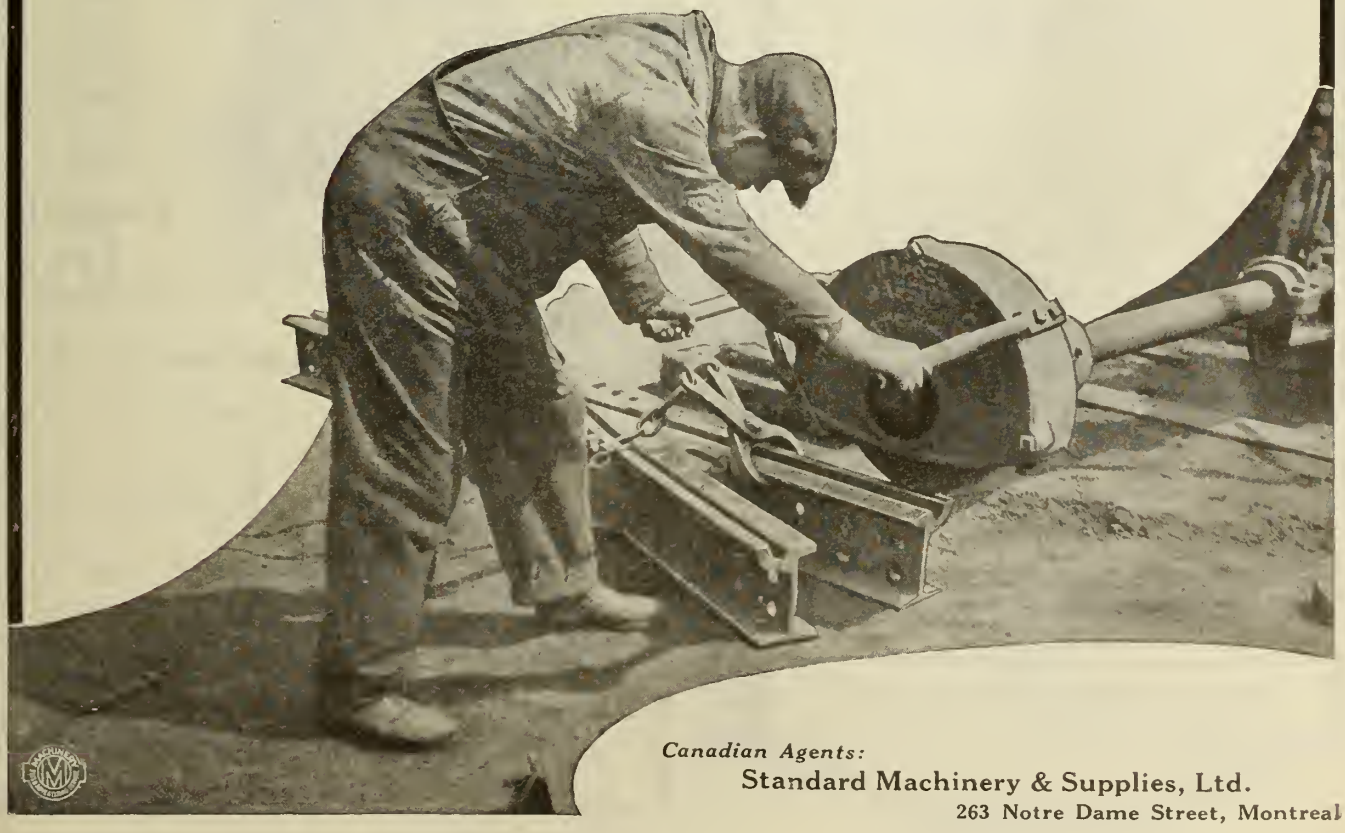
This photograph, taken at the Barbour-Stockwell Company (Cambridge, Mass.), shows the operation of taper grinding the ends of manganese steel frogs from ¾ in. to nothing over a space of 6 in.

The wheel—a Waltham Alowalt, grain 16, grade Q—is 24 in. in diameter with a 2 in. face, and is run at a speed of 955 R.P.M. The driving shaft is directly connected to a 5 H.P. electric motor, the whole apparatus being mounted so that it may be swung in all directions.

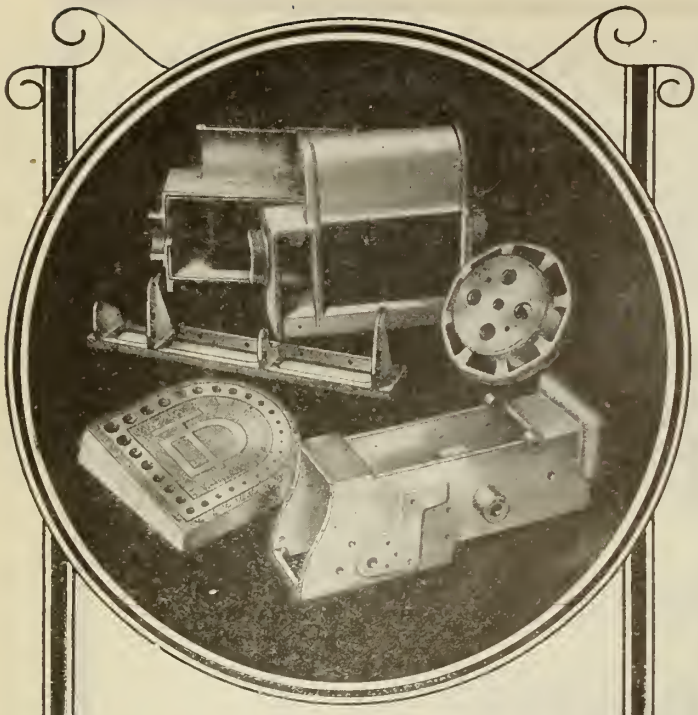
Grinding—the only method by which this work can be successfully performed—is made economical here by the use of Waltham Wheels. Uniform high quality and excellent results made their exclusive use a matter of course after an extensive trial.

Waltham Grinding Wheels fill a well-defined place in the grinding department of many shops. Describe your grinding operations in detail. Let us show you how these wheels will increase production and save money in your plant.

WALTHAM GRINDING WHEEL CO.
WALTHAM MASS., U.S.A.



Canadian Agents:
Standard Machinery & Supplies, Ltd.
263 Notre Dame Street, Montreal



FRANKLIN DIE-CASTINGS

They Simplify Production and Reduce Costs

For nearly thirty years Franklin Die-Castings have aided the development of many fields of industry by reducing costs and simplifying production.

Wherever Franklin Die-Castings are adaptable they lower the cost of production through the saving of time, labor, equipment and material otherwise spent in machining.

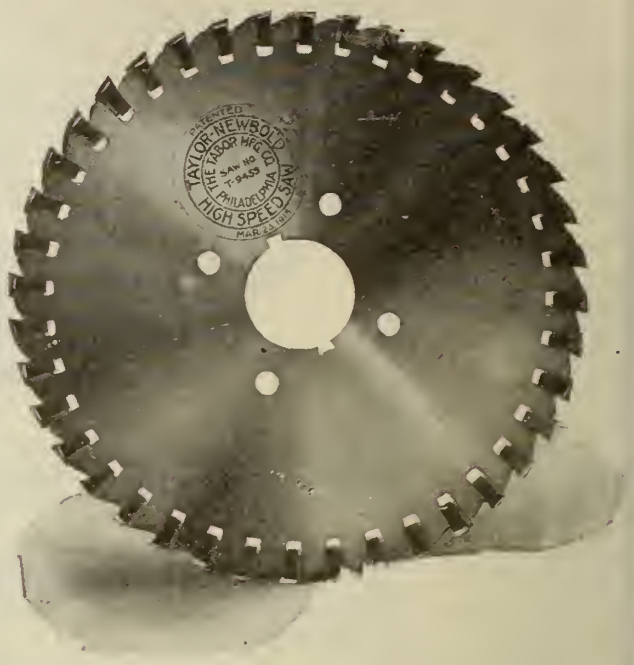
Franklin Die-Casting methods often make it possible to produce a device in fewer parts. It is through such advantages, derived from the use of Franklin Die-Castings, that many products have been made commercially practical.

In 1892 we originated the die-casting industry. From our long experience, we can advise you whether the die-casting principle can be applied correctly and profitably to your special needs.

THE FRANKLIN DIE-CASTING CORPORATION
Gifford and Magnolia Streets SYRACUSE, N.Y.

We cast in Aluminum, Tin, Lead and Zinc base alloys. Estimates made from samples, drawings or blueprints.
Send for Booklet

THE IMPROVED
TAYLOR-NEWBOLD



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Tabor Mfg. Co., Philadelphia, Pa., U.S.A.

Gray Iron and Semi Steel Castings of all Descriptions

From 5 lbs. up to 4 tons

Foundry capacity, 15 tons per day.

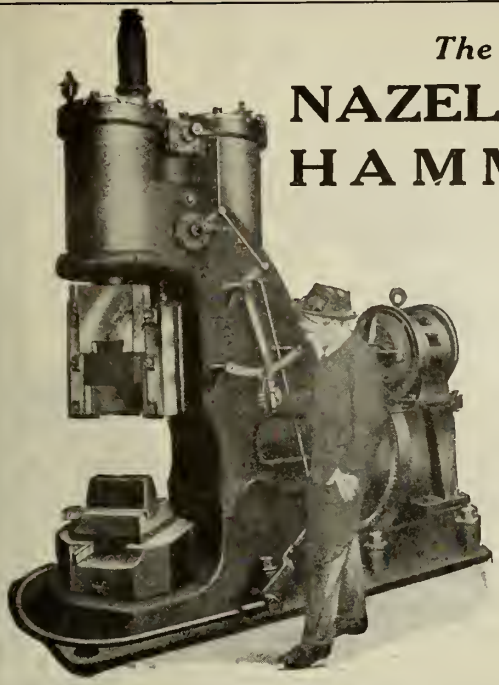
Difficult castings our specialty.

Mixtures regulated by chemical analysis and all castings sandblasted.

Estimates from blue prints submitted promptly.

If desired, we can make patterns to your drawings.

G. W. MacFarlane Engineering, Limited
Paris, Ontario



The

NAZEL AIR HAMMER

NOTED FOR ITS BLOW AND CONTROL

A self-contained unit, HAMMER AND COMPRESSOR COMBINED, built in three types, six sizes arranged for BELT OR DIRECT MOTOR DRIVE, with capacities up to 7 inches square, for all manner of jobbing, manufacturing and certain classes of drop forgings.

Nazel Engineering & Machine Works
Dept. F., Philadelphia, Pa.

1/3 to 1/2 Reduction in Milling Cost

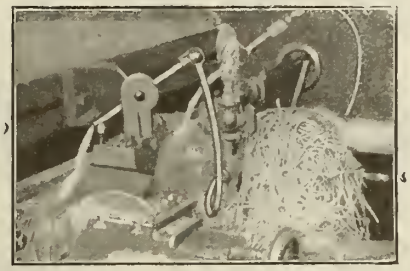
This will be the result of taking small milling jobs from your big millers and putting them up to

The U.S. MILLER

The Miller for Small Work

A small machine takes up less space, requires less power, is easier to operate and is more accurate.
The Paramount Miller of its size. Drop us a line for full details.

United States Machine Tool Company
Cincinnati, Ohio, U.S.A.



Performance Talks Loudest

When you buy a cutting oil, buy it for what it has done in the past—not for what it promises to do in the future. Performance is the thing that counts.

Because of its remarkable efficiency—extending over a long period of years—you have the positive assurance, before you use a single drop, that you will get uniformly satisfactory service from

LARCUL CUTTING OILS

Many of the largest and most important machine shops in the country are using Larcul, and we are told that the results are even better than with lard oil.

LARCUL AMBER CUTTING OIL

A very high grade oil, entirely free from injurious chemicals. On account of its transparent quality, Amber Larcul has a distinct advantage in connection with work that must be kept constantly under the eyes of the operator.

We recommend Amber Larcul on all types of automatic machines, turret machines, gear cutters, hobbing machines, etc., for high carbon, Vanadium, chrome nickel and tungsten steel.

LARCUL EBONY CUTTING OIL

Identical with Amber Larcul in cutting characteristics. Particularly efficient for pipe threading, bolt threading, nut tapping, on turret machines running on high and low carbon and alloy steels, and on automatic machines for forming, turning, boring, threading, etc.

Let Us Give You a Demonstration

CATARACT REFINING COMPANY
LIMITED
Toronto, Ontario

SCIENTIFIC LUBRICANTS *for* SCIENTIFIC LUBRICATION

OAKITE CLEANS

2000 Auto Parts for 78c

THIS Auto Factory* now uses Oakite for cleaning mineral oil from fenders, aprons, radiator shells, etc., before japanning, ***at a fraction of former cost.***

The parts were formerly washed with a prepared alkali cleaner, and averaged 6 per cent rejects after japanning.

With Oakite materials, the rejects average only one in 800!

The actual cost of Oakite materials for cleaning each lot of 2000 parts is 77½ cents.

But in computing the ***full economy*** in using Oakite materials, due consideration must be given to the saving effected in practically eliminating rejects.

This Advertisement is one of a series based on actual occurrences.

*Name upon application

May We Serve YOU Too?

OAKITE MANUFACTURED BY OAKLEY CHEMICAL CO. 44 THAMES STREET NEW YORK

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Lying in the United Kingdom and
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Cable Address:
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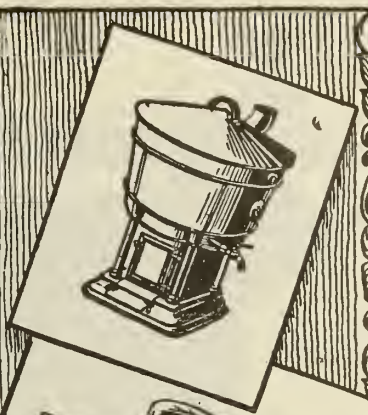
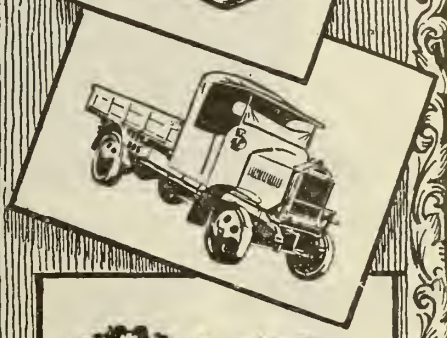
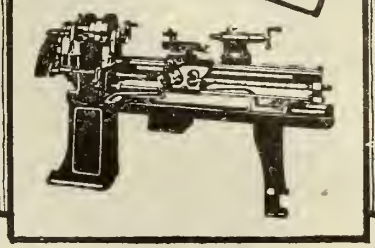
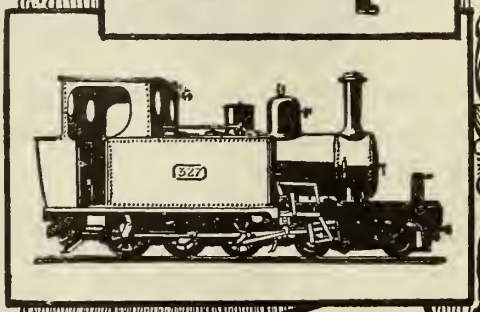
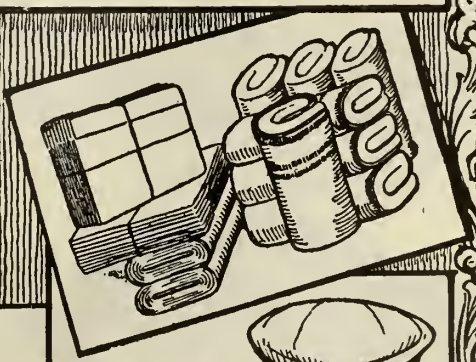

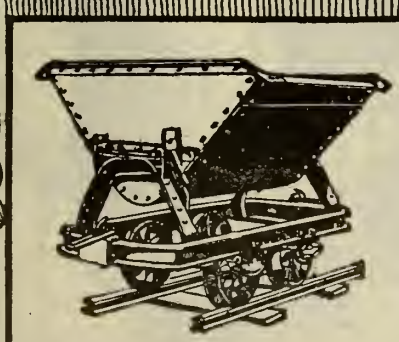
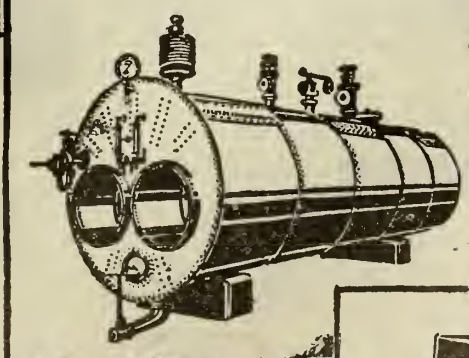

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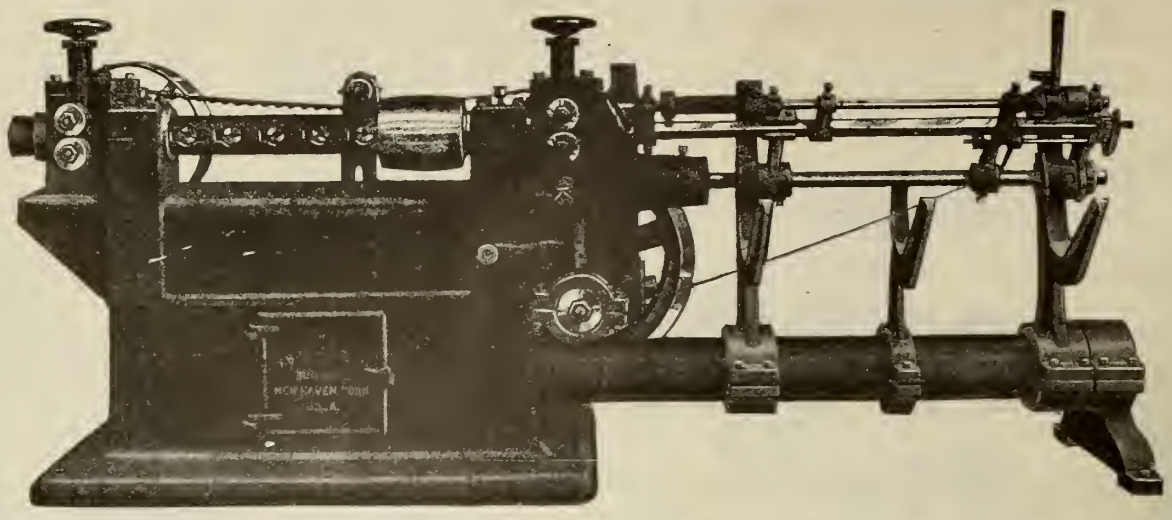


Perfect Wire Straightening Quickly and Profitably Done on Our

Automatic Wire Straightening and Cutting Machine

Just put your coil of wire on the reel, adjust the rolls and dies, and set the gauge for the length you want. The machine does the rest—thousands of feet per day, perfectly straight and cut to accurate lengths.

Catalogue tells more about them, and we will be glad to send you a copy.

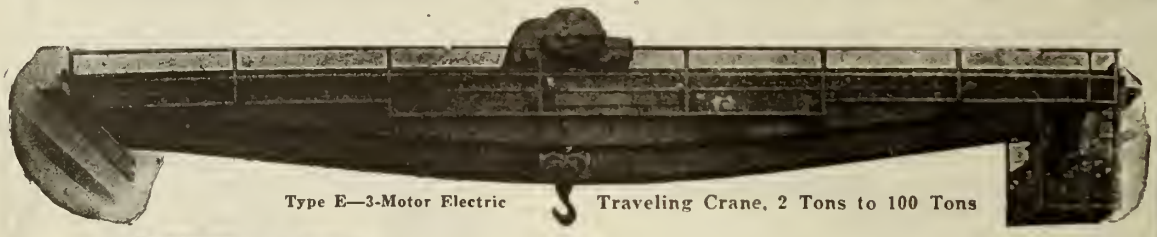
THE F. B. SHUSTER CO., New Haven, Conn.

FORMERLY JOHN ADT & SON ESTABLISHED 1886

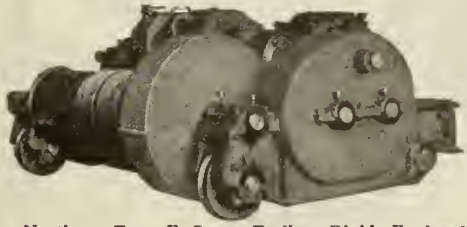
ALSO MAKERS OF STRAIGHTENERS FOR SQUARES, HEXAGONS, FLATS, ETC.

CANADIAN MADE CANADIAN MADE

Electric and Hand Traveling Cranes

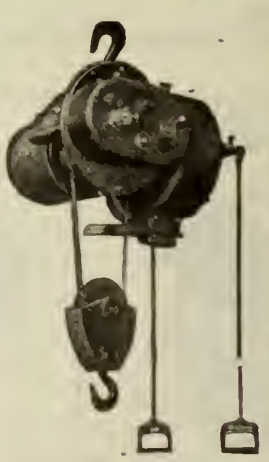


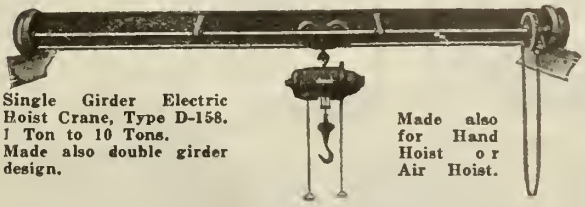
Type E—3-Motor Electric Traveling Crane, 2 Tons to 100 Tons



Northern Type E Crane Trolley, Rigid, Enclosed Construction. Patented in Canada.

We make a wide range of CRANE and HOIST designs. All sizes and capacities, 1 ton to 100 tons.





Single Girder Electric Hoist Crane, Type D-158. 1 Ton to 10 Tons. Made also double girder design.

Made also for Hand Hoist or Air Hoist.

Get our prices and specifications before you buy.

In asking prices, state SERVICE, CAPACITY, SIZE OR SPAN POWER, and, if electric, KIND OF CURRENT.

Catalogs free.

Type D Electric Hoists —½ to 10 Tons.

Air Hoists, Trolleys and Tracks.

Type No. 20 Air Hoist.

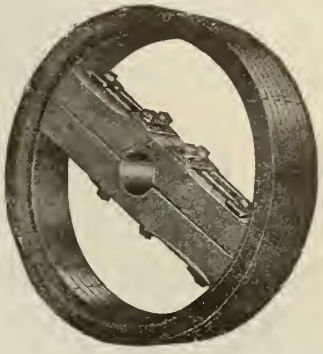
Northern Crane Works, Limited

Walkerville, Ontario, Canada

"BERNARD"
TRANSMISSION APPLIANCES

have achieved an enviable reputation in the Industrial World. Their performance under every conceivable working test has proved their dependability, and they are the most economical because of their durability.
We stand back of our products and will give dealers every assistance.

Put them to the test.

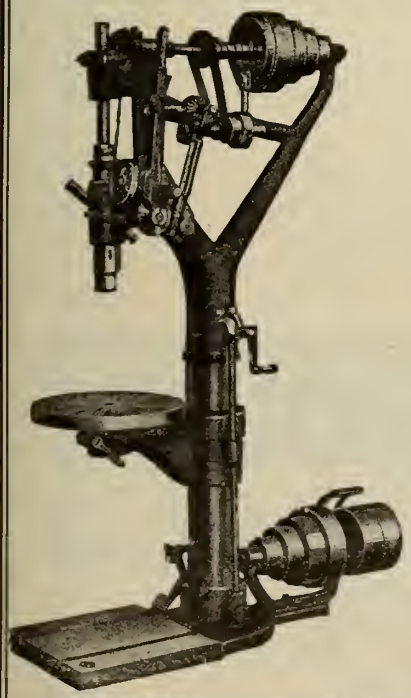


The A. Bernard Industrial Co.

Manufacturers of High-Grade Power Transmission Appliances

Offices and Works: FORTIERVILLE, Que., Canada

Silver Drills



Simplicity, Convenience and Strength mark every feature

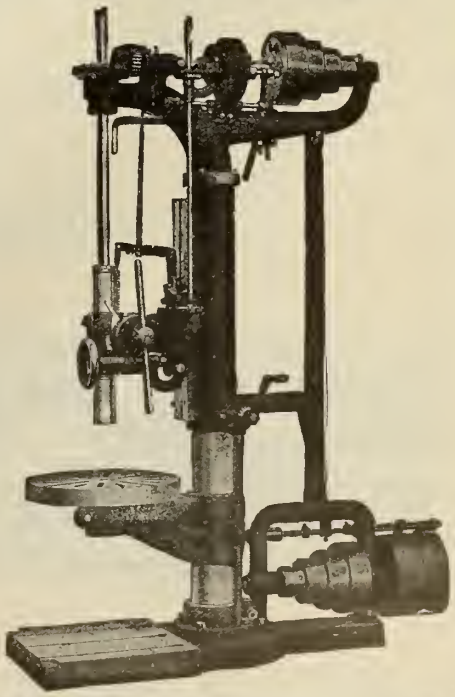
—and these factors are essential in a drill intended for economical work, for the speedy production of high grade parts where accuracy and finish are important. Silver Drills rigidly retain their accuracy under the heaviest and fastest work. The result is fewer rejects and broken tools.

—20-in. drills in four styles—plain lever feed, lever and wheel feed, power feed automatic stop, back gearing. Singly, or in gangs of 2, 3 or 4.

—25-in. drills with eight spindle speeds and six positive geared feeds.

—Compact, Efficient, Economical.

New catalogue containing detailed information on request.



The Silver Mfg. Co.

290 Broadway, Salem, Ohio

Manufacturers also of the Silver Radials

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Removing the Brake

FRICTION is the relentless enemy of efficient operation. In the average mill it destroys at least 25 per cent. of all the power produced or bought.

Yet this tremendous waste can be largely reduced—in fact, has been reduced to a minimum in hundreds of plants of every description through the aid of SKF Bearing Engineers.

These practical engineers, backed by the fund of knowledge constantly available in the SKF Research Laboratories, render an invaluable service. They remove the brake that slows down production by solving perplexing and costly friction problems.

Manufacturers are invited to avail themselves of this bearing service at any time.

CANADIAN SKF COMPANY, LIMITED
MONTRE L TORONTO

SKF INDUSTRIES

Hess-Bright Ball Bearings
S K F Ball Bearings
Atlas Steel Balls
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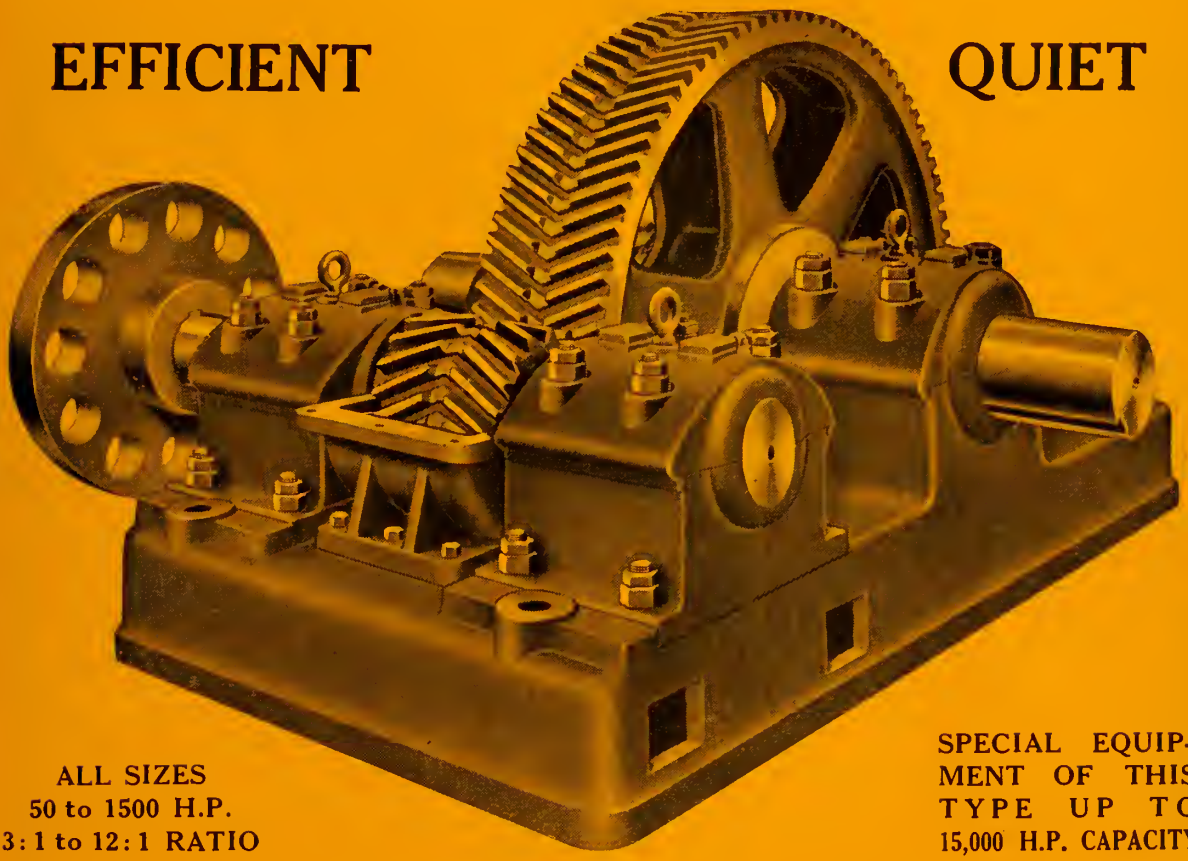
Transmission Hangers

DOMINION
HERRINGBONE GEARS

EFFICIENT QUIET



ALL SIZES
50 to 1500 H.P.
3:1 to 12:1 RATIO

SPECIAL EQUIPMENT OF THIS TYPE UP TO 15,000 H.P. CAPACITY

DRIVES FOR GIRDER MILLS, HOT AND COLD SHEET MILLS, PLATE MILLS, BAR MILLS, WIRE MILLS, BRASS MILLS, SKELP MILLS AND SEAMLESS TUBE MILLS, Etc.

SMALL DRIVES FOR RUBBER MILLS, RUBBER CALENDERS AND SUGAR MILLS, Etc.

Manufactured by

THE DOMINION STEEL PRODUCTS COMPANY, LIMITED
BRANTFORD CANADA

FAWCUS MACHINE COMPANY
PITTSBURGH, PA.

MADE
IN CANADA

MALLEABLE AND CAST IRON PIPE FITTINGS

Annual Capacity
6000 Tons

Quality Products

Prompt Service

M Brand Pipe Fittings, Screwed or Flanged, Black or Galvanized.

We are equipped to make the general run of malleable and grey iron castings for machinery manufacturers, agricultural implements, automobiles and specialties.

Cast Iron Fittings
stamped with our trade-mark mean fittings made with iron of high tensile strength — proper proportions and correct tappings.

RECESSED DRAINAGE FITTINGS

Malleable Fittings
of our brand mean fittings made of *Air Furnace Refined Iron*, reamed and tapped to gauge with perfect threads.

A trial of our pipe fittings will prove the quality of service they give.

International Malleable Iron Company, Limited
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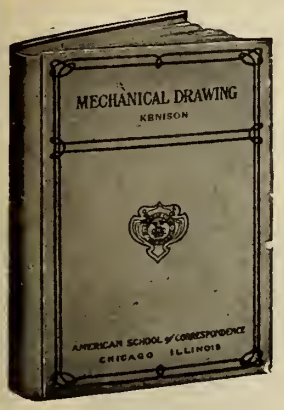

Clearance Sale of High Grade Technical Books

FOR several years we have maintained a Technical Book Department, handling high-class books published by various well known publishers. For various reasons we have now decided to discontinue our Book Dept. and in order to clear out what stock we have on hand we offer the following books at prices considerably lower than the regular selling price. Each item represents high quality at bargain prices. These books will not last long—first come first served. This is a fine opportunity to add to your technical library.

Title of Book	Name of Author.	Binding	No. of pages	Illustrated	Price
Electric Chemistry	G. W. Cravens	Cloth	132	Yes	$1.10
Hawkins Electric Dictionary (Best)	N. Hawkins	Leather	537	No	2.50
Electricity Simplified	T. O. Sloane	Cloth	172	Yes	.85
Electrical Motor	E. E. Burns	Cloth	197	Yes	1.25
Starting a Printing Office	R. C. Mallet and W. H. Jackson	Cloth	90	Yes	1.45
Half Tone Process	J. Verfasser	Cloth	378	Yes	2.50
Modern Printing Machinery	Wilson & Gray	Cloth	455	Yes	4.50
Manufacture of Paper	R. W. Sindall	Cloth	275	Yes	1.50
System for a Medium Size Printing Shop	C. V. Simmons	Paper	26	Yes	.50
Embossing	R. H. Dippy	Paper	12	No	.25
Patents, Inventors, Advisers	Marion & Marion	Cloth	170	Yes	.75
Machinists' Guide	Wm. Rogers .	Cloth	323	Yes	1.50
Mechanical Refrigeration	S. Sydney .	Cloth	70	Yes	1.25
*Stationary Engineers.	Is in sets of three volumes.				
Boiler Construction	F. B. Kleinhans	Cloth	422	Yes	2.50
Ford Car	V. W. Page	Cloth	288	Yes	2.00
New Catechism of the Steam Engine	N. Hawkins	Cloth	429	Yes	1.50
Mechanical Arts Simplified	D. B. Dixon	Cloth	497	Yes	1.25
Change Gear Devices	O. E. Perrigo	Paper	81	Yes	1.25
Factory Power Costs	J. G. Branch	Paper	43	No	.75
The Field Engineer	Unable to find book in stock				1.50
Power Stations and Transmission	G. C. Shand	Cloth	84	Yes	.85
Liquid Air	T. O. Sloane	Cloth	365	Yes	2.10
New Guide Book to the Local Marine Board	C. M. Swainson	Cloth	545	Yes	1.30
Modern Machine Shop Tools	W. H. Van Dervoort	Cloth	552	Yes	3.00
Locomotive Catechism	R. Grimshaw	Cloth	432	Yes	1.50
Locomotive Breakdowns	G. L. Powers	Cloth	244	Yes	1.25
Modern Ironmonger		Cloth	341	Yes	1.00
Gas Engine Troubles	J. B. Rathbun	Cloth	448	Yes	1.00
Combustion of Coal and Prevention of Smoke	Wm. M. Barr	Cloth	347	Yes	1.25
Engineers' Library	W. H. Wakeman	Paper	Different No. in each	Some are	.25
Elements of Machine Design	J. H. Barr	Cloth	446	Yes	2.00
Hawkins' Indicator	N. Hawkins	Cloth	73	Yes	.75
Gas Engine Construction	Parcell & Weed	Cloth	304	Yes	2.00
Mechanism of Mechanical Movements	Unable to find book in stock				2.00
Pattern Making	Ritchey & Monroe	Leather	222	Yes	1.25
Machine Design	E. L. Wallace	Cloth	157	Yes	1.25
Foundry Work	B. L. Gray	Cloth	196	Yes	1.25
Forging	J. Jernberg	Cloth	131	Yes	1.25
Tool Making	E. R. Markham	Leather	288	Yes	2.00

***These books are in sets of 3 volumes to a set. There are eight sets in stock. The price of which are $4.50 per copy or $12.50 per set.**

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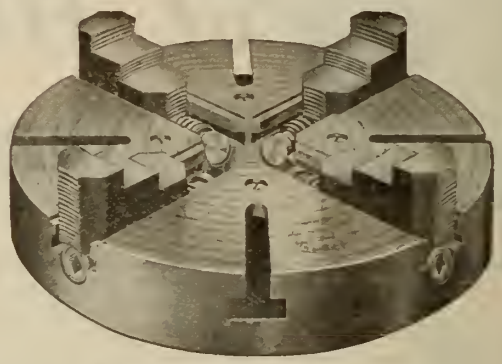
are not an experiment—they have come to stay. They are a necessity with the modern machinery and high-speed steel cutting tools.



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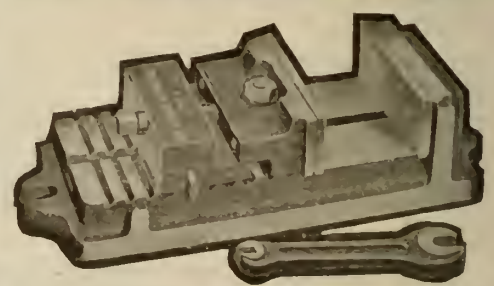

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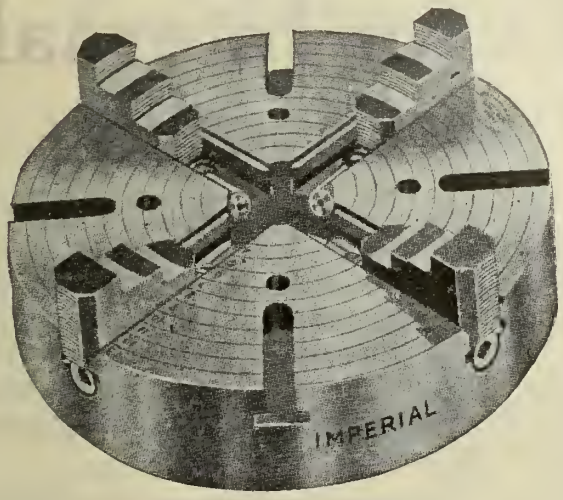

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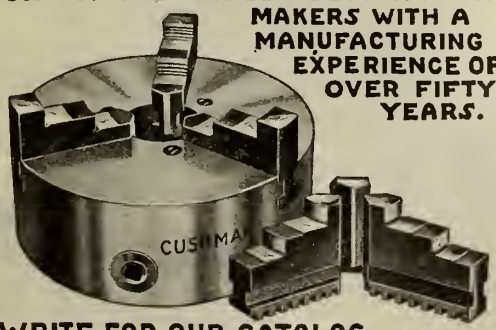

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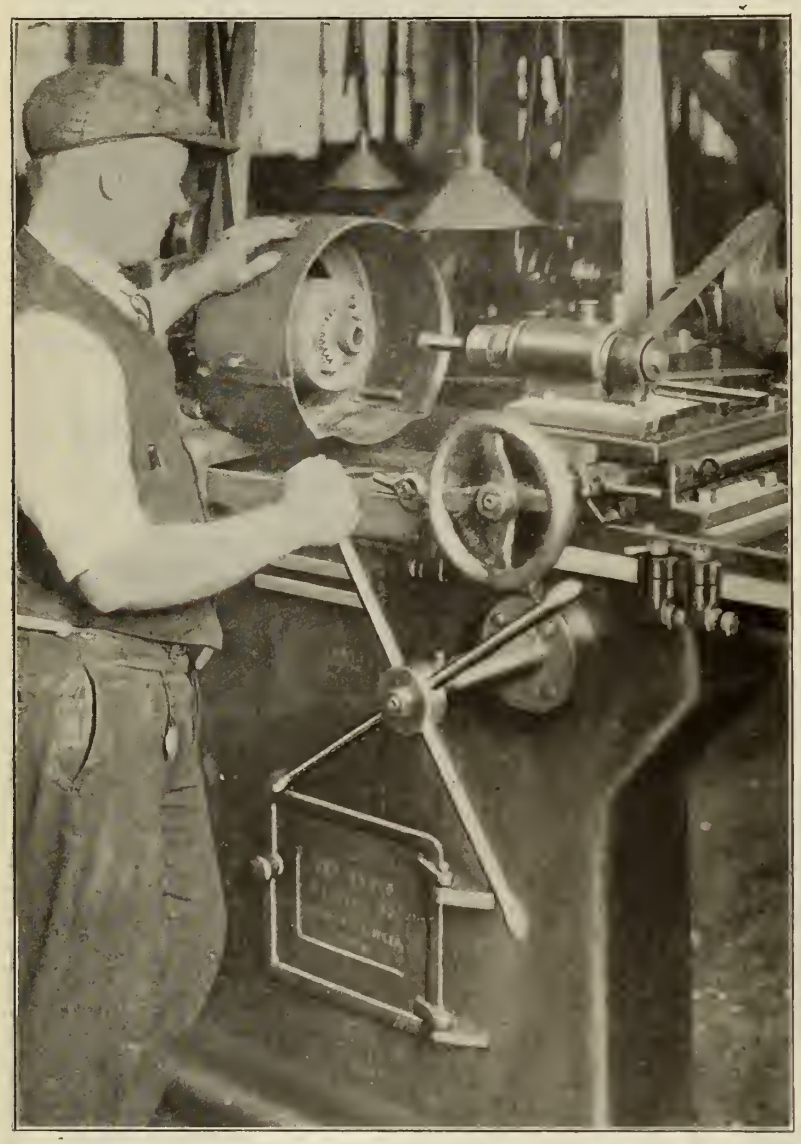

Style No. 75 for Internal Grinding

The Toledo Chevrolet Motor Co. are using 18 Style No. 75 Heald Internal Grinding Machines for finishing holes in automobile parts. The illustration shows a style No. 75 which for 18 months has been grinding the bore in differential gears to a limit of .0005.

This style machine readily handles such work as transmission gears, pinions, washers, collars, bushings, rings, ball bearing races, etc. It is extremely rugged and durable, simple in construction, easy to operate and fully guarded.

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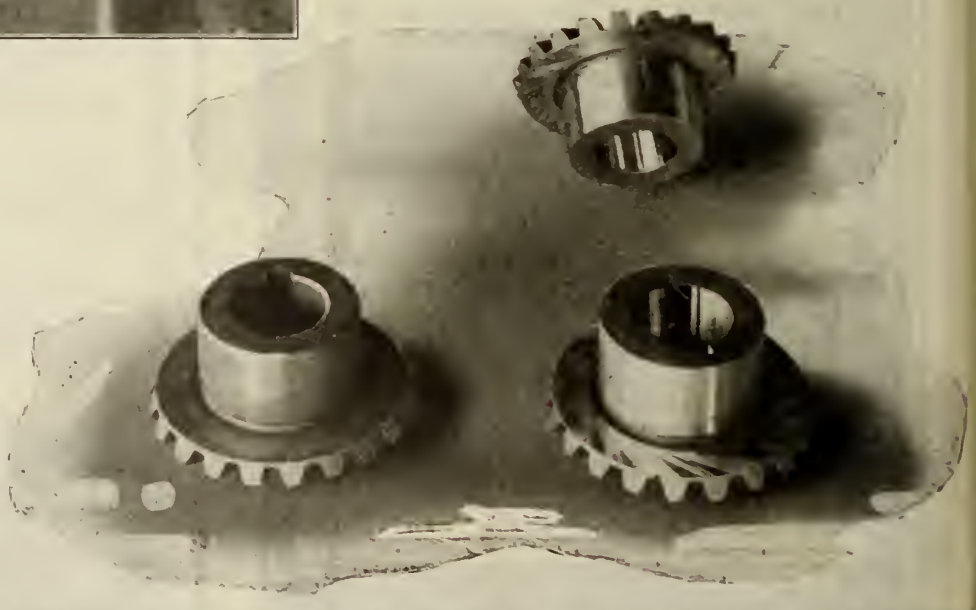
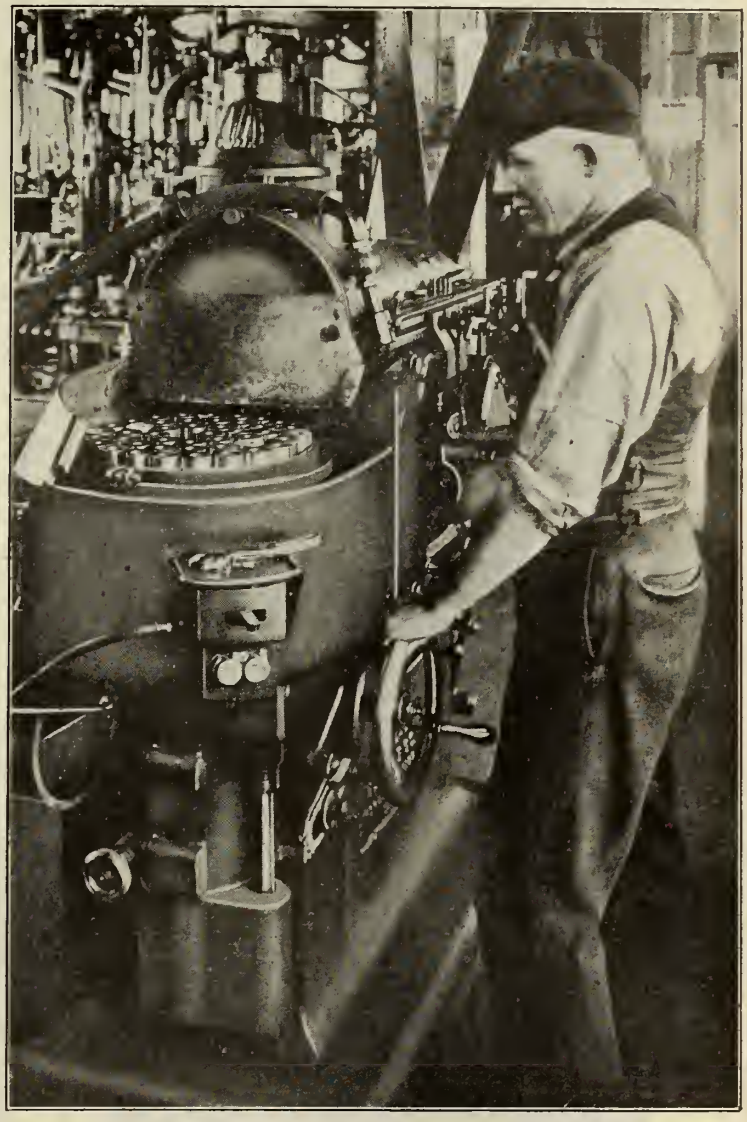


for grinding gears

Style No. 22 for Surface Grinding

The photo on this page shows a Heald Style No. 22, surface grinding gear blanks at the plant of the Detroit Accessories Corp. at the rate of one a minute, both sides.

Any flat work can be ground with this machine, such as dies, rings, collars, cutters, reamer blades, keys, etc. With its angular adjustment it is particularly adaptable to grinding saws, knife blades, gauges, etc., requiring a slight angle.



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General manufacturing plants prefer the **Rockford Miller** because they require a machine which they can depend on to do any work within its range to the complete satisfaction of the inspection department.

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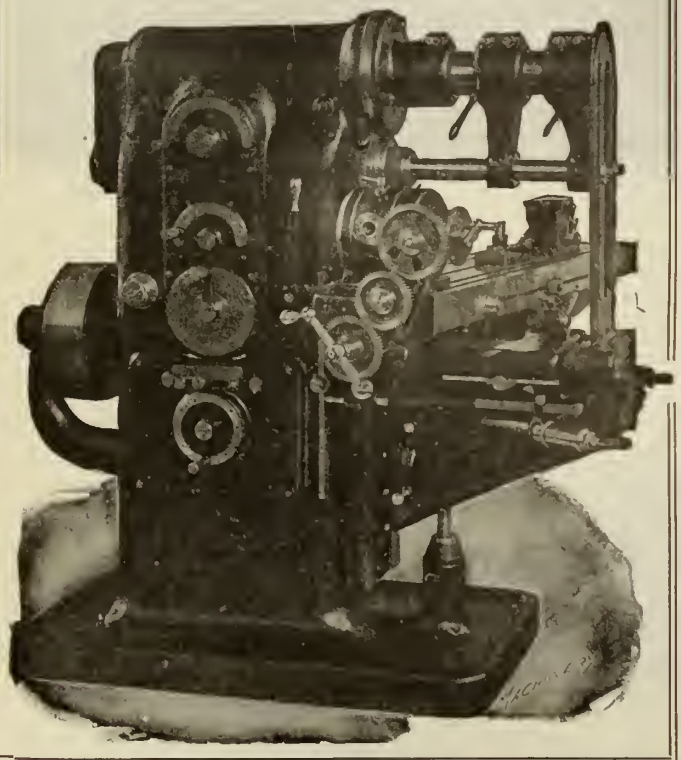

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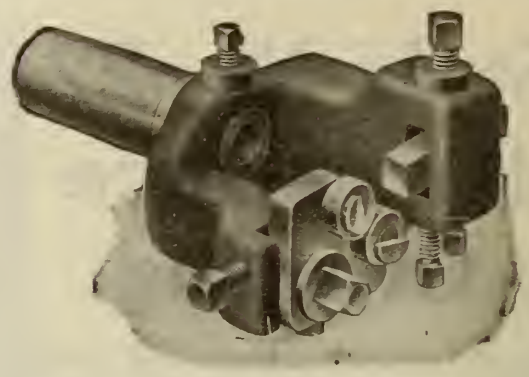

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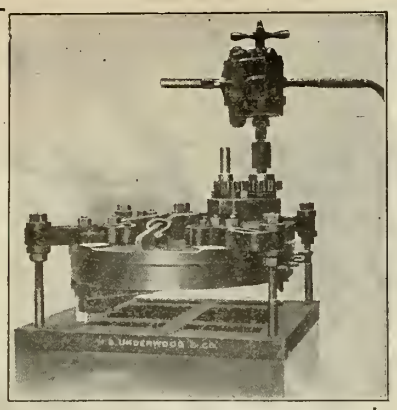

Our latest Portable Valve Seat Planer is the result of a demand for a machine which would face off at one cut, deeply worn seats. Duplicate orders from the most prominent railway shops prove the quality of its service.
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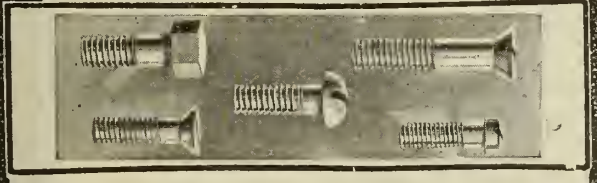

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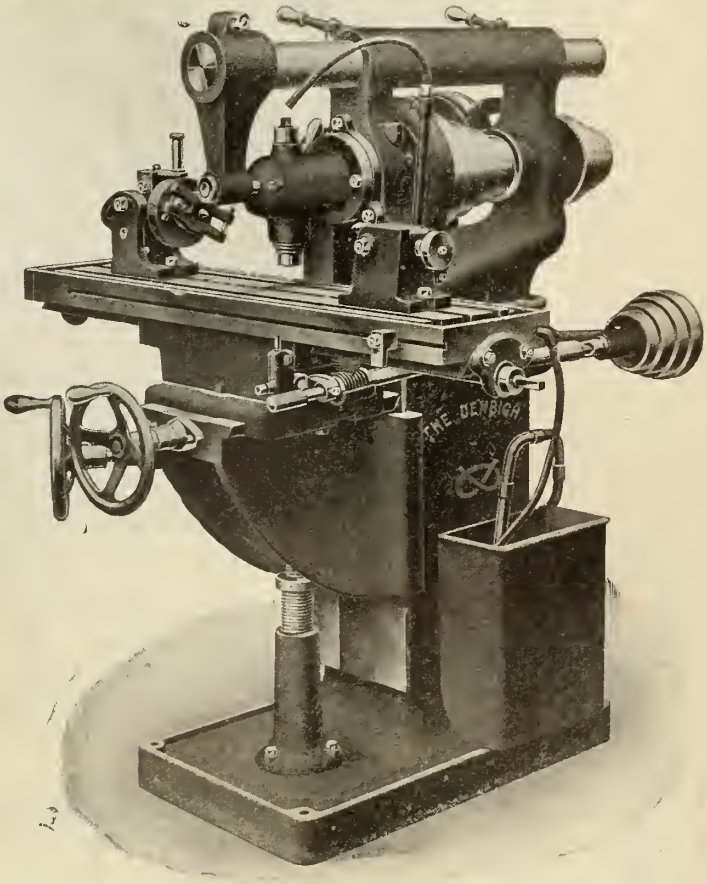

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Lachine surrounds the manufacturer with the economic conditions that allow him to meet competition successfully. Its commanding position on the main lines of the G.T.R. and C.P.R., the St. Lawrence and the Lachine Canal insures low freight rates and first class transportation facilities.

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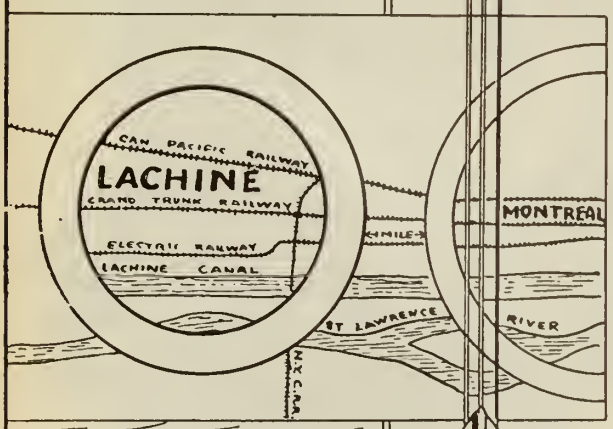
There are a number of excellent industrial sites available that possess both water and rail facilities. Ask about them. The most detailed information given cheerfully on request.



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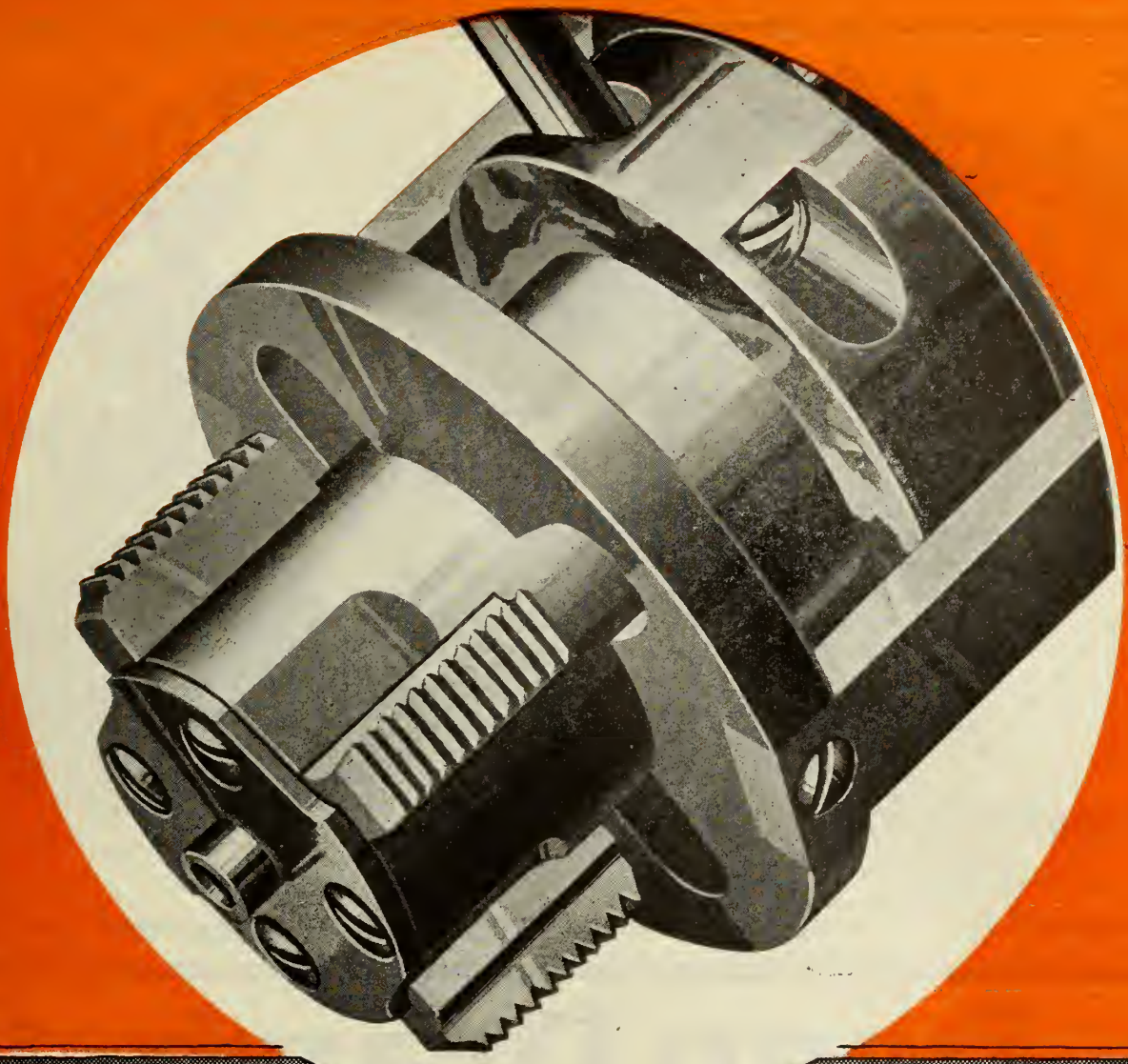
For more detailed information write

Mr. E. Leduc

Sec.-Treas. of the City of Lachine



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It's all fully illustrated and explained in the new NAMCO TAP & DIE Book. Ask for your copy.

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The attachments are all very simple in design and easily adjusted upon the machine, being graduated so that any desired angles can be at once obtained.

The head is made from a solid casting and embodies rigid arch construction. Spindle turns in large bronze bearings without vibration. Write for full particulars.

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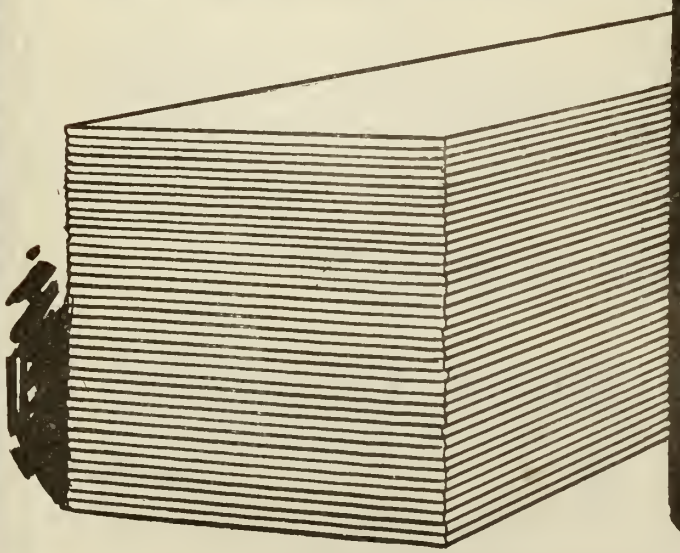

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Universal motor for direct or alternating current, 110-220 volts. (Licensed under Buche Universal Motor Patent.)

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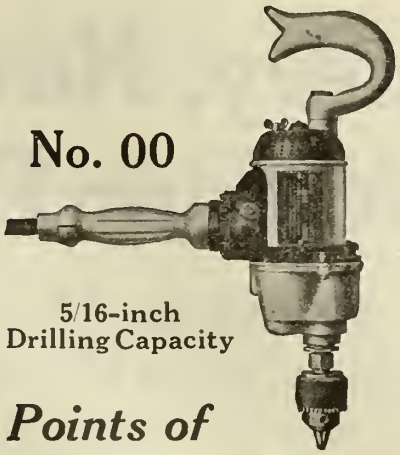

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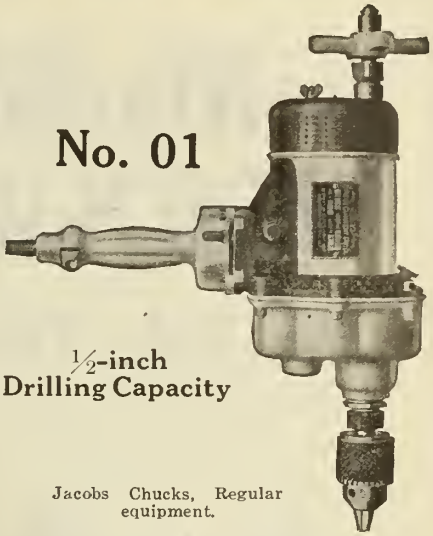

½-inch Drilling Capacity

Jacobs Chucks, Regular equipment.

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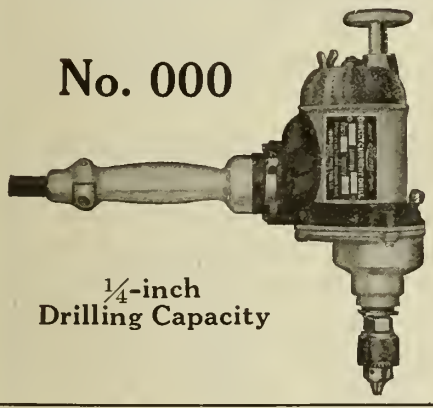

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Points of Superiority:

Light weight—The internal gear driver permits the use of smaller gears and gear case—3 teeth in contact instead of one.
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Most Powerful—The method of winding the field and armature, and the use of ball and roller bearings result in greater power.
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Safety — The Thor switch breaks both sides of the line, leaving no current in the drill when idle. It would be impossible to make a switch insuring greater safety.

These features are used in Thor Electric Tools exclusively, and will not be found in any other make. Their compact construction, neat design and high grade finish is unsurpassed.

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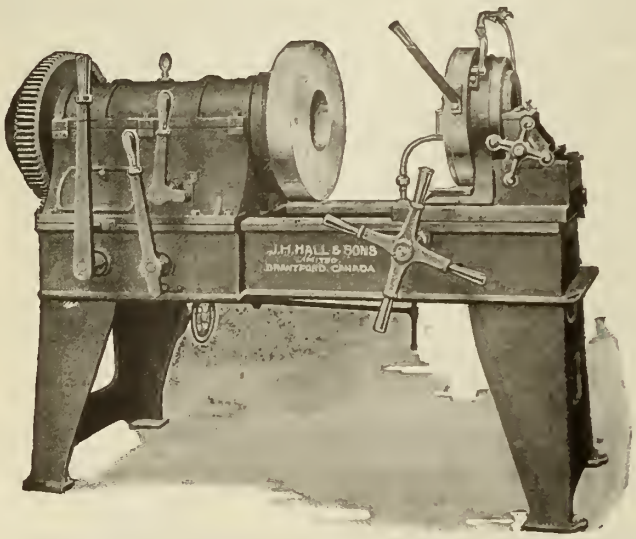
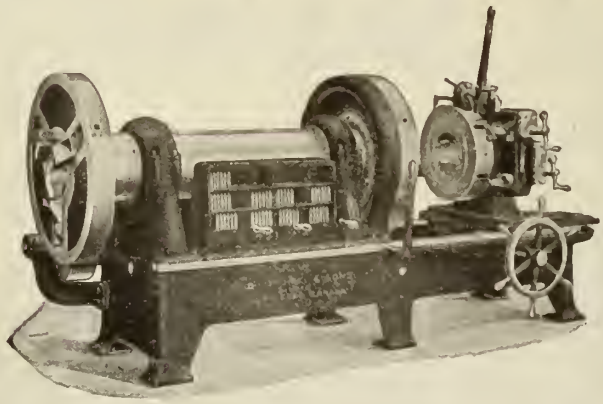
We Make Pipe Threading Machinery of Merit

Sizes 1/8" to 18"



The Hall No. 6 Pipe Machine



The Hall No. 8 Pipe Machine

If you were to ask the highest authorities on industrial economies what will finally bring industrial peace, you would be told, "Machinery."

Men who have watched the development of the vast industry which supplies machinery that saves labor and increases production, know its future possibilities. Important work and great responsibility lie in the path directly ahead.

Machinery that will lighten labor will play the greatest part of all in the Sanitary and Heating business, because threading and cutting pipe is hard work, and a lot of it has to be done by hand unless machines are permitted to play a larger part than heretofore.

There is also the problem of finance to be taken into consideration. Every dollar leaving Canada is one dollar less upon which to do business. And money, to-day is at a premium, just as is labor. Both can be conserved by keeping our money in the country and making hard work easy. Both will tend to increase production.

We should be glad to discuss your threading problems wherever, whenever you desire.

Williams Tool Corp. of Canada, Ltd.

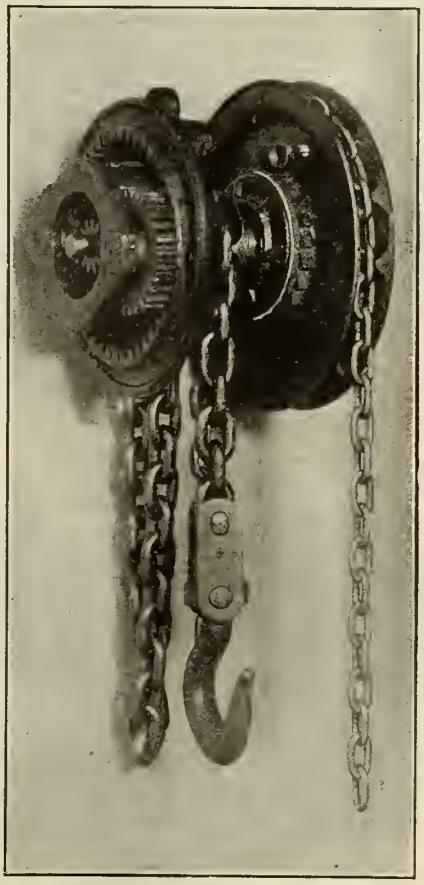
Brantford, Canada

Successors to: John H. Hall & Sons, Limited

MORRIS TRIPLE GEAR CHAIN BLOCKS

are considered by chain-block users as the standard of quality. The exceptionally long life of Morris blocks has surprised many buyers of industrial equipment.

Conscientious workmanship and quality materials have been the main source of our success in the manufacture of chain blocks and enables us to give the user the highest degree of



EFFICIENCY
STRENGTH
SAFETY

We can ship immediately from stock all sizes from ¼ ton to 20 tons—standard or special lifts.

THE HERBERT MORRIS CRANE & HOIST COMPANY LIMITED

HEAD OFFICE AND WORKS:
NIAGARA FALLS, CANADA

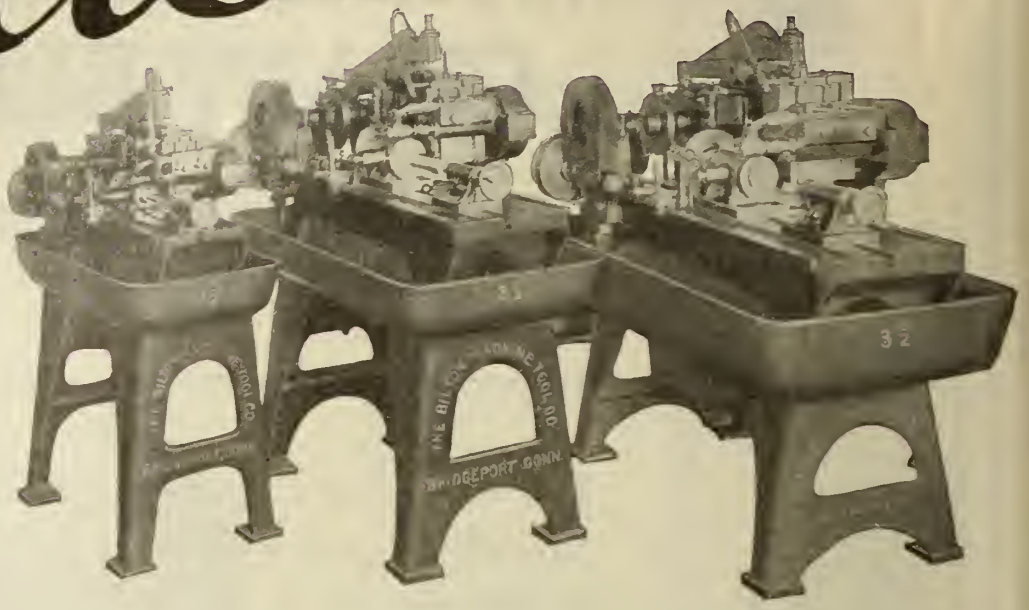
OVERHEAD CRANES
JIB CRANES

ELEVATING TRUCKS - STORAGE BATTERY TRUCKS

ASH HOISTS
RUNWAYS

If interested tear out this page and place with letters to be answered.

Bilton GEAR MILLERS



Fully Automatic

Their adaptability is almost unlimited on small work—such as cutting spur, bevel, miter, angle gears, saws, ratchets, sprockets, cutters, knurls, taps, cylinders, form cutting, manufacturing, milling, etc.

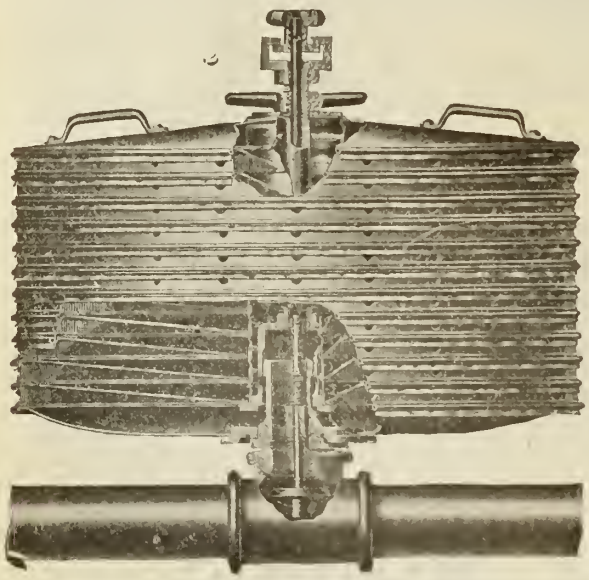
A big time saver, as indexing takes place during return stroke of cutter — which is removing metal 90% of the time.

Write us for Catalog 30-6

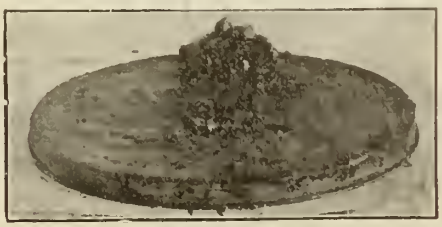
Over 500 leading manufacturers now use the Bilton for high production on accurate work

Bilton Machine Tool Co. Housatonic Avenue **Bridgeport, Conn., U.S.A.**

Foreign Agents: Alfred Herbert, Ltd. Chas. Churchill & Co., Ltd.



No. 1—Sectional View of Bowser Filter Section Assembled.



No. 2—Filter Disc with dirt filtered from oil.

It Gets The Dirt It's A BOWSER Oil Filter

The pictures shown illustrate the Bowser Filter Section as used in the Bowser Oil Filter.

No. 1 shows the Filter Section assembled, ready for use. No. 2 shows one of the Filter discs with dirt that the Filter has collected from used oil. This pile of dirt is about 6 in. in diameter and from 2 in. to 3 in. high.

There are twelve of these filter discs and cloths in a Bowser filter section, each as effective as the one you see pictured. As many complete Filter Sections as needed are furnished in the Bowser System.

Bowser Systems are applicable to any size and type of power producing and transmitting machinery.

We will be glad to send literature and explain to you how the Bowser principle of Oil Filtration can be applied to your power plant.

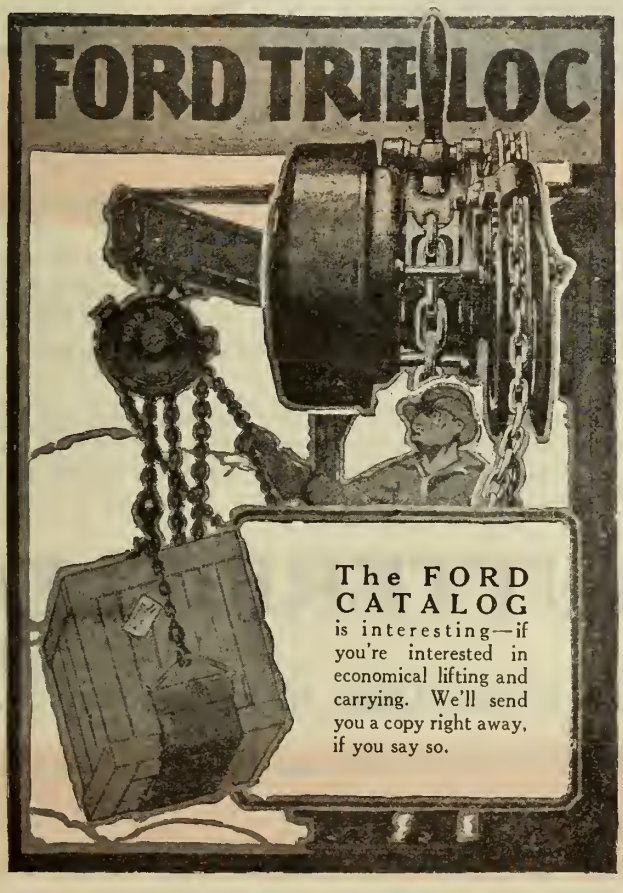
S. F. BOWSER COMPANY, Limited

66-68 FRASER AVE., TORONTO, CANADA

Offices in Principal Cities of the World

LIONROYAL
and
SOVEREIGN GENUINE
Use Babbitt Metals alloyed under the "Stanley Process" and you take no chance—
The *Quality* is guaranteed and remains long after price is forgotten.
LONGER SERVICE PER BEARING
means lower cost per year

BRITISH SMELTING & REFINING Co. Limited.
Drummond Building Montreal.


FORD TRIBLOC
The FORD CATALOG
is interesting—if you're interested in economical lifting and carrying. We'll send you a copy right away, if you say so.

RUGGED STRENGTH, "built in," is the reason for FORD TRIBLOC permanence.

It is made by men who, first of all, know by actual experience just what a Chain Hoist must do, and who, secondly, have ever striven to keep the Ford Tribloc the best Chain Hoist made.

The Hand Chain can't jump the hand wheel flange, for a (patented) loop hand chain guide prevents this. Steel cut gears in planetary drive, set in a dust-proof housing, drop forged steel hooks and high-test steel chain, spell safety. Triblocs are built in capacities ranging from half a ton to twenty—and more.

2173-D

FORD CHAIN BLOCK CO.
2ND & DIAMOND STREETS PHILADELPHIA, PA.

OVER-SEAS REPRESENTATIVE
ALMACOA ALLIED MACHINERY COMPANY OF AMERICA ALMACOA
51 CHAMBERS ST. NEW YORK, U.S.A.

PARIS BRUSSELS TURIN BARCELONA RIO DE JANEIRO

If interested tear out this page and place with letters to be answered.

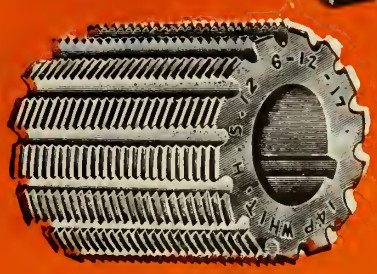
BUTTERFIELD products will give you the satisfaction that is to be expected of high-class tools, They are as good in quality as modern manufacturing science can make them coupled with 35 years of concentrated experience.

The quality represented in Butterfield tools and the prompt and efficient service in making deliveries have won the confidence of manufacturers in many parts of the world.

BUTTERFIELD &

UNION TWIS

Rock Island, Que., Canada - -



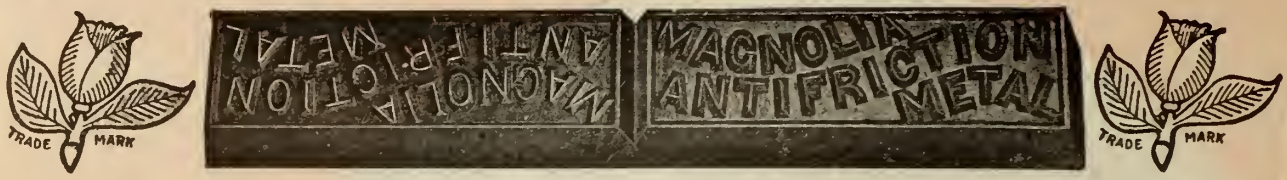
THE Butterfield line comprises a full variety of high speed and carbon twist drills, reamers and milling cutters; taps, dies and screw plates. Large stocks of standard styles are always carried in stock. Exceptional equipment enables real satisfaction to be given in the production of tools to meet special requirements.

Full particulars of the Butterfield line are contained in the Butterfield catalogs. Copies upon request.

COMPANY DIVISION

DRILL COMPANY

- Toronto Office, 220 King St. West



New Truths and Old Fallacies

Fusibility of Alloys—*Continued*

In spite of the opposition at first displayed against Magnolia Metal, it was introduced with surprising rapidity, and few American concerns can point to such wide-spread use of their product—especially a proprietary article which had to stem the tide of both prejudice and intense local competition in every country.

This rapid progress was not the result of intensive advertising, as, at that time, the Magnolia Metal Company could not have undertaken it.

As a matter of fact, in those days, most everybody had more or less bearing trouble from using Genuines, and they welcomed the relief that Magnolia gave them; and the good news spread by word of mouth with the speed of a prairie fire.

These facts are recited because of the important relation they bear to the whole subject.

When Magnolia gave proof of such excellent qualities the intermediate mixtures referred to came into being. Those who clung to the idea that tin gave predominant value to a babbitt, evidently concluded that they might cheapen Genuine by adding some lead without impairing the supposed superior qualities derived from the use of tin. They started off by adding 10 per cent. lead, and then competition and desire to cheapen product broke down all barriers and thereafter babbitts of every conceivable mixture were made to suit the individual ideas of the composers.

In the light of present knowledge it is self-evident that nobody then knew in what manner, if any, these various combinations affected the product and if anybody knew the nature of solders they failed to apply the analogy and merely took things for granted and many are still oblivious of the true facts.

(Continued next month.)

For copy of complete article:
"New Truths and Old Fallacies"
Address our Montreal Office

SOLD BY LEADING DEALERS EVERYWHERE OR BY

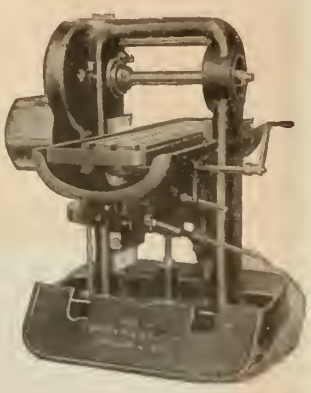
MAGNOLIA METAL CO.

Office and Factory:
Montreal: 225 St. Ambroise St.

BRIGGS MILLERS

Production Tools

Machine tools to-day are judged by their ability to do efficient work, save time, labor and expense. These have ever been the measures by which Briggs Millers have been designed and constructed. That our engineers have succeeded in meeting these requirements is evidenced by the increasing popularity of Briggs Millers.



No matter what the nature of the work or how severe the service the Briggs Miller will stand up to it. Its unusual rigidity, great strength and ability to take wide deep cuts when running at a high rate of speed, has established a wide reputation that is unexcelled. We would like to show how "B r i g g s" adaptability and convenience can increase output and lower costs for you. A letter will bring full details by return mail.

Gooley & Edlund, Inc.
CORTLAND, N.Y.

Canadian Representatives:
Garlock-Walker Machinery Company, Ltd., Toronto
Williams & Wilson, Ltd., Montreal

—*for a large variety of grinding*

if your variety of grinding is large invest in a Manhattan Universal Grinder. It is capable of handling cylindrical or internal grinding with the utmost in speed and accuracy.

Write for details.

Manhattan Machine & Tool Works

Grand Rapids, Mich., U.S.A.

Manhattan All-Around UNIVERSAL TOOL GRINDER

Foreign Representatives The Oliver Machinery Co., Ltd., Manchester, Eng. Farmer & Co., Clerkenwell, London, E.C.

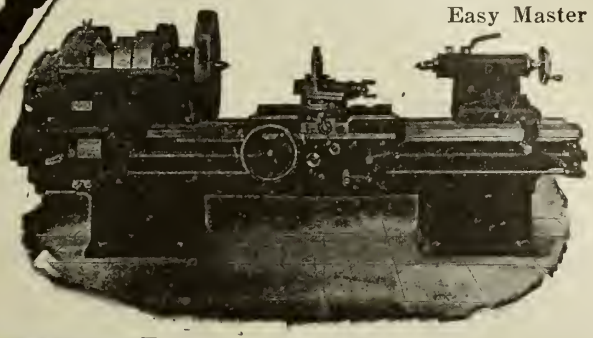
2

SIDNEY

FOR SERVICE

Heavy Duty Lathes

The 25-inch Heavy Duty Quick Change Sidney shown below is the last word in lathe construction. Every possible improvement will be found in this late model. Bed lengths available are 10, 12, 14, 16, 18 and 20 feet. Also built with a 27-inch swing.



Easy Master of Big Jobs

Regardless of the severity of work, dependence put on Sidney Lathes has never been misplaced. The Sidney line has made good—with a vengeance. New Bulletin just issued on 25-inch machine. Write to-day!

The Sidney Tool Company

SIDNEY, OHIO

Canadian Agents:

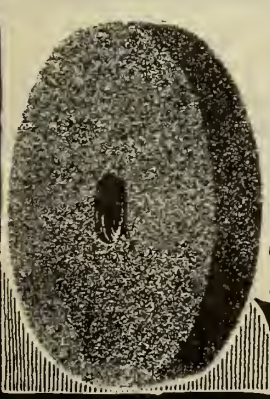
Yeates Machinery & Supply Co., Montreal, Quebec
H. W. Petrie, Limited, Toronto, Ontario

What is Your Work?

Just a word from you regarding the class or nature of the work you wish to grind and we will select a "Dominion" which will exactly suit your needs.

Dominion Grinding Wheels

Are made in Canada—they rank in quality with the best makes. Every grain bites. Every wheel is uniform to grade and grain and gives uniform service on the work for which it is designed. Buy Dominion wheels and save duty and exchange.



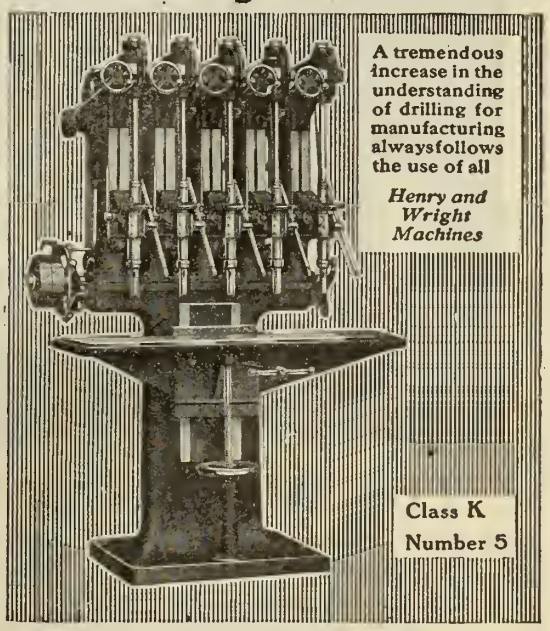
Dominion Abrasive Wheel Co., Limited

Mimico - Ontario

DOMINION Grinding Wheels

HENRY & WRIGHT

Drilling Machines



A tremendous increase in the understanding of drilling for manufacturing alwaysfollows the use of all *Henry and Wright Machines*

Class K
Number 5

The Henry & Wright Mfg. Co.

Hartford, Conn.

Canadian Fairbanks-Morse Co., Montreal, Toronto, Winnipeg; A. R. Williams Machinery Co., Toronto, St. John, N.B.; H. W. Petrie, Ltd., Toronto; Williams & Wilson, Montreal; Rudel-Belmap Machinery Co., Montreal; Canada Machinery Corp., Galt, Ont.; Geo. F. Foss Machinery & Supply Co., Montreal; General Supply Co., Montreal.

If interested tear out this page and place with letters to be answered.

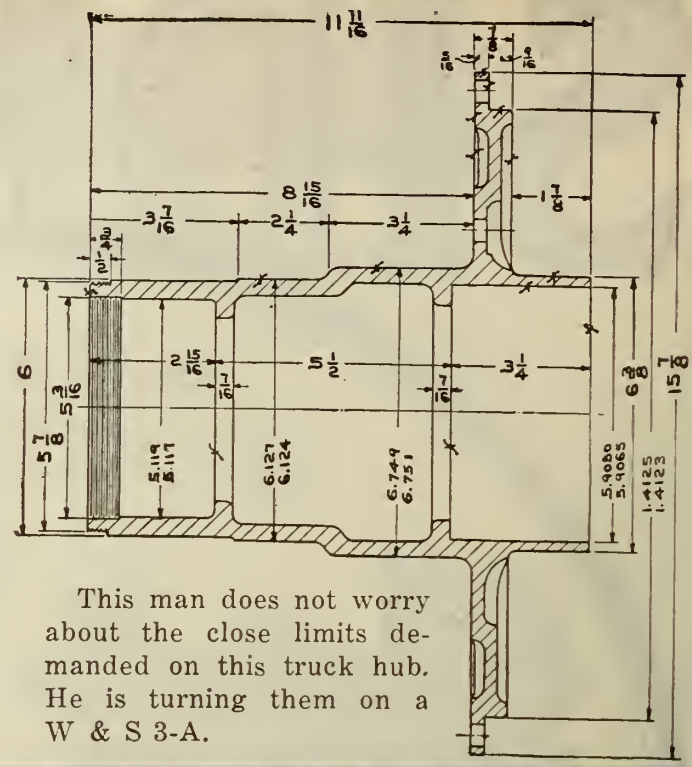
"Production—A Human Problem"

Automotive Industries
Editorial, July 8th

You can increase your production and profits and at the same time insure the whole hearted co-operation of your operators by installing Warner & Swasey Turret Lathes.

Ask any Turret Lathe operator. He'll tell you he prefers to work on Warner & Swasey Turret Lathes because he can do more and better work on them with less effort.

Warner & Swasey Turret Lathes are rigid, powerful and accurate; easy to tool and easy to operate.



This man does not worry about the close limits demanded on this truck hub. He is turning them on a W & S 3-A.

The Warner & Swasey Company, CLEVELAND, OHIO, U.S.A.

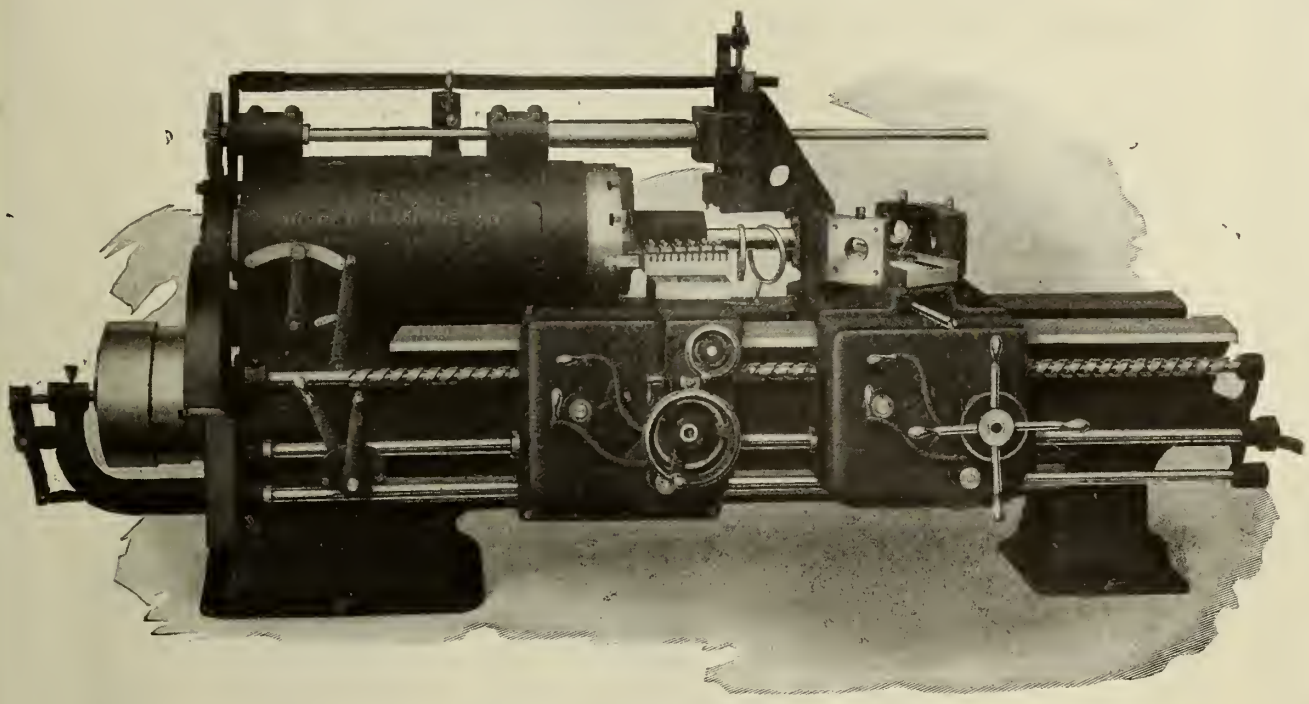
New York Office, Singer Bldg. **Boston Office, Oliver Bldg.** **Buffalo Office, Iroquois Bldg.**
Detroit Office, Ford Bldg. **Chicago Office and Show Room, 618-622 Washington Bouvd.**

CANADIAN AGENTS:
A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg, Vancouver, St. John.
Williams & Wilson, Ltd., Montreal.

FOREIGN AGENTS:
Charles Churchill & Co., Ltd., London, Birmingham, Manchester, Bristol, Newcastle-on-Tyne, Glasgow.
Allied Machinery Company, Paris, Turin, Zurich, Barcelona, Brussels.
Wilhelm Conesson Company, Malmo, Copenhagen, Stockholm, Gothenburg.
R. S. Stockvis en Zonen, Rotterdam.
Benson Brothers, Sydney, Melbourne, Adelaide.
Yamatake & Company, Tokyo.
McLeod & Company, Calcutta.
Anderson, Meyer & Company, Ltd., Shanghai, Tientsin, Pekin, Honkow, Canton, Yumanfu, Changhau, Kalgan, Hongkong.
Brossard-Mopin & Company, Saigon, Singapore, Haiphong

STEINLE

Full Swing Side Carriage Turret Lathe



More Piston Rings

The above cut shows a standard Steinle Turret Lathe set up with tools for making eccentric piston rings at one of the tractor plants of the Advance-Rumely Company. As will be seen, a cylinder is held in special jaws of the chuck and by means of the special attachment, bored concentric, turned eccentric and rings cut off with gang tools spaced to proper width, all operations being accomplished simultaneously.

The great range of this equipment is an important feature. It will machine rings from 4 in. to 21 in. diameter having any desired eccentricity.

The attachment is entirely self-contained and can be removed in a few minutes, leaving the standard machine free to handle other work such as pistons, fly wheels, cylinder heads, hubs, gear blanks, etc.

Send us drawings of your piston rings or other parts so our engineering department can estimate "Steinle" production, or ask to have a representative call upon you to determine what work can be produced to advantage on our equipment.

Steinle Turret Machine Company

Originator of the Full Swing Side Carriage Turret Lathe

Madison, Wis., U. S. A.

AGENTS—Machine Tool Engineering Company, Singer Building, New York City; Cadillac Tool Company, Dodge Power Building, Detroit, Michigan; L. G. Henes, 75 Fremont Street, San Francisco, and Title Insurance Building, Los Angeles, California. FOREIGN—Leo. C. Steinle, 53 Victoria Street, London, England.

If interested tear out this page and place with letters to be answered.

It Cuts

That's the Secret of the Efficiency of Aloxite Cloth

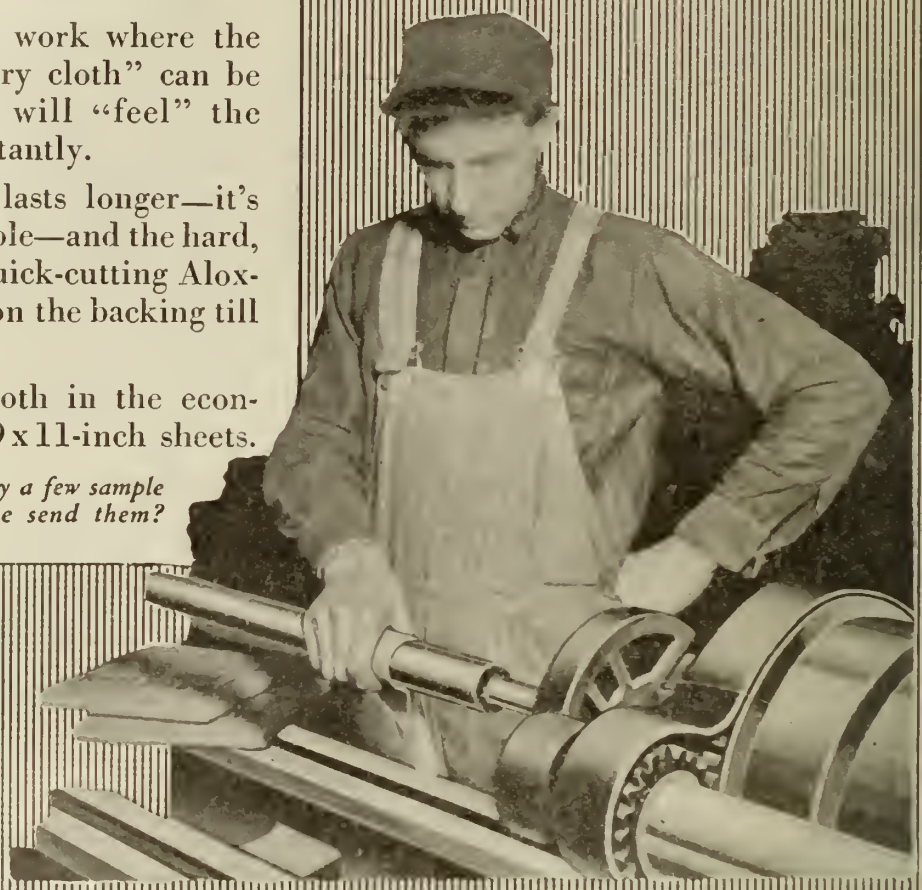
IT isn't a case of slow, time-killing rubbing when you are using Aloxite Cloth, because it cuts clean and fast, always leaving a smooth, uniform finish.

Use it on any work where the ordinary "emery cloth" can be used and you will "feel" the difference—instantly.

Aloxite Cloth lasts longer—it's extremely flexible—and the hard, sharp, tough, quick-cutting Aloxite grains stay on the backing till worn off.

Get Aloxite Cloth in the economy rolls—or 9 x 11-inch sheets.

Will you try a few sample sheets if we send them?



Aloxite Cloth

The Cloth that cuts

The Carborundum Company, Niagara Falls, New York

New York Chicago Boston Philadelphia Cleveland Cincinnati
Detroit Pittsburgh Grand Rapids Milwaukee

THE MASTER METAL ☐ THE MASTER METAL

STELLITE

Not Steel—but its master

Stellite is the only metal which can tax the capacity of the modern lathe.

Heat which would burn up the finest high-speed steel tools, makes Stellite give heavier, cleaner cuts than when cold.

Stellite is the real high-speed cutting metal —an alloy tougher, harder, more lasting than the finest steel ever made.

Stellite tools actually increase the capacity of the shop without additional machines or floor space.

You should learn just what Stellite can accomplish in your shop. Let us give you an actual demonstration.

DELORO
Smelting & Refining Company Limited

Head Office and Works: DELORO, CANADA

Branch Warehouses:
200 King St. W., Toronto, Ont., Can.
174 Corporation St., Birmingham, Eng.
26 Albemarle St., London, Eng.

THE MASTER METAL ☐ THE MASTER METAL

If interested tear out this page and place with letters to be answered.

Why Schmidt Played Off Key

SQUAWK!

The Conductor rapped testily on the opened score and glared over at the brasses. (I was sitting in the back of a Broadway Movie Palace listening in on a rehearsal of the orchestra.)

The cornetist on his right—the alto saxophone player on his left—both stared accusingly at the red-faced Schmidt who sat looking at his new saxophone with a puzzled air.

"We're playing no Chinese scales this morning, Mr Schmidt," said the Conductor with heavy sarcasm. "If you'll please to stick to the music as written we'll go on with the rehearsal. Ready!"

My mind turned back to my last summer's trip through the Buescher Band Instrument Company's plant. I can't play two notes on a saxophone but from what I learned on that trip I knew what was wrong with Schmidt's saxophone.

* * * * * * * * *

"It's ticklish close work," said Mr. Lewis. "The mouthpiece of a saxophone has got to be right." We stood in the finishing room of the Buescher Band Instrument Company's big factory out in Elkhart, Indiana, where the famous Buescher True Tone band instruments are made. All around me workmen were putting the finest sort of finish on the gleaming brass and silver instruments with strips of fast cutting Speed-grits.

"You see," Lewis went on, "if the rubber mouthpiece of a saxophone is the least bit out of true—lower on one side than on the other—it will squeak and squawk—usually at the wrong time. And look here!" He took a trombone from one of the finishers.

"The slightest leak in the slide or joint of these fellows and their tone goes howling to the dogs. With Manning Speed-grits these parts are finished to less than one-thousandth of an inch.

"Accurate? We have to be. Think of our awful responsibility. Possible discords, you know. We make harmony here—nothing else."

Incidentally there's complete harmony between Buescher workmen and Speed-grits.

Good workmen know the difference.

Manning Speed-grits

Look for this trade-mark on the back of every sheet, belt or disc.

Send for "The Difference Book"—Address

RITCHEY SUPPLY COMPANY

154 Pearl Street (CANADIAN DISTRIBUTORS) **Toronto, Canada**

Or send to Manning Abrasive Co., Troy, N. Y. U. S. A.

Speed-grits

comes in the following varieties:
GARNET PAPER
GARNET CLOTH
GARNET COMBINATION
FLINT PAPER
EMERY CLOTH
EMERY PAPER
METALITE CLOTH
HANDY ROLLS
GRINDING DISCS
DURITE CLOTH
DURITE PAPER
DURITE COMBINATION
DURUNDUM PAPER
DURUNDUM CLOTH

Manning Speed-grits

Reg U.S Pat Off.

Don't say sandpaper—say Speed-grits

The World's Standard Sheet Packing

Rainbow Sheet Packing—the *original red sheet*—has given the mechanical world 30 years of unexcelled service under the most exacting conditions.

There are instances of gaskets cut from

Rainbow Sheet Packing

being found in excellent condition after 20 years of dependable service in high pressure steam lines. Insist on the *"Rainbow" Diamond* trade mark to ensure this dependable service in *your* steam lines.

Our nearest branch will be glad to send you a catalogue on request, and, if you wish, one of our technical experts will gladly help you overcome your packing troubles.

Genuine Rainbow Sheet Packing is made in Canada by

CANADIAN CONSOLIDATED RUBBER CO. LIMITED
DOMINION RUBBER SYSTEM
AND ASSOCIATED COMPANIES

Our Dominion Hose, Packing and Industrial Rubber Goods are all the same high standard as Dominion Friction Surface Belting.

Dominion Rubber System Service Branches

Halifax	Toronto	Fort William	Edmonton
St. John	Hamilton	Winnipeg	Calgary
Quebec	London	Brandon	Lethbridge
Montreal	Kitchener	Regina	Vancouver
Ottawa	North Bay	Saskatoon	Victoria

BELTING

Transmission: "Dominion," "Keetwatin," "Para."
Conveyor: "Rockproof," "Canadian," "Hiheat."
Elevator: "Dominion," "Rockproof," "Endurance."
Agricultural: "Lumber Kind," "Star," "Western."
Grain Elevator: "Mercalf Standard," "St. Lawrence," "Grain King."

HOSE

Air: "Kushion Kover," "Para," "4810 Airtite."
Steam: "Indestructible," "Rockproof," "Para."
Water: "Indestructible," "Kushion Kover," "Para."
Suction: "Para," "Star," "Trade."
Garden: "Canadian," "Dominion," "Star."

PACKINGS

Sheet: "Join-Tite," "Star," "Importers"
Rod: "Cabestos," "Valve-Bestos," "Canadian."
Valves: "Montreal," "Commercial," "Canadian."

MISCELLANEOUS

Mats, Matting and Flooring, Plumbers' Specialties, Rubber-covered Rolls, Friction Tape, Splicing Compound, Dredging Sleeves, Hard Rubber Goods, Tubing, Rinex Soles, Catspaw Heels, Jar Rubbers, Moulded Goods.

If interested, tear out this page and keep with letters to be answered.

ELECTRIC STEEL AND ENGINEERING, LIMITED

Head Office: Welland, Ont.

Works

ELECTRIC STEEL & METALS, Ltd.

Welland, Ontario

Steel Castings

of Any Analysis

Carbon, Manganese, Nickel, Chrome and Forging Ingots, etc.

WABI IRON WORKS, LIMITED

New Liskeard, Ont.

Mining Machinery

Iron Castings, Crushers, Rolls, Tanks, Pumps, etc.

BOVING HYDRAULIC AND ENGINEERING CO., LIMITED

Lindsay, Ont.

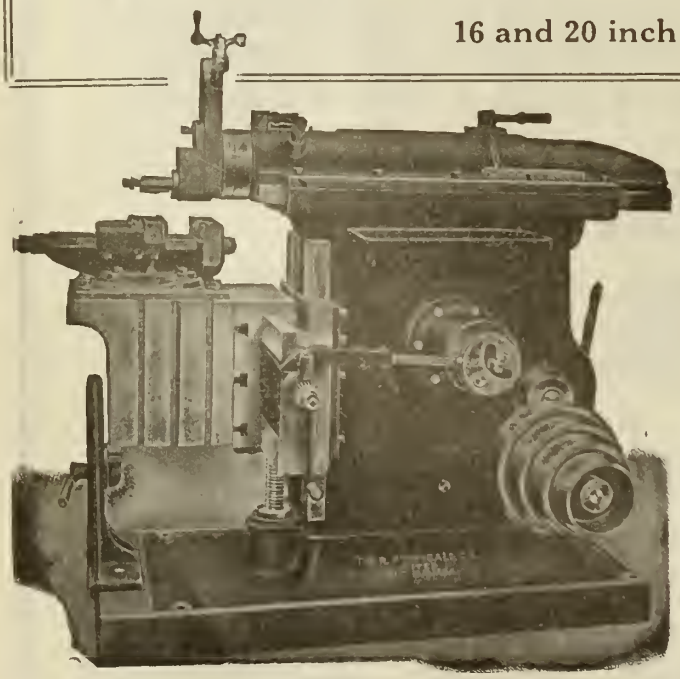
Turbine Water Wheels

Pumps for pulp and paper mills, Pumping Engines for municipal purposes, Centrifugal Pumps.

McDougall Crank Shapers

16 and 20 inch

ARE-MAC-DEE IS A GUARANTEE



A Bigger Day's Work—

is made possible with McDougall Crank Shapers than with any ordinary Shaper because the McDougall is built on lines especially for this purpose. It embodies the most approved features of the most practical shapers on the market and care has been taken to exclude all non-essential parts.

The column is massive in construction, well braced and reinforced internally. Exceptional strength is also seen in the ram, which is semi-circular in form and of box type. It can be set forward by crank conveniently arranged.

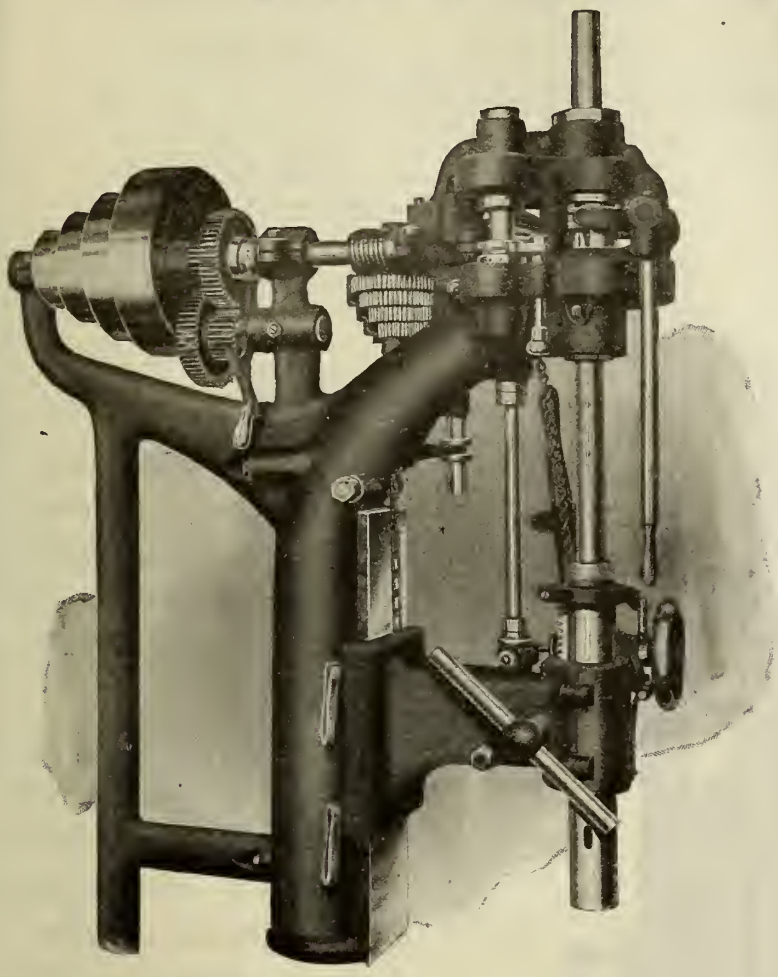
Slides are square, accurately fitted and with broad bearing surfaces.

Have us explain the other salient points of this finely constructed machine. Full details on request.

THE R. McDOUGALL COMPANY, LIMITED, Galt, Ont., Can.

The Canadian Fairbanks-Morse Company, Limited
Sales Agents

The Driller that saves time—



and why

Hoefer Time-Saver No. 1—The Tapping Attachment

90 per cent. would be a conservative estimate of the time and cost saving of tapping on the same machine that does the drilling. And the Hoefer Geared Tapper only requires lowering or raising a small knobbed shaft to set the attachment in action or to disengage it.

Hoefer Time-Saver No. 2—Changing Feeds.

In our geared feed we have one of the most convenient and rapid arrangements in existence. Without leaving his position and on even the largest sizes of drillers the operator can instantly change the feeds while the drill is in action.

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You don't have to use valuable time locating a spindle hole and a spindle sleeve hole and then aligning them before you can get the drift in to drive out the drill. The Hoefer way is simply to drive the drift into **one** hole and then knock out the drill.

These are a few of the outstanding Time-Savers of Hoefer Drillers. They illustrate one of the guiding principles of Hoefer design—to make a machine that will shorten the time on each job and help conserve the operator's energy.

The big and little conveniences and time-savers on Hoefer Drillers also show another Hoefer characteristic—a **practical** driller designed by **practical** engineers closely in touch with operating problems and eternally plugging away to make a better machine.

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12A

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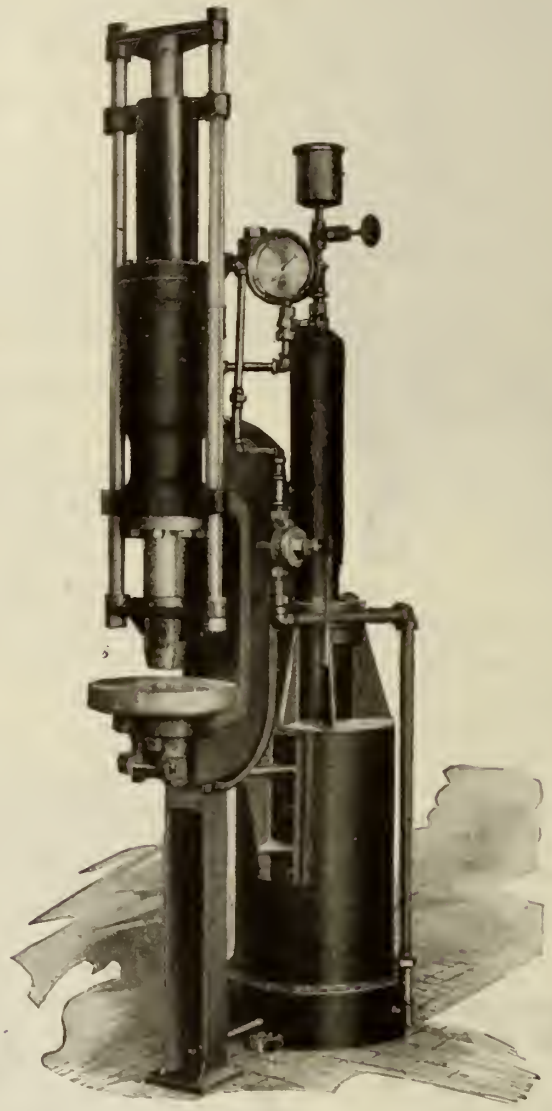

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Part only of a treatise on "Grinding Wheel Selection," by Carl F. Dietz, Vice-President and General Sales Manager of Norton Company, Worcester, Mass.

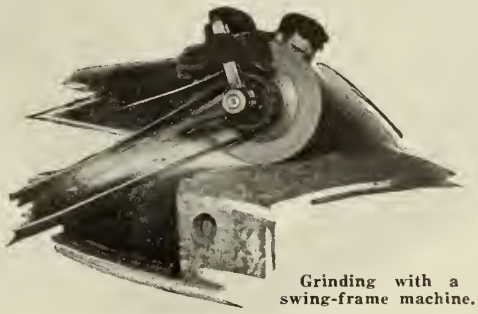
Offhand grinding includes all sorts of rough grinding on castings or other parts where precision is not required, but where the quick removal of metal is the primary object. It also includes certain kinds of tool grinding which depend on the skill of

Off-hand grinding on a floor stand.

the operator, but is usually confined to the rougher tools for lathes and planers.

There are three types of machines employed; floor and bench stands, swing frame, and flexible shaft machines. Obviously the floor stand, being generally the most rigid of these types, may for certain operations be fitted with comparatively soft wheels. For various kinds of tool grinding or light general work, grades M to P can well be employed, while for heavy castings such as journal boxes and the like, or very sharp work, grades as hard as U are necessary.

Swing frame machines are subject to much vibration, due to their usual light construction and also to the manner of application. In grinding with swing frame machines the wheels are generally subject to much abuse, being brought down upon the casting with much force. Vibrations transmitted as a rapidly intermittent series of shocks at the wheel face can readily be seen to exercise a destructive influence on the structure. Grain particles are split off before they have performed their measure of work unless they are firmly held; hence harder grades must be selected.



Grinding with a swing-frame machine.

The flexible shaft machine is not much used, but finds application where the parts to be ground are clumsy and have corners or recesses that can only be reached! by having a wheel so mounted that it can be presented to the work by the operator at will. Bath tubs, sinks, certain railway castings, and

Flexible shaft equipped with Norton wheel.

the like are ground in this manner. Obviously with little to support and only the hand of the operator to guide or steady it, the wheel has to overcome the shocks resulting from the many irregularities of surfaces ground and therefore needs to be of hard grade.

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R-34

GIS

17 MINUTES

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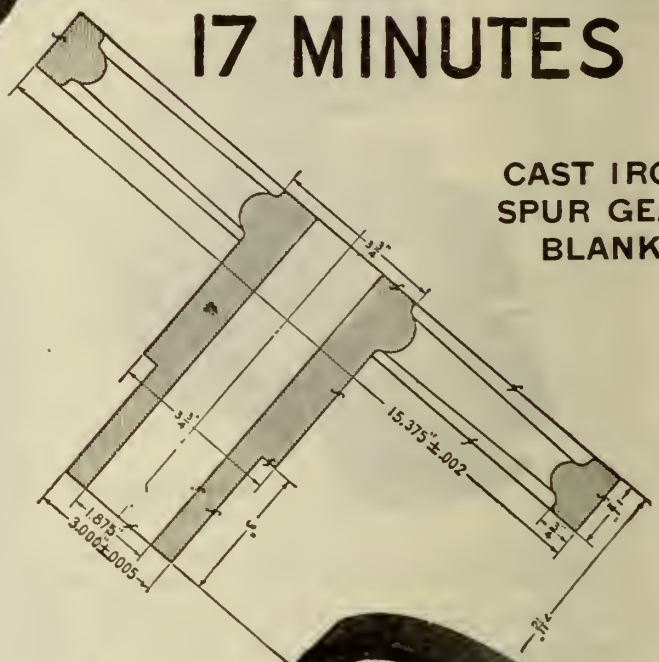

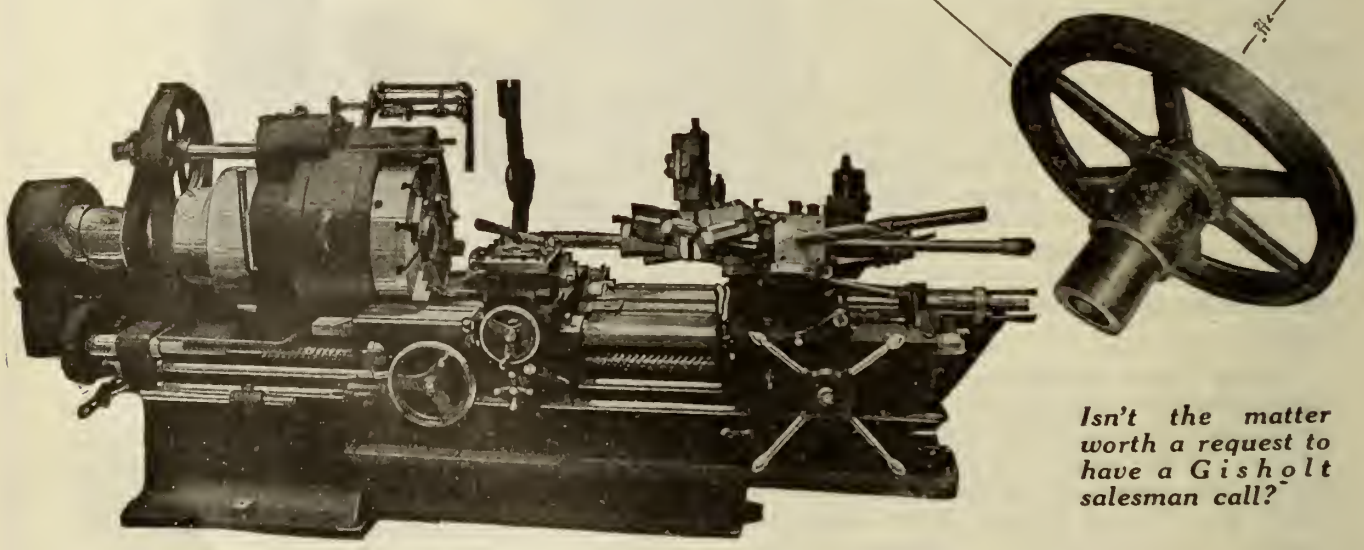

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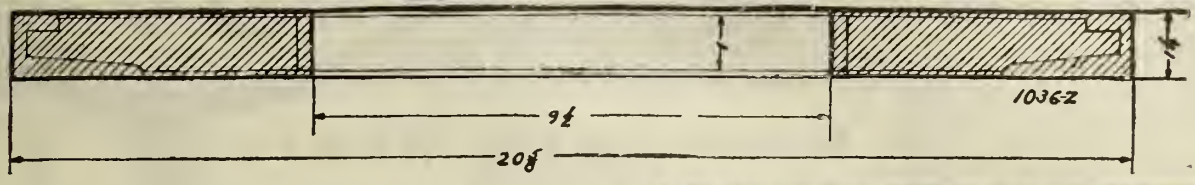

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The workman shown at the right is interested in the job.

You are interested in the time it takes to do it.

The workman appreciates the ease with which the job is handled and the confidence he has in the machine.

You appreciate what these qualities mean to the cost of handling this, and similar work.

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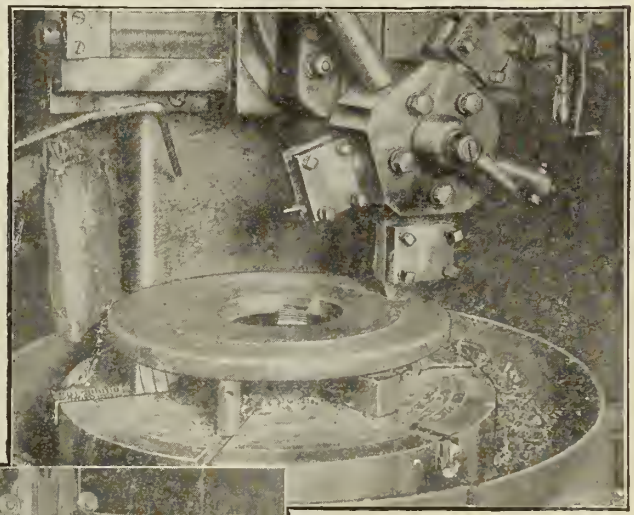

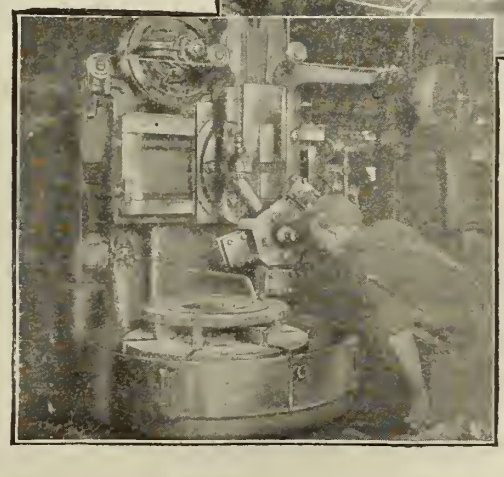

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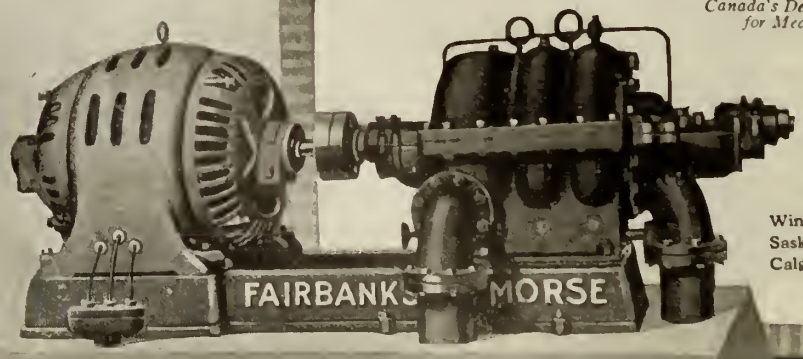

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CANADIAN MACHINERY AND MANUFACTURING NEWS

Vol. XXIV. No. 6 August 5, 1920

Measuring in *Thousandths* Forty Years Ago

Measuring to a Thousandth of an Inch 40 Years Ago Was Some Task, But the Machine as Described Did Its Duty Nobly—The Progress of Measuring Methods is Also Discussed.

By J. H. MOORE

IN these days of interchangeability and unit production we often lose sight of the fact that it is not so very long ago since such conditions came into being. In olden days we have no record of even the foot and inch. Everything was measured by the cubit, and fraction thereof, and for the benefit of those not familiar with this term, we might say that a cubit is supposed to be the length of the forearm from the elbow to the extremity of the middle finger.

This view illustrates how the machine was used.

Evidently this system of measurement caused some controversy between the different countries, for each country adopted their own idea of a cubit. In England we find that 18", or 45.72 cm., was considered a cubit, while the ancient Egyptians decided 20.61", or 52.35 cm., equalled the same factor. The ancient Romans said 17.4", or 44.20 cm., was the correct measurement, while the ancient Greeks claimed 18.25", or 46.35 cm., was the one and only real cubit, and so it went on, each nation working to their own standard.

Leaving this confusing period behind and coming to the early eighties, that is about 1880, we find conditions very much improved, as far as standards are concerned, but not so greatly advanced in the working to those standards. Feet and inches, with their various fractions were, of course, in use, but anything less than a 1-64 was very seldom bothered with. When you worked to a 1-64 it was considered fine work. Interchangeability was practically unknown, the idea being to make each succeeding machine as near as possible to the last one.

Let it be understood that we are casting no reflection on the class of mechanic existent at that time, for machinists in those days were workmen of the highest order. They could run every machine in the shop, not merely one or two, as is sometimes the case to-day. Considering the equipment they worked with, they accomplished wonders. What we desire to point out is this, that accuracy and interchangeability did not seem to be considered as necessities.

To speak of a millionth of an inch in those days would have been an act of folly, and no doubt your friends would have persuaded the doctor to pay you a little informal call shortly after your flamboyant statement. Even a thousandth of an inch was closer than they could measure, micrometers not being existent at that time, and so conditions went on until one memorable day an important step was made in the right direction.

In the well-known town of Dundas, Ont., there existed a machine tool concern who were far from content with the measuring methods at their command. This was the firm now known as the John Bertram & Sons Co., Ltd., and their present

spirit of striving after simplicity, quality, and accuracy seems to have been existent even at this early date, for in a pioneering frame of mind they started to make a measuring machine for themselves.

Making such a machine was a real task in those days, for where was the standard to come from? Sixty-fourths were not good enough for them; thousandths was what they were after, but how to obtain this accuracy, that was the real puzzle. Of course, to us in these enlightened days it appears a simple problem, but remember conditions as they existed at that time.

Mr. John Bertram and Mr. Charles G. Draeseke, who later became chief draughtsman and designer for the firm, started on their ticklish proposition. It was decided to use a 12" scale as a basis to work from; in fact, it was the only basis they could work from, and a special scale, as accurate as possible to secure, was purchased. This scale was over ⅛" thick, and in our vocabulary, "Was some scale."

The Start of the Machine

A piece of steel was secured and turned down to 1¼" diameter. It was next decided that they would cut a perfect 8-pitch thread on the piece just turned. Sounds simple nowadays, but in those days an accurate lead screw on a lathe was unknown in this plant, and the change gear system was a scream compared to present-day practice. By figuring closely, however, and by cutting special gears for the change studs on the lathe, they proceeded to mark with a very sharp-pointed tool the path which the proposed thread would take. After experimenting for some time, they found the desired combination, and using the 12" scale as a guide, they cut the thread, studying the result through a magnifying glass.

Eureka! the scale was placed against the 12 inches of thread, the glass was run over the distance carefully. The thread was perfect—not an error existed. Needless to mention, joy reigned in this plant on the completion of the task, the screw being the most important part of the proposed machine.

The next problem consisted of laying out and marking what they termed the dividing disc, and in order that readers can get a good idea of the general appearance of the machine, we suggest they refer to either of the views shown, all of which depict the disc clearly.

This portion is divided in the following manner. On the outside rim there are 125 divisions, each division representing a thousandth. The method of arriving at this conclusion was very simple. They made the lead of the screw 8-pitch in order that 8 times 125 would make 1,000. In other words, in eight turns of the disc the screw would move one inch, at the same time 1,000 divisions would pass the guide scale shown at C in Fig. 2.

The side portion of the disc is divided into 128 divisions, which means that they actually get a decimal equivalent by using the side markings. In those days all gauges were made by 1-16ths, therefore, 64 of the 128 divisions equalled 1-16; 32 divisions, 1-32; 16 divisions, 1-64, and so on. Everything seems to have been thought of, for they even placed the 7" scale, shown at C, Fig. 2, to act as a guide and reminder. This scale shows to better advantage in Fig. 3.

Further Details of Machine

As can be understood, some arrangement had to be made for adjustment. This was accomplished by means of the screw D. This screw has a fine thread, about 16 to the inch, and has a lock-nut to hold everything securely when once set. The disc B, which we have previously commented on, was marked in an old gear-shaper, which by the way, was used up to a few years ago. A shows the thread which caused the biggest task of all.

To give readers some idea of the machine's general proportions, we append the following approximate dimensions. The bed measures 17" x 6", and is made from cast iron. On top of the bed is placed a 2" x ¼" deep slot. In this slot the two top portions slide, each having a tongue to suit. These parts spoken of are fastened to the bed by means of washers and cap screws underneath, slots being placed in bed to allow for adjustment. The disc is 6" diameter, and is marked as already explained. The two top portions are made entirely from the best quality bronze, and the nut on the main measuring head E is split and provided with shim. The screw illustrated in this nut takes up any adjustment necessary, and the nut itself is 4" in length. The finer adjusting nut F is 3" long, and the scale C is marked from 0 to 7" in eighths of an inch. As already explained, this scale is merely a reminder and a guide.

These dimensions, briefly, bring out the main points in the machine, but what we would like to emphasize is the soundness of the fundamental principles involved. Remember that no one in the plant had ever seen a micrometer, yet, in a way, they adopted the very same principle. Some time after the machine's completion one of the first Brown & Sharpe micrometers was brought into their plant. Great rivalry was the natural result, and the owner of the micrometer claimed he had the only fine standard, and that the machine as illustrated was only a fad. This, of course, started the fireworks, and a test was made, with the result that both the machine

FIG. 2—GENERAL VIEW OF MACHINE BRINGING OUT THE POINTS OF INTEREST.

and micrometer were exactly similar. Messrs. Bertram & Draeske were happy men that memorable day.

The motive that prompted the making of this machine in the first place was, as we have already explained, the desire to obtain some standard to which they could work with perfect safety. On completing the machine, all their gauges, ring, plug, and otherwise, were made to the machine, feeling sure they were correct in every way.

This was the initial step to bigger and better things, and the awakening of the spirit of progressiveness for which this firm is famed. They have been pioneers in many movements and developments, and by that spirit have reached an enviable position in the machine tool trade that needs none of our championing. This same earnest effort after simplicity, accuracy, and efficiency is still existent, and the simplicity, yet effectiveness of this old-time measuring machine is a good example of the same qualities in their present line. We do not say this in an effort to lavish praise, but merely as a statement of a fact which is recognized by all interested in the machine tool business.

FIG. 3—ANOTHER VIEW OF THE MACHINE.

Present Conditions

Coming to present conditions we find that things have changed since the measuring machine described was conceived. A thousandth of an inch is an exceedingly coarse measurement in these days of rapid production. The system of measurement has likewise changed.

The Pratt & Whitney Co., Dundas, which is handled under the same management as the Bertram concern, have developed a system of gauging that is well worthy of description, not only as a comparison to the old-time method already described, but for its own particular merits.

It is hardly necessary to ask readers if they know what a gauge made by this concern looks like, for they are to be found in practically every machine shop in some form or other. Have you ever realized that to make these gauges absolutely accurate it is imperative that some standard be adopted whereby accuracy can be assured? This is where the benefit of the modern measuring machine comes in, and no doubt every reader is well aware of the appearance of a modern P. & W. measuring machine.

Every gauge, tap, die, etc., manufactured by this concern goes to one of their measuring machines for checking purposes. The problem of building such a machine was a very different one from the other illustrated at Figs. 1 to 3. Briefly, the four principal problems confronted in the designing and building of the machine were as follows. First, the extreme difficulty of making a perfectly straight bed which would not be affected by temperature or torsional strains. Second, the production of a dividing screw of a degree of accuracy far ahead of anything that had hitherto been attempted. Third, the absolute necessity of automatically governing the measuring pressure of the instrument, and fourth, the accurate re-locating of the sliding head on the various positions on the bed at a known distance from the stationary head.

These problems were all the more difficult insomuch that the machine was being designed for general use and not for use by experts in their own plant alone. The ultimate object was to develop a commercial instrument which could be sold at a reasonable figure, or in other words, manufacture a machine that would allow all manufacturers the means whereby standards could be originated and duplicated to within the narrowest limits possible by human skill. When one considers this viewpoint, one naturally sees where added thought had to be given to the varied uses to which such a machine would be put.

To speak of the success of this instrument is like telling the story of some past war. Both alike are history. The achievements are innumerable, and there is hardly a large manufacturing establishment that cannot boast of a P. & W. measuring machine.

Method of Operating

The writer had the pleasure of viewing various tests on this style machine, and a description of the same would not be amiss. As can be understood, all kinds of material can be measured. The bed itself is on a three-point bearing, and along the rear of bed is placed small silver bosses one inch apart.

On each of these bosses are placed cross-hair lines, the intersection of which is the dead centre of the boss. These marks are invisible to the naked eye and can only be seen through the microscope provided with the machine, and noticed clearly in the illustration. How the marks are placed on these bosses is a trade secret which, of course, we do not discuss. Various rests, attachments, etc., are used, depending on the nature of the test, but we will suppose in this case that we are going to measure a piece for its length. You first set the stationary head in a known and convenient position. Then, having fastened this head in place by means of the handle shown in photo, you proceed with the actual measuring.

If one looks closely at the stationary head shown to the left, in Fig. 4, they will see a small lever or pin supported by a spring tension. It is this feature that guarantees the governing of the measuring pressure. Should one press too hard on the micrometer dial of the sliding head this pin will fall out entirely, warning the operator that he has not the correct pressure, while on the pressure being perfect the pin will drop to a vertical position only, and not out entirely.

We will suppose that we have placed the piece to be measured on suitable rests, and in position between the measuring spindles. The proper pressure has been exerted and the pressure pin has dropped to a vertical position.

All one need do is read the dial for their measurement, which will be correct within a limit of 1-100,000 of an inch.

In the testing of the pitch of a tap depth of thread, angle, etc., a special attachment is used which detects errors in such a manner that the operator of machine cannot possibly miss the inaccuracy, if any. There are other innumerable attachments and devices for the machine that one cannot very well explain, and, in fact, must be viewed in use to be appreciated; but enough has been said to show the thought which has been placed into the manufacture of this instrument.

Although the machines are standard at 62 degrees Fahrenheit, it is not necessary to use them at such initial temperature as variations due to temperature will affect both the work and machine practically alike.

When the machine is used for scientific research, however, the initial temperature should be adhered to. In fact, wherever possible the temperature of 62 degrees should be kept to as near as possible. As a general rule concerns using these machines recognize their merit and value, and place them either in a special box and stand, or in a room for measuring purposes alone. The latter condition is the best of all, and it was in such a room that the writer viewed the machine at the Dundas plant. As a still further guarantee that only the best of products will leave these two plants, they have installed an up-to-date laboratory, equipped complete in every detail. It is in this department that all raw material is tested for its quality before being used. The analysis is very exacting, and no doubtful material is ever used. This is still another step in the right direction. Not only do they intend making their product to the correct size, but of the best procurable material.

Referring once more to the modern measuring machine just described, it would seem that we have reached the finest form of measuring possible. Without question good use has been made of the past 40 years in the development of an efficient and accurate system of measurement, but who knows what another similar period may bring forth.

This extract from Mr. Charles Draeseke's letter of July 6th, 1920, to Sir Alex Bertram, refers in an intimate way to the developments and tests in the earlier days of the firm:

The "Darling, Brown & Sharpe" scale that you allude to was, if I remember right, an 18" one, bought as you say about 1878 or 1879. What fixes the date in my mind is that it was in 1878 that Sir John got into power with the N. P., and things immediately began to boom. The rule was graduated in 12ths, 14ths, and 20ths, so as to be used for gear measuring and it was by it that your father and I discovered the error in your leadscrews. On second thoughts now it may have been a 24" scale because I distinctly remember as though it were but yesterday, that you could distinctly see the error in 18 inches. I was turning up a lot of No. 4 drill spindles at the time, and before reducing the small portion to the required diameter I just took a smooth cut over that part, filed it a little and then ran a 4 PI. mark over it with a very fine pointed tool and when the rule was applied you could distinctly see the error in 18", think it was something like 1-64", but cannot be sure of this. However, whatever it was, we geared up the lather to correct it, but cannot remember the change-gears used now, but they produced a thread with no visible error. By use of these gears I cut the screw and nut that are on that measuring machine you refer to. I then made two sets of cylindrical gauges for the shop, and as far as we were able to discover by applying them to any American made machines they were correct, at least for all commercial purposes. The date of the measuring machine would be I should say, 1879. Shortly after that you bought a leadscrew from P. & W. Co., or Bements, don't remember which, for that long 20-ft. lathe that W. Fechnay ran, where most of our leadscrews were cut. You also put a corrected screw on Mike Cahill's lathe downstairs.

Note.—W. Fechnay and Mike Cahill mentioned in Mr. Draeseke's letter are still working in the Bertram plant.

DISPOSAL OF OLD COMPRESSED-GAS CYLINDERS

Some time ago a rather unusual incident occurred in a manufacturing plant, says The Traveler's Standard, showing the necessity of handling with great care cylinders or tanks used as containers for compressed gases. In the plant referred to, large quantities of steel and iron scrap of the most miscellaneous character are melted in an open-hearth furnace and the metal thus obtained forms the basis for the manufactured products of the plant. At one time a compressed-gas cylinder was received with other scrap, and upon being thrown into the furnace it exploded and blew the entire top off the furnace. This experience was remembered, and when a similar gas cylinder was received on another occasion, it was taken off the charging buggy and thrown on the charging floor. Several hours later one of the employes, observing the valve on the cylinder was still in place, secured a wrench and opened the valve. The cylinder had been filled with chlorine, and enough of the gas was released to cause serious discomfort to three men, and to make them unfit for work for several days. Not long after this occurrence still another gas cylinder was found in the scrap, and examination revealed the fact that it contained something like 25 pounds of anhydrous ammonia. This also might have caused trouble if it had been put into the furnace or left lying about the plant. As a result of these experiences, an order was issued to the effect that all cylinders thereafter received should be taken to the "skull-cracker" and broken up, before charging them into the furnace. There are at least two lessons to be learned from these experiences: (1) Compressed-gas cylinders should not be exposed to high temperatures unless it is known, positively, that they are entirely empty (and if the valve is still in place and closed, and there are no easily seen openings in a tank, it is safer to assume that it is not entirely empty); (2) all possible precautions should be used when opening gas cylinders, even if they are supposed to be empty—do it out-of-doors, be sure there are no fires or open flames anywhere in the vicinity, and have the work done by some person who understands the dangerous properties of gases. A warning of particular importance to the users of compressed gases is this: Be sure each cylinder is empty before discarding it, and if any gas remains in the cylinder, see that the cylinder is put in a safe place and marked in some way so that it cannot possibly be thrown on the scrap pile through error. Instead of scrapping a gas cylinder, return it to the gas manufacturer. If it is in good repair it has a money value and can be re-filled and sent out again and if it is no longer serviceable, the manufacturer will know how to dispose of it safely. If a cylinder is received in a leaky condition, leave it out in the open air and protect it so that inquisitive persons cannot be harmed by the escaping gas; and if the gas remaining in the cylinder cannot be used safely, notify the gas manufacturer and ask for instructions regarding it.

What is the Purpose of a Heat-Treating Process?

Any Such Process is Supposed to Impart Hardness, Toughness, Tensile Strength, Grain Structure and So On, as the Case May Be, to the Material Being Heat Treated

STEEL treatment is demanding and receiving more attention lately than at any other time in our industrial life. This being a fact we felt that readers would be glad to peruse a description of what is known as the Hump method of steel treatment, but before proceeding with the same we might add that this matter is information gleaned from the literature issued by the concern handling this method of heat treatment.

We are well aware that the purpose of heat treatment is to impart certain qualities of hardness, toughness, tensile strength, grain structure, etc., to the material. These qualities should be obtained and accomplished without change in shape or size of material, without scaling or decarbonization, without waste of material by poor treatment, and with the least possible expense of labor and supervision. Such is, of course, an ideal condition, yet that is what the firm handling this hump method claim to have succeeded in obtaining. They state the following claims regarding their method of heat treatment:

Our system gives unmistakable indications when the charge has reached the critical or transformation point, as a reference point for quenching. It insures uniform temperature of all parts of the charge. Distortion due to unequal expansion is minimized and rejections are practically eliminated. It gives accurate control of and information regarding the rate of heating and permits of a maximum rate of heating without injury to the charge. Pyrometer inaccuracy and incorrect information as to transformation point are eliminated as causes of incorrect treatment. A clear, explicit record of the rate of heating and of quenching point for each charge is made and preserved, and can be referred to in connection with subsequent physical tests. During the heating period the work is protected against contact with fresh supplies of oxygen or contaminating gases, avoiding scaling or decarbonization.

The electric furnaces are long lived and have low upkeep charges. There is less fire hazard than with fuel-burning furnaces and the many uncertainties of fuel furnaces are eliminated. Working conditions in the heat-treating room are improved, due to a lower temperature and the absence of smoke and noise from burners. The furnaces for hardening and drawing are clean in operation and can be installed in comparatively small space in the machine shop, where the materials can be heat-treated in the direct course of manufacture, thus reducing charges for space and handling. All heat-treating operations can be brought under the complete and certain control of one man, who is guided by the unequivocal indications of instruments. High quality, uniform and regular production is assured. The same results are obtained day after day.

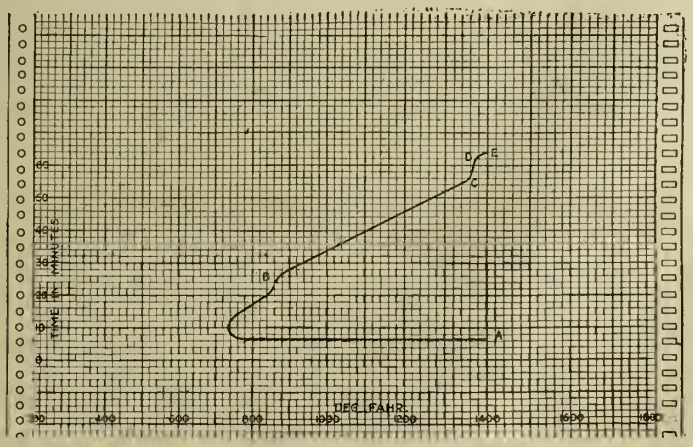


FIG. 1—CHART SHOWING THE HUMP CLEARLY.

At Fig. 1, we depict a chart produced by a Leeds & Northrup Pyrometer in the heat treatment of a piece of steel by the process under discussion. But let us proceed with the description of the system as told by the firm themselves.

THIS VIEW SHOWS FIVE ELECTRIC FURNACES WITH RECORDERS FOR THE HEAT TREATMENT OF CARBON STEEL TOOLS.

The Hump Method

In the hump method of heat treatment, which is covered by U. S. Patent No. 1,188,128, the outward manifestation of the changes in internal structure which take place when steel is heated past the so-called critical or transformation point is employed to indicate when the work should be withdrawn from the furnace. In using this method the temperature of the furnace, and therefore of the work, is raised at a uniform rate until the transformation point of the steel is reached. At this time there will be a marked decrease in the rate of temperature rise. This change in the rate of rise is made plainly visible to the operator by an autographic recorder connected to a thermocouple placed close to or in contact with the work. The effect is clearly shown by a bend or hump in the curve as at C. See Fig 1.

This hump corresponds to a pause in temperature rise or decrease in rate of heating of the steel, which occurs in spite of the fact that heat is being transferred to the work during this interval as rapidly as before or after. It is explained by metallurgists as being due to the dissolving of cementite, or carbide of iron, in the pure iron, or ferrite, and to other chemical and physical changes depending upon the composition of the steel. By microscopical and chemical means, it is known that the physical and chemical structure of steel after quenching is profoundly influenced by the relative position of the quenching temperature with respect to the temperature at which the arrest occurs. The

hardness, strength, ductility and toughness are all definitely influenced.

As a guide in hardening, the temperature pause, or decalescence point, as it is called, is much more reliable than is the furnace temperature as indicated by a pyrometer. The arrest in temperature signalled by the hump or bend in the line drawn by the pyrometer pen shows that the internal changes so momentous as affecting the qualities of the finished steel are actually taking place, and once the proper interval to be allowed after the hump before quenching has been determined, there is no uncertainty about the results of hardening.

If, on the other hand, the work be controlled with reference to temperature readings only, there are several possible sources of error, namely:

(a) The thermocouple may be at a temperature different from that of the work, due either to insufficient time having elapsed for the work to assume the furnace temperature or to inequalities in temperature between different parts of the furnace. Experiments which have been made with Leeds & Northrup commutating recording pyrometers connected to read alternately upon two or more thermocouples in a single furnace show that surprising differences in temperature persist even after prolonged "soaking." To insure that the work shall actually reach the desired temperature within a reasonable time the furnace is often held at a higher temperature, which is afterwards reduced. The "soaking" and possible overheating of the work may, and often do, result in injurious growth in grain size in the metal being treated.

(b) In attempting to hold the furnace at a constant temperature, the temperature may fluctuate, and even though it may subsequently be reduced to the proper temperature, the work may nevertheless have been overheated and injured. In this method the quench is made as soon as the work is at the right distance beyond the critical point and the work is given no opportunity to reach an excessive temperature.

(c) The temperature which is assumed as the critical temperature of the steel may not be correct. On the other hand, in using this method, the time at which each lot of material passes through the critical point is definitely located.

The lead pot and the fused salt bath methods of heating work for hardening give greater assurance than does the ordinary furnace that the work shall reach a uniform temperature, but there still remain uncertainties as to the actual transformation temperature, and as to accuracy of the temperature measurement, and growth in grain size due to too long immersion may occur. Lead or salt baths give no control whatever of the date of heating. Hardening baths also have many practical disadvantages, such as expense, dirt, necessity of subsequently cleaning the work, space occupied, etc.

(d) The pyrometer used for measuring furnace temperature may be incorrect.

The user of this method need not concern himself about the absolute accuracy of his pyrometer, nor bother with independent transformation point determinations. It is not at all necessary that the temperature indicated by the thermocouple should be the correct temperature of the work, for so long as the recorder connected to the thermocouple shows clearly the pause in temperature rise, the moment at which transformation occurs is definitely known. Having learned by trial just how many minutes or how many degrees should elapse after the beginning or end of the transformation before the work is removed from the furnace, he is upon sure ground and can repeat results.

Uniform standardized conditions and a controllable rate of heating the work are essential to this method of heat treatment. A small furnace for heat-treating tools, dies, etc., is shown at Fig. 3. The heating element consists of a vertical cylindrical resistor, surrounded by insu-

FIG. 2—SOME MILLING CUTTERS AND TAP BLADES HARDENED BY THIS METHOD.

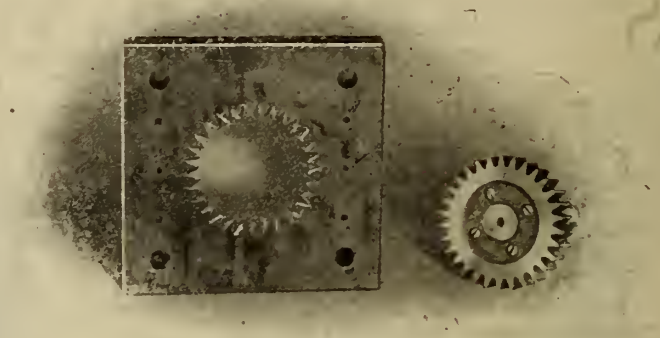


FIG. 4—THIS DIE WAS BROACHED BY THE PUNCH, THEN HARDENED AFTER. IT FITTED PERFECTLY.

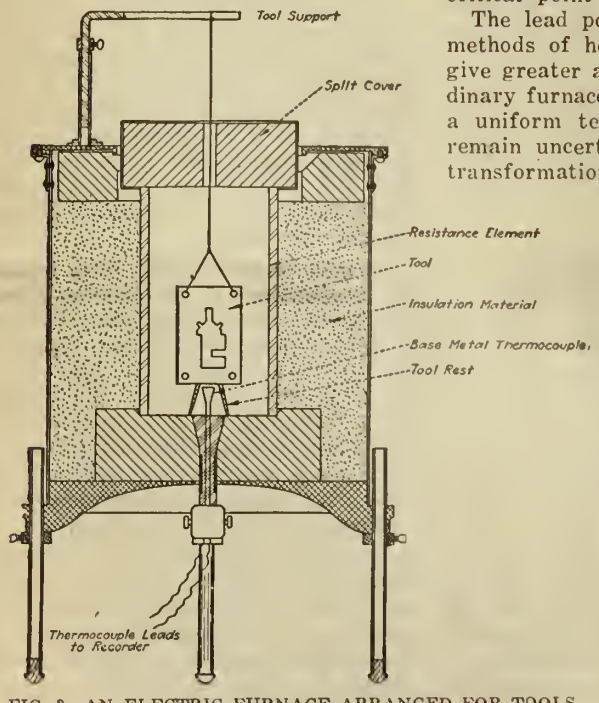


FIG. 3—AN ELECTRIC FURNACE ARRANGED FOR TOOLS AND DIES.

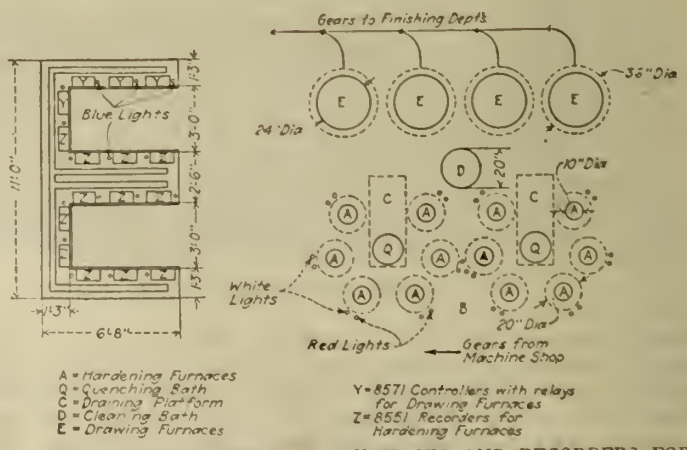


FIG. 5—ARRANGEMENT OF FURNACES AND RECORDERS FOR HEAT TREATMENT OF AUTOMOBILE GEARS.

lating material in a sheet-iron jacket. The resistor rests upon a refractory block which is supported by a cast-iron bottom plate. The heating chamber is closed at the top by a refractory cover, while a cast-iron top-plate confines the loose insulating material filling the space between resistor and jacket. An iron-constant thermocouple of bare No. 8 gauge wire projects upward from the centre of the bottom refractory block.

By means of a small wire attached to a tool support on the top plate of the furnace the work to be treated can be suspended in close proximity to, or touching, the end of the thermocouple. In production furnaces other methods of supporting the work are used. For example, in the furnace shown at Fig. 6, designed for the heat treatment of automobile transmission gears, the work is placed upon holders before insertion in the furnace. Covers placed on the furnace completely close in the heating chamber, preventing renewal of the atmosphere, and the work is thus protected against oxidation and scaling.

time. This is desirable in order to avoid stresses and distortion that would follow from unequal expansion or contraction if different parts of the work passed through the transformation point at different times.

The arrival of the work at the transformation point C causes an abrupt change in the rate of heating. Due to the suddenly increased capacity of the steel to store heat, the temperature stops rising or proceeds much more slowly than before, although the rate of supply of heat energy has not been changed. However, once the transformation is completed, as at D, the temperature again rises rapidly. The pause is plainly shown by the hump in the curve.

true whether or not the temperature represented at the point C on the chart is correct and whether or not it is the actual temperature of the steel at that moment. The important fact is that the chart tells the attendant when the steel is going through the transformation, from which he may know that quenching after a certain interval will secure the desired physical qualities. Furthermore, the chart remains as a record of just how each individual lot of steel was treated and can be referred to in connection with properties developed in physical tests of that steel.

It is found that the rate of temperature increase has a marked influence upon the properties exhibited by the steel

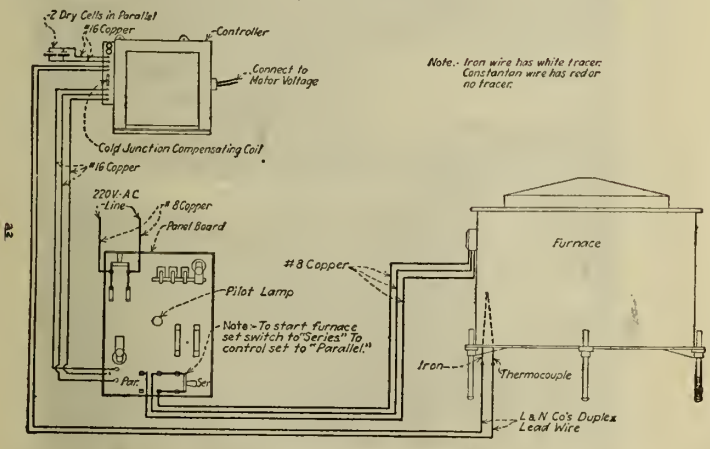


FIG. 7—WIRING DIAGRAM FOR L. & N. ELECTRIC DRAWING FURNACE AND RECORDING CONTROLLER.

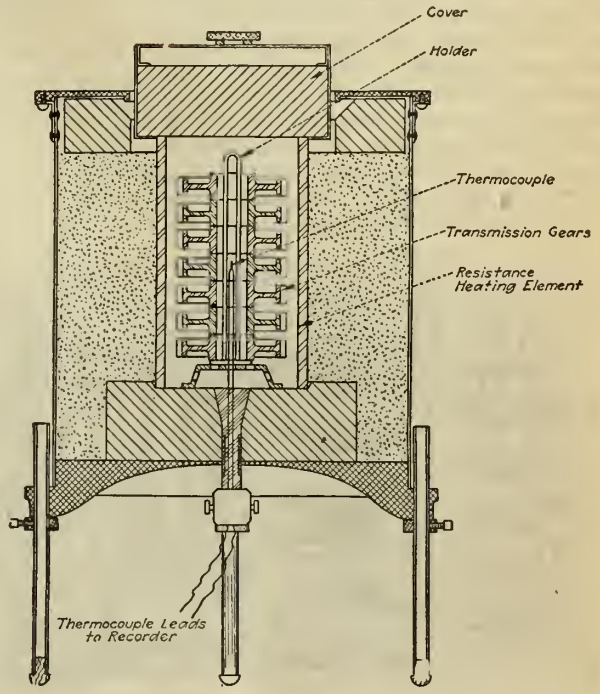


FIG. 6—ELECTRIC FURNACE ARRANGED FOR HEAT TREATMENT OF TRANSMISSION GEARS.

Regular Procedure

At the moment when the work is introduced into the furnace the temperature of the latter is, say, 1400° F., but the heat storage capacity of the furnace walls being small compared with that of the charge, the temperatures of both thermocouple and furnace walls drop rapidly for a few hundred degrees, the current through the heating element or resistor being shut off during this time. The result can be seen in the chart at Fig. 1 The temperature drops rapidly from 140° F. at A to about 870° F., and then rises slowly to B, where it is stationary, the thermocouple, the furnace walls, and all parts, small and large, of the charge having reached approximately the same temperature. The switch is then closed, the input being so regulated that the temperature rises at the desired rate. The fact that the work and furnaces start from the same temperature at B, far below the critical point, coupled wit a proper arrangement of the heating element with respect to the charge, insures that all parts of the work will go through the critical point at the same

Before quenching, it is necessary to heat the work to a certain distance above or for a certain time after this point, the time or distance depending upon the mass and shape of the steel, the quenching medium employed, and the qualities desired. The exact further heating to be allowed after the completion of the transformation point is learned by experience or trial, but once known, all uncertainty as to the result is practically eliminated.

In using this method, the metal is quenched without hesitation as soon as the pen has gone the prescribed distance past the hump which indicates the transformation point. Errors due to inaccuracy of pyrometers, non-uniform temperature in the furnace, failure of the work to reach the furnace temperature, or incorrect information regarding the transformation temperature, are avoided, and the steel is not injured by overheating or by holding it at a high temperature for too long a time. Each piece of work carried the same distance beyond the reference point C or D will show the same internal structure. This is

quenching. The resistance furnace is admirably adapted for controlling the rate of temperature rise, since the rate of energy input is easily regulated by reference to an ammeter supplied as part of the furnace equipment. The Leeds & Northrup potentiometer pyrometer, also forming part of the equipment, is likewise peculiarly suited for carrying out this method of heat treatment, as it is sensitive to small changes in thermocouple e.m.f. and exhibits changes in rate of temperature rise upon a magnified scale.

Results Achieved

This method of heat treatment has been found in practical work on a commercial scale to confer the following benefits:

The microscopic structure and physical properties of the hardened steel can be controlled with accuracy and certainty. Results can be studied and conditions, as shown by the recording pyrometer chart, repeated, or if desired, modified, by changing either the rate of heating or the location of the quenching point with relation to the transformation point,

or both. There is a great reduction in volume changes, distortion, and breakage as compared with the ordinary methods of hardening. The work is free from scale and decarbonization. The cleanliness of operation with electrical furnaces, and their small weight and bulk, make it practicable to locate the heat-treating department in the machine shop in the direct course of manufacture. The rehandling involved in taking the work to a separate heat-treating department and bringing it back again is obviated.

As an example of the use of the electric furnace in hardening tools, the manner in which punches and dies are produced in our own shop, where this method has been used exclusively for the last six years, will be described. Some of these punches and dies are shown in the accompanying illustrations. The punch is first made in the ordinary way by machining and hand finishing. It is easy to secure accuracy in the making of a punch, as all measuring, gauging, etc., is done on the outside. The die is made to approximately the correct size, but slightly smaller. The punch, having been hardened, with little or no change in dimensions, is then used as a broach to cut the die. It is forced into the die a short distance, raising a burr, which is removed by filing, the operation being repeated until the cut is finished. The die is then relieved, but no further work is done on the cutting edge. After hardening the die by the hump method, its size and shape are found to be so exact with respect to the punch that subsequent work, as stoning or grinding, is not required.

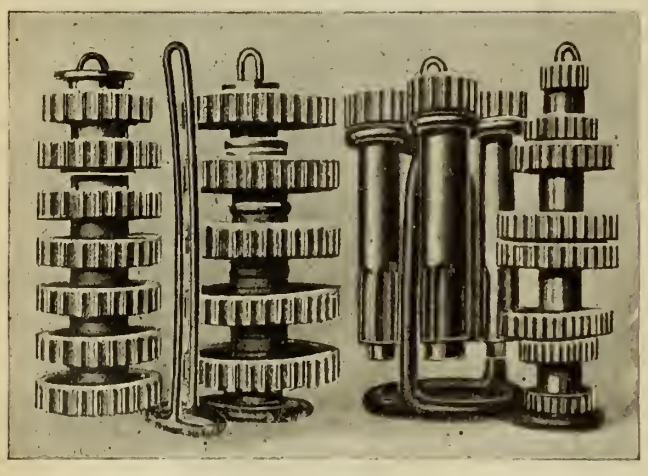


FIG. 9—GEARS ASSEMBLED ON HOLDERS READY FOR THE FURNACE.

Dies which have been broached by the punch and then hardened by the hump method are said to be superior, for purposes where close correspondence of punch and die are necessary, to hand-made dies hardened in the ordinary manner. Hand-made dies must be corrected by hand work after hardening, and such hand work can be guided only by reference to a templet. It is practically impossible to make the templet exactly the same shape as the punch, and it is also difficult to make the die fit the templet exactly. Even on work where internal calipers or micrometers can be used, it is not practicable to make the die exactly the same shape and size as the punch, as any hand work is necessarily more or less irregular.

The fact that dies hardened by this method fit exactly with the punches by which they were broached shows that there has been no volume change or distortion during the process of hardening. It has been found, however, that the previous history of the material, the rate of heating and the interval which is allowed to elapse between the transformation point and the quenching point have certain relations to volume changes which are of great importance in the hardening of such objects as dies, milling cutters, gears, etc.

Production operations are greatly simplified by the use of electric heat-treating furnaces. As an example, refer to Fig. 5. Formerly in this plant automobile transmission gears were heated for hardening in lead pots located in the basement beneath the machine shop. After the gears had been machined, they were removed on trucks to an elevator, lowered to the heat-treating room, an uncomfortable place because of heat and fumes, and wheeled to the lead pots. The gears were placed in the lead pots in batches, and when they had come up to temperature were lifted out one at a time and dropped into the oil quenching bath. The time of heating in the lead pot was thus not the same for all pieces, and the temperature also varied with the location in the pot, possibly resulting in non-uniform hardness and grain structure. The gears were also sometimes injured by dropping upon one another in the quenching tank. The drawing was done in gas furnaces, followed by an oil quench. Upon their return to the machine shop the gears were wire brushed to remove adhering lead.

The electric furnace equipment replacing the lead pots and gas furnace is located in the machine shop itself. There are six electric hardening furnaces located on three sides about a quenching tank, with three electric annealing furnaces on the remaining side, also a drain grid and a cleansing bath between the quenching tank and the annealing furnaces. The tops of all furnaces and tanks are flush with an elevated platform. The work is brought on trucks to the edge of the platform, where a boy arranges the gears upon holders, which are easily picked up by the operator and upon which the gears remain until they have passed in turn through hardening furnace, quenching tank, cleansing bath and drawing furnace. Corresponding to each hardening furnace, there is a curve-drawing recorder and for each drawing furnace an automatic temperature recording controller, all mounted upon a wall near by, where also are the furnace rheostats. An assistant foreman on duty at this point directs the operations according to the indications of the curve-drawing recorders connected to the hardening furnaces. The automatic controllers of the drawing furnaces require no attention.

FIG. 8—THIS DRAWING FURNACE IS USED FOR DRAWING TRANSMISSION GEARS. TEMPERATURE IS CONTROLLED WITHIN 5 DEGREES FAHRENHEIT.

Leeds & Northrup drawing furnaces are installed with Leeds & Northrup recording controllers for regulating the temperature automatically. The recording controller is identical in principle and construction with the pyrometer already described, with the addition of switches which are opened or closed when the tem-

(Continued on page 102)

Small Firms Can Enter the Export Field

Firms Should Be Prepared to Stay Behind Their Goods and Have Shipments Right Up to Standard of Samples—A Valuable Field to Exploit for Future Business.

By J. H. RODGERS, Montreal.

THAT there is good business to be secured for Canadian firms in the export field is the opinion of G. G. Hodges, vice-president and managing director of the Industrial Export Co. of Canada. He discussed various phases of the matter with "Machinery," and has some good advice to offer to shippers and to those who have not yet tried the foreign field.

"For some time past," stated Mr. Hodges, "there has been a great deal of discussion regarding the value of export business, and in spite of the evident interest in that phase of our commercial enterprise, very little action, except on the part of large corporations has been taken with a view to stimulating our business overseas.

"A close analysis of the situtation leads to the belief that the fundamental cause for this lackadaisical attitude lies in the nature of the average business organization. Our industries in Canada are not made up of large units, but represent a multiplicity of smaller organizations, each of which is controlled by one man or a small directorate, and the output in each individual case is not very large. Domestic busness prior to the war, served to keep these organizations busy for the best part of the year, and even though the plants were not running to capacity, the results achieved were sufficient to make it possible for the owners to continue operating probably with the same policy year in and year out. The war stimulated industry, causing in many cases an increased plant capacity, which is to-day in excess of the requirements of the domestic market, and the taste for export business acquired during the war has developed among many manufacturers a desire to develop the foreign field. Unfortunately, the average manufacturer does not know how to go about getting this business, and is either unwilling to admit his lack of knowledge, or is dubious about his ability to hold his own outside of the domestic field."

One Way of Getting Business

"In the Old Country, as in the United States in lesser degree, it is customary for manufacturers to place their samples in the hands of firms whose business it is to solicit and handle the business secured from foreign countries. Unfortunately Canada has not many such intermediaries, yet there are a few such organizations equipped to take out of the manufacturer's hands all responsibility relative to the handling of his foreign business. It remains for the manufacturer to confide in such an organization, and to place in its hands his samples and complete data, so that his lines may be brought to the attention of the organization's representatives, and in turn to the attention of the various firms in the foreign field.

"He must not be too impatient, however,—he must realize that unlike the domestic market, a letter or a representative cannot get in touch with a possible buyer in the course of a few days. Months may pass before the prospective buyer in the foreign field can be approached and his business secured. Samples may go out at great expense on the part of the selling organization, and be lost or returned without business, but sooner or later, with the manufacturer's co-operation, and with a reasonable amount of patience, the effort put forth by the selling organization will bear fruit, and once initial business is in, he can fairly well depend on repeat business assuming larger proportions as time goes by."

Chance for the Small Firm

"It matters not if the manufacturer is in a small country town, he can just as well handle the export business if his lines are in the hands of a reputable export firm, because it is the duty and desire of this firm to undertake not only the selling and the financing of the shipments, but also to look after the shipping, seeing that the merchandise gets on board the ship on its way to the customer.

"There is no need for the smaller manufacturer to keep out of the export field when he requires the business so much. It is true that without the aid of an export selling organization he might feel the expense and trouble involved too great to permit him to handle export business, but if the Canadian manufacturer, large or small, desires an outlet for his products, two things must be borne in mind: First, that the export business can be just as valuable as the domestic business, and the time is coming when the manufacturer who is going to make a success of the domestic market must be able to compete by bringing down his overhead with the export trade.

"Secondly, he must produce goods which are up to sample in every instance. Possibly it would be just as well to add a third injunction. If he places his line in the hands of an export house, it is essential that he give that firm his hearty support. He little realizes, possibly, when he does hand his samples and prices to that house, just what expense and trouble it will go to in order to place his line before the respective buyers, whether they are in England, South Africa or China.

"If only Canadian manufacturers would understand that foreign buyers desire Canadian merchandise, and that now is the time to go after the business, we need not fear a slackening of business with which to keep the wheels turning."

—Rally in Montreal "Star."

Would it be Wise to Adopt the Metric System?

If You Have Any Doubt in the Matter Read This Article Which States Sufficient Vital Facts to Send the Metric System Where It Belongs, Namely, Not in Our Country

THIS last few months has witnessed one of the biggest attempts of a lifetime to foist on the American public the metric system of measurement. We need not go into all the details relative to this movement for that is now history. What we do wish, however, to point out is that the movement has met with the fate it deserves, namely, received what it dreaded most, "Honest Publicity."

By honest publicity we mean statements of facts as they really exist. Various periodicals on Uncle Sam's side of the line went after the proposed scheme in great style showing kinks in the armor in practically every joint. They pointed out why the adoption of such a system would be nothing short of national suicide, and now that these facts have been compiled in definite form we feel it would make ideal reading for our readers who should be likewise interested. The committee on industrial development of the Cleveland chamber of commerce presented to that body the following information regarding the metric system, and why they believed its compulsory adoption should be opposed. They state as follows:

The metric system was invented by James Watt, the inventor of the steam engine, in 1773, and contemplated in its original form a decimal system of measurement not only for weights, distances and volume, but also for time as related to the hours of the day, which were to be ten; the days of the week, which were to be ten; and the months of the year, which were to be ten. It also included a decimally divided circle and compass.

The measurements for time, a decimally divided circle and compass apparently were not practical, as, so far as your committee has been able to learn, they have never been used.

The measurements of distance, volume and weight have been adopted or legalized in many countries. France adopted by a compulsory law, this system in 1793. In 1812, under Napoleon, the law was repealed and the French adopted, by a compulsory law, this system called "Systeme Usuelle." In 1837, the metric system was again made compulsory in France. Despite the operation of this compulsory law for more than eighty years, it is stated that the old units are freely used in many industries in France; for example, the aune and denier are still used for measuring silk.

Many South American countries have adopted the metric system by compulsory and permissory laws. However, a survey conducted by the American Institute of Weights and Measures conclusively proves that the use of this system is not universal in these countries.

Argentina adopted the system in 1863. Yet an examination of the results of a questionnaire shows the use of many units unknown in the metric system. For example, land is sold by the square vara. In marine measurements the kilometer, meter, pie, ton, mile, knot and cubic foot appear to be used about equally.

Brazil adopted the metric system in 1862. The same condition is found there, with such terms as gallao, arroba, alqueire, etc., appearing frequently.

The adoption of the metric system in Chile in 1858 has apparently not altered the use of the old system in that country. The units libra, quintal, pie, vara and inch are found to be used in many industries.

The same condition prevails in Colombia, which adopted the system in 1853. In fact, this is the condition prevailing in practically all of the South American countries.

With slight differences, the units other than the metric units in use in Latin American countries are remarkably similar to the English system.

The condition prevailing in South America is interesting in that, at the time of the adoption of the metric system by the several countries, little or no physical disadvantage, in the form of deep-rooted manufacturing practice, existed. Apparently the reluctance of the peoples of these countries to change is attributable to the greater convenience of their old system.

It is stated on good authority that 50% of all machine tools manufactured in the world are made in the United States. It is further stated that 82% of the total business of this character originates in the United States and in Great Britain, both of which countries use the English system. These machine tools are the basis from which all manufactured products spring, and it is not only possible to do, but manufacturing in the metric system is being done constantly with machines and machine tools in which the great majority of the parts are built to the English inch measurements. These machines, in most cases, are standardized and in the case of frames, bases and parts of a similar nature, it makes no difference whether the machine is to be used for manufacturing products to English inch measurements or metric measurements. In the majority of cases the only changes which are necessary are in such moving parts as lead screws and some change gears and parts of a similar nature. Where a company is doing a considerable export business, these metric parts have also become standardized, so that they present no more difficulty in their manufacture than do the corresponding parts, which are built to English measurements.

Proponents of the metric system urge as their main argument the advantage that would result in export trade from its adoption. To this argument your committee takes exception.

Many things manufactured in the United States are sold in tremendous quantities in foreign countries without a particle of hindrance by virtue of the system of measurement by which they were made. Foreign automobiles sell in the United States without a thought being given as to whether or not they are made to the metric or to the English system, and it is a well known fact that the American automobile made to the English measurement system has invaded every known country in the world.

Examples of the ready sale abroad of articles made by the English system could be multiplied without end.

The American Institute of Weights and Measures recently conducted what might well be called a census of metric use in the United States. The response to their questionnaire is particularly illuminating when applied to a consideration of the foreign trade of many American manufacturers. For example, out of the replies received from automobile manufacturers, it was found that none were equipping their cars for foreign trade exclusively with tires and rims in metric sizes. In fact, the companies which perhaps do the largest automobile export business, such as Dodge Brothers, Ford, Maxwell, etc., ship their cars equipped exclusively with tires in American sizes.

The Paige-Detroit Motor Company states that occasionally a request for metric spark plugs is received. They further state that such requests are few and far between, because of the predominance of American spark plugs, and that in eighteen months they have not shipped a single car so equipped.

Dodge Brothers, who ship more than a million dollars' worth of automobiles a year to foreign countries, equip all of their cars with standard English thread spark plugs. Instances of this kind could be multiplied practically without end.

The Cleveland Twist Drill Company, which has been in export trade for a great many years, reports that in its particular line ninety per cent. of the

shipments to France, Sweden, Italy and Spain are made in metric measurements; to other so-called metric countries, roughly, fifty per cent. But the great bulk of its exports go to countries using the English system—Canada, Australia, South Africa and Great Britain. The Cleveland Twist Drill Company is absolutely opposed to making the metric system of weights and measures compulsory.

The metric system was made legal in the United States in 1866, and is open for the use of anyone desiring to adopt it. Contracts drawn in this system are legal and binding.

It is now proposed to introduce into Congress a bill which, if passed, will make the use of the metric system compulsory in the United States. In the opinion of your committee, the enactment of such a law would cause inestimable loss to the manufacturing interests of the country, and would create confusion and chaos from which the country would probably not recover for years.

An idea of the chaos that would be created in everyday affairs may be gained from glancing over the following list of changes that would have to be made.

In domestic life:

Grocers' scales all require new poise weights, all notched balance beams scrapped and new ones provided, with new sliding weights.

Peck and bushel measures discarded.

Liter, larger than a quart, new containers required.

Hectoliter, equal to 2.8 bushels, not a practical unit.

Prices on all commodities to be readjusted to new units.

In culinary matters:

All recipes to be readjusted to kilogrammes and liters; cook books to be rewritten; general confusion in kitchen operations.

New milk bottles.

In other household affairs:

Gas meters to be replaced by new system of units of volume, or readings of meters taken in one system and converted into the other, to avoid scrapping meters in use.

Water meters in same category as gas meters.

Tape measures and yard sticks to be discarded.

In shopping:

Counter measuring machines to be reconstructed, yards to meters.

Dry goods to be folded at cotton and woollen mills in meter folds instead of yard folds, requiring change of machinery.

Photographic plates in common sizes to be known by awkward combinations of figures. An 8 by 10 plate becomes 203 by 254 millimeters.

Quires and reams to be displaced by decimal multiples, requiring changes at manufacturing plants.

All containers and cartons to be modified in sizes and shapes to be adapted to new unit sizes.

Shirts, collars and cuffs to be known by strange names of sizes. A 16 inch collar becomes a 406 millimeter collar. A 187 millimeter hat is worn instead of 7⅜ inches.

In building materials and construction:

Abandon board measure and substitute square decimeters, centares, or ares.

Doors familiar to all builders as 2 ft. 6 in. by 6 ft. 8 in. become 762 by 2032 millimeters.

An ordinary brick is 51 by 101 by 203 millimeters. Sizes of sash also are converted into strange units. Weights of tin, copper, zinc, lead sheets and plates placed before builders in unknown units, in awkward combinations.

Molds and pallets in brickyards to be changed to new units or inconvenient numbers used to represent sizes.

Earth excavation on basis of cubic meters, representing about 1.3 cu. yd. Designation of shovels and dippers in excavating machinery to be in fractions of cubic meters instead of definite yards.

All architects' drawings to be in new units, involving a most perplexing conversion of current building material units or made up on a system that will involve changes in all woodworking machinery to meet metric units.

In railroad affairs:

Change in position and renumbering of, say 100,000 mile posts, an incidental and minor affair relative to other changes.

Standard gauge of track becomes known as 1435 millimeters.

Changes in time-table mileages.

Books of rules rewritten and speeds given in new units instead of miles per hour. Slow boards all repainted with new speeds thereon.

Speed recorders scrapped or remodeled.

Employees instructed in new methods of estimating speeds.

Dimensions of all wheels, axles, standard parts of car construction changed into new units.

Railroad track and warehouse scales to be reconstructed into metric units. Capacity of cars to be in new units.

In public land surveys:

Lands in many states surveyed and staked out in townships, sections, quarter sections and eighth sections, in none of which divisions is there an easy conversion into metric units.

In reconveyance of lands, present deeds giving metes and bounds in English units would require expensive and elaborate efforts to put dimensions and areas in metric units, which if correctly made would still be unintelligible to most people.

As great as the confusion in the few respects above mentioned and as expensive as the process would be in all the usual affairs of life, these few enumerated examples pale into insignificance beside the cost involved in making the conversion in the manufacturing industries. The cost of the war is but a fraction of that which would confront the general industries of the country. Virtual scrapping of all small tools and fixtures would be faced by manufacturers were such an act of Congress passed.

A colossal fortune in changes of lead screws and screw cutting gears in lathes alone is involved.

In all machinery the changes become of such a staggering nature their mere contemplation is most depressing. Days would be required simply to state the number of changes involved in the industries.

The ravages of war have fixed definite limits of territory. The ravages of the metric system changes would be universal in domestic affairs.

Compulsory legislation in this matter would plunge the nation into economic disorder, wiping out values in billions of dollars.

A dual system is confusing beyond description. Two systems do not admit of being in common use. A gradual change, piecemeal, is impracticable. A sudden sweeping change would throw the entire country into disorder.

In the chemical laboratory the metric system is used. It is there because it has advantages in chemical work. It was adopted because of its advantages there.

The metric system would be adopted by the industries if it possessed advantages for them.

The rewriting of all text books, engineers' tables, the changes in architects' drawings, in mechanical drawings, the education of the personnel of machine shops and other industries in the use of a new system of units are matters of greater magnitude than any yet undertaken by this country.

Interchangeable manufacture is strictly an American invention. Indeed, it is referred to in Europe as the "American method." Standardization is for the purpose of interchangeability. American industries have spent time and money standardizing for the purpose of economical manufacture on an interchangeable basis and to-day outstrip in this respect European methods so far that there is no comparison.

Your committee is not able to believe that the adoption of the metric system will promote this sort of standardization and interchangeability. It is our opinion that it will not only retard this work, but that it will destroy all that has already been done, and that much time and much money would have to be expended in making the change.

The metric system does not provide for the purpose of the manufacturer convenient units of measure. American manufacturers are accustomed to making micrometer measurements. In gear cutting, for example, there is not a single pitch in the metric system that will fit the United States system now so universally used. An example of this is the 12-pitch gear which is used by thousands in this country. The closest pitch to this in the metric system is module 2. These gears will not run together because the thickness of the metric tooth measured along the pitch circle is .124", while that of the 12-pitch tooth is .131" thick. In order to run these gears together it would be necessary either to change the 2 module to 1.889 module, or to change our standard to 2 module. It would mean that millions of gears on hand would no longer be interchangeable, that millions of dollars would have to be expended for changing over and rebuilding gear cutters, and that the necessary gauges for checking the product would become obsolete, except for the purpose of repairing old gearing.

A common automobile cylinder dimension is that of the 3¾" bore. It is a standard size and is turned out by one concern alone in quantities of 12,000 per day. This standard is so well established that pistons and rings can be secured to fit it in every city in the United States. The metric translation of this size is 95.25 MM. Would our manufacturers be willing to adopt, or would other countries be willing to adopt this size of 95.25 MM., or would it not be found necessary to adopt a 95 MM. bore? If 95 MM. should become the standard, it is not difficult to estimate the effect on the manufacturer who would be forced to scrap his tools, fixtures, jigs, etc.

The United States makes more than one-half of the screw products of the world. Our system is the most interchangeable of any of the systems which are in use at the present time. The bolts and nuts made by one manufactur-

er are readily interchangeable with the corresponding sizes made by another manufacturer. It has even been found that our standard 1"-8 thread per inch bolts and nuts can be used with 1"-8 thread bolts and nuts of the English Whitworth system.

In the metric system there is not a single diameter of bolt or pitch which will fit those now being extensively made in the United States. The pitches in the English system are expressed in terms of a certain number of threads per inch of length; while in the metric system they are measured from a given point on one thread to a corresponding point on the next thread, and under this system all fine threads become an awkward fraction of a millimeter.

It was estimated at the time of the signing of the armistice that the gauges, checks, etc., made for war munitions alone cost the government $30,000,000. At least half of these will be of no use to the War Department or to anyone else if a compulsory metric law is passed. This gives an inkling of the tremendous cost of making the change proposed.

The English system, for the purpose of manufacturing, is as susceptible to decimal division as is the metric system. Beginning with the inch it is customary to halve for each sub-division up to a convenient fraction, 1-32 or 1-64, beyond which micrometers and other instruments are adjusted to hundredths, thousandths and ten-thousandths, all of which units are practicable and usable.

In the metric system the first decimal subdivision of the meter is the decimeter, a unit 3.937" long, of no utility and rarely used. The next unit is the centimeter, a unit too large for good work and too small for use in distance measurements. The next is the millimeter, .03937", the most widely used unit because of the adaptability of its size value. This unit is about as fine as can be used on a steel scale. For tools and fine, accurate mechanisms a millimeter is too large, and so the next subdivision is the 1-10 millimeter, which is .0039". The great bulk of good work in machine tool, automobile, tool working and other industries requires units between 1-10 and 1-100 millimeter. The one is too coarse and the other too fine The result is the halving and quartering of millimeters to get usable units approximating 1-100, 1-1000 or 2-1000 of an inch. Thus, it will be seen that the advantage claimed for the metric system of providing a decimal system fail by virtue of this forced use of fractions.

A great majority of manufacturers are on record as opposing the adoption of the metric system under one of the three heads:

(1) It offers no advantage over the present system of inch measurements.

(2) It is a very expensive procedure to introduce.

(3) It will produce great complications during the period of transition.

Your committee, after consideration of its investigation and of the facts that have come to its attention, earnestly urges the Chamber of Commerce to go on record as being absolutely opposed to the compulsory adoption of the metric system of weights and measures in this country, and strongly recommends that the Chamber of Commerce direct communications to the members of the Committee on Coinage, Weights and Measures of the Congress of the United States, and to all of the representatives of Ohio in the Congress of the United States, opposing a legislation which will in our opinion be so disastrous to all of us.

SAFEGUARDING MACHINERY AT ITS SOURCE

SPEAKING on this subject, Mr. H. A. Schultz of the U.S. Steel Corporation, remarked as follows:

"As chairman of this committee I might say that as we have been so recently appointed we have hardly had time to get into action, and this report can contain little more than a statement of present conditions and a promise for the future. Some three years ago your council appointed a committee using the same title as that of the present. The first committee working on this subject was very energetic but, as it was pioneering, it was rather difficult to point to results. Probably the most important feature of the work of the first committee was in paving the way with the Machine Tool Builders' Association, and with the American Society of Mechanical Engineers. That this pioneer work was in a measure successful and also as a reflection of the trend of things, we have but to turn to the advertising pages of our technical journals, where page after page show machines pictured with hazardous points guarded. It is true that the guarding is not always adequate, and also that the manufacturer sometimes fails to guard all of the hazardous points, but on the other hand think of the advertising pages of 10 or 15 years ago! In those days the gears, power transmission, etc., were devoid of any covering.

It is perfectly obvious that the best time to safeguard the machine is while it is being designed. Then only can we hope to incorporate the features essential to safety and obtain the kind of a job that is pleasing to the eye and satisfactory to the critical inspection of the engineer inspector and the plant manager. Too often, unfortunately, the guards that are installed after the machine is in its working position in the shop are frail, unsightly and inadequate.

Safety specifications should be based upon practical recognized safety standards, and should be drawn up in a form so that they may be included and used as a whole, or in part, for any contract for construction work, or for purchase and installation of machinery and equipment. A set of safety specifications should be attached to, or embodied in, general specifications when originally submitted to contractors or manufacturers for bids. In this manner the contractor or manufacturer will be fully advised as to the safety requirements and these features will be included and properly taken care of during the process of construction.

Where the size of job, or the character of the equipment involved warrants, it has been found very desirable to go over the safety specifications in detail with the contractor before the work is started and during the process of designing, and then inspect the equipment in the contractor's shop before shipment is made. By so doing a mutual understanding between the contractor and the purchaser may be reached regarding the safety features, and unnecessary expense incident to additions in the field may be obviated.

The work of this committee will necessarily depend very much on the degree of co-operation it secures from the members of the section and probably the greatest help, in addition to suggestions, would be secured when purchasing departments demand that the machinery ordered be furnished with all necessary safeguards and that such guards must comply with state laws, insurance companies requirements, and the requirements of the safety department of the purchaser.

If we begin with our own companies we may feel reasonably certain that later such demands will be made by the purchasing departments of all companies —in fact, many of them have already begun, as you know. Much good can also be obtained if we will do missionary work with our own companies, that is, those of us who are connected with the companies having machinery for sale. Surely we can take steps to insure the proper safeguarding of machinery which is for sale by our own employers. Then, too, we can do missionary work with manufacturers from whom our company make purchases by pointing out the hazardous features of the machines they manufacture, and suggesting the necessary safeguards. Always, of course, we should emphasize the fact that manufacturers of machines that are adequately guarded have an advantage over their competitors whose machines are not guarded because the sales engineer can truthfully state that the machine, as delivered, will comply with the requirements of the safe practice inspection department of the State Industrial Commission, and also the requirements of the various insurance companies.

Let us all think, for a moment, of all the machines that are now on the market that could, with but slight effort and small expense, be redesigned to include proper protection for workers operating the machine. When we think of the large number of such machines we are inspired by the very size of the job ahead of us and the opportunity that it gives for everyone to do at least one bit of definite constructive work for accident prevention.

Have We Any Definite Data on Brake Wheels?

The Author States His Knowledge Regarding the Design of Brake Wheels, But Regrets That More Definite Laboratory Tests Have Not Been Made

By JOHN S. WATTS.

THERE are many features in the designing of brake wheels, upon which we should have more definite information, and I would like to see some of the College experimental laboratories make some tests to determine the facts governing these points.

The first point to be decided upon in designing a brake band, is the co-efficient of friction, of the materials, of which the brake wheel and band are to be made. These co-efficients are given in the various handbooks for all the usual materials, with one important exception, namely, asbestos, which is now largely used and has proved its usefulness for the work.

The co-efficient of friction for asbestos linings on cast iron wheels is 0.3, and is practically constant at all speeds and pressures. This is a smaller co-efficient than that of some of the woods used, but much higher pressures can be imposed on the asbestos than on wood, as it will not char or burn from the heat generated, therefore for heavy or long continued braking action the asbestos is much the superior of wood brake blocks.

In connection with the co-efficient of friction, it will be noted that the co-efficients for the various woods on cast iron is only three-fifths of the co-efficients for the same woods on wrought iron. It would seem, therefore, that the most effective arrangement would be, to bolt the wood blocks to the brake wheel, instead of to the brake band, and so take advantage of the higher co-efficient. This arrangement, though, may be dangerous if not carefully looked after, as the brake band, being then the part that will take the wear, may become dangerously thin from wear, before it is detected, if not inspected at regular intervals.

I know of one case where this change was made, and has worked very satisfactorily, but the change was made to overcome trouble from the heat generated. The brake wheel was twelve feet diameter by twelve inches face, and was used on a drop table to lower freight cars from a higher track to a lower one. The heat generated, when the blocks rubbed on the wheel, was so great, that the rim of the wheel became heated to the point where the expansion caused the spokes to crack. This trouble was entirely overcome when the blocks were bolted to the wheel, as the wood did not then transmit the heat to the wheel.

The next point that arises is the required diameter and width of the brake wheel, which involves consideration of the area of the braking surface, required to absorb and dissipate the energy due to the falling load. If the brake is to be operated frequently or for long periods of time, the ability of the brake wheel to radiate the heat generated will probably be the deciding factor. If the brake is only used intermittently and for short periods of time, the safe bearing pressure on the brake lining will be the point to be decided upon.

Taking up the question of the area required to dissipate the heat, we have only the following rather meagre data.

By one technical writer, we are informed that, on a friction disc brake of the type used on electric cranes, the number of thermal units conducted away per square inch of bearing surface per minute, may be considered to be from 4 to 7, in a current of cold air; and from .75 to 1 in a cool place; in both cases the quantities stated are for intermittent service.

This gives a range of from .75 to 7 thermal units per square inch, under the same class of service, and is rather too wide a range to be considered useful information without any details as to the causes for such a great variation. Converting these thermal units into foot pounds per minute, we have .75 x 778, to 7 x 778 = from 583 to 5,446 foot pounds per square inch per minute.

In another place we find it stated that from 200 to 250 foot pounds of energy can be dissipated when using wood blocks on a cast iron wheel, this much lower amount being on account of the danger of burning the wood. It is also stated that car brakes, iron on iron, under favorable cooling conditions, often absorb as much as 10,000 to 15,000 foot pounds of energy per square inch. The time is not stated, but is presumably one minute.

Collating this information we find that we have the following data:

For wood blocks, 200 to 250 foot pounds per square inch per minute;

For fibre on iron, 600 to 5,500 foot pounds per square inch per minute;

For iron on iron, up to 15,000 foot pounds per square inch per minute.

Unfortunately, we do not have information specifying just what condition imposes these limits. We should have tests made to determine the foot pounds of energy that can be dissipated by each of the various materials used for brake linings, up to the point where charring commences, when running under load for varying periods of time, with varying periods for cooling, the idea being to consider the brake lining alone, and determine the limits for the lining material separately from the wheel, as far as possible. For iron or asbestos linings it is obvious that the heat generated does not affect the question, so far as the brake block or lining itself is concerned, within practicable limits.

For any kind of brake lining, there is another limiting feature, that is, the safe bearing pressure per square inch, to avoid mechanical failure or disintegration of the material. For wood this bearing pressure must be kept below the amount which would cause the wood to splinter. Tests should be made to determine this pressure for the various woods and different thicknesses, as the allowable pressure will vary, probably with the thickness. For fibre and asbestos, the bearing pressure may be a maximum of 200 pounds per square inch, provided that the material is riveted to the brake band with rivets spaced on centres close enough to keep the tensile strain, imposed on the fibre by the dragging effect of the friction, within safe limits. There seems to be no information available as to the tensile strength of the various kinds of fibre used, but for asbestos brake linings the ultimate tensile strength is about 4,000 pounds per square inch, and a working stress of 400 pounds per square inch is safe. For iron on iron the bearing pressure must be kept below the point where rapid abrasion would commence, which is at a pressure of about 600 pounds per square inch.

Taking up now the question of the ability of the brake wheel itself, to dissipate the heat generated, or at least enough of it that the temperature of the wheel will not rise to a dangerous point. The heat radiating power, in thermal units, per square foot, per hour, per degree of difference in temperature, for cast iron, is given as .648; which is equal to 504 foot pounds, or say, .06 feet pounds per square inch per minute. As practically all this radiation must be from the rim of the wheel and we cannot count as radiating surface that surface on which the band is rubbing, we will have on an average about three times as much radiating surface as we have surface on the brake band. We may, therefore, expect to radiate 1.8 foot pounds per square inch per minute, while the brake is on, and if this is one-half of the total time, we will dissipate 3.6 foot pounds per square inch per minute per degree of rise of temperature.

The limit beyond which the temperature of the wheel should not rise, depends upon the material used in the brake blocks, and for wood should not exceed 300° Fahrenheit, and for any material, to prevent breaking the wheel by unequal expansion, should not exceed 400° Fahrenheit.

Taking the atmospheric temperature at 70°, we have, then, an allowable increase of temperature of 230° for wood or fibre, and 330° for asbestos or iron, which gives us 3.6 x 230=828; and 3.6 x 330 = 1,188 foot pounds of energy per square inch of braking surface, per minute, which can be radiated under

the conditions assumed, that is, the radiating surface being three times the braking surface, the brake operating during one-half of the time, and the increase of temperature as given above.

It must be noted that if the brake is on for any considerable length of time, it would be possible that the temperature might rise beyond the danger point before the period of rest occurred. On the other hand, a certain amount of the energy is absorbed in raising the wheel to this temperature, and this may be taken into account, when the wheel is relatively heavy, and the machine is operated for shifts of a few hours, with time between shifts to cool off.

If necessary the radiating surface may be considerably increased by the casting on of ribs, preferably of such a shape as to cause a current of air to pass over the radiating surface. If not otherwise a detriment, the capacity of the wheel can be increased by making the rim heavier, and so taking more heat to raise the temperature to the danger point.

I hope that we will have some authority make the tests outlined above, with an average size and design of wheels, using all the various brake linings, and so determine what the limits are in respect to the power which can be absorbed, due to the temperature rise with a number of trials at various proportions of loaded and rest periods.

To summarize, the data required is as follows:

The maximum bearing pressure for each lining.

The maximum temperature for each lining.

The maximum temperature for the average brake wheel.

The radiating capacity per square inch of brake surface of an average brake wheel, when revolving, and when stationary.

Plan Boards as an Aid to Administration

This Article, Which Appeared in the "Organizer," Describes a Very Interesting Form of Plan Board That Enabled the Management to Keep in Touch With the Various Operations.

By HARTLAND SEYMOUR.

IT IS generally admitted that the plan board is one of the most interesting and most helpful aids to administration and organization which scientific management has brought us. It is essentially a graphic index—is, in fact, a most complete and thorough follow-up system.

The type of plan or control board varies, of course, with the nature of the work. One of the most complete plan boards ever seen by the author was constructed and operated, briefly, as follows. The board itself covered one side of the room—that is, the production office. The height from the floor to the top of the board was 6 feet. The board itself was 3 feet 6 inches wide, so that the bottom was 2 feet 6 inches from the floor. Thus both top and bottom were easily reached from a standing position.

Across the top of the board, from end to end, ran a division which recorded the complete assemblies. In this case the product was a motor-vehicle chassis. The series number and the number of the chassis to be manufactured was drawn up on a strip of stiff card and pinned along the top of the board as shown in the first figure. Thus, in this case, an order had been issued for the manufacture of 150 of the standard chassis; this series was given the letter "L" by the order department. Accordingly a long strip of Bristol board with the series letter and the number thereon was pinned up across the top of the board.

Below this ran two parallel lines the length of the board and graduated up to 200. The full particulars of the current order were drawn up and pinned in the space on the left as shown, while the scheduled date of completion was pinned upon the extreme right. Then a cardboard outline of a chassis, colored red, was pinned up at the figure 150. A corresponding cardboard outline, colored blue, was then adjusted day by day so that the progress of completed assemblies could be watched.

The progress on each section of the chassis and each individual component was recorded as follows. The board was divided by five vertical lines into six equal sections. A line running across the top of each section was graduated to 200. Then strips of paper, each equal in length to the width of each section on the board, were entered up with full particulars of each component, name, number, and the number per set, and so forth, as in the second illustration.

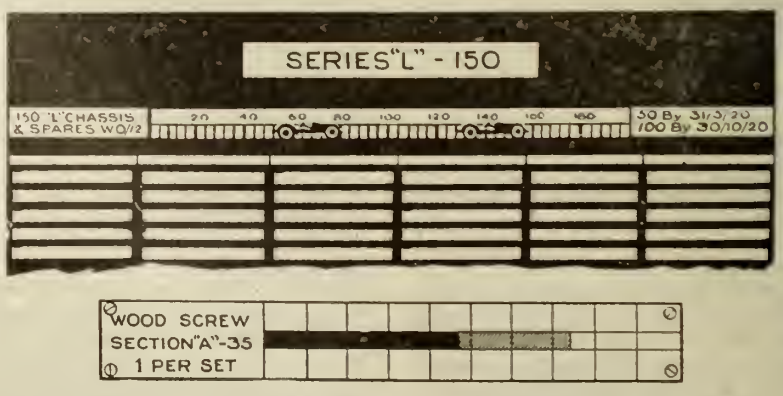
These strips were then ruled across to correspond with the graduations on the board, so that when pinned up the graduation marks would run the entire length of the board. Horizontal lines were drawn on each strip as shown and colored red. The operation was then as follows:

The strips having been placed in proper sequence on the board, the progress on each component was recorded by painting over with black the red line on the strip. To take an instance. A screw on a certain part of the chassis will do. Well, this screw belongs to a "section" of the whole assembly, one only of which is required. So that of Section A, let us call it, 150 are required to make up the 150 chassis, with the corresponding number of the screw taken as an example. This screw will have a number, say A/35, so that it can be readily identified. Then the particulars of this screw are entered on the strip, as shown, and its progress is recorded as described.

Each section of the total assembly has a strip of its own. We will suppose there are ten such sections. Then the strip bearing Section 1 is pinned at the start, and the strips, bearing the components going up to make that section, follow it. Then comes Section 2, followed by its components, and so on right down to Section 10, with its parts Each section is, then, a small assembly of its own, and as so many components are completed which go to the assembly of any one section, this fact is recorded on the assembly strip.

Another Example

We have considered the case of a screw, one of which was required per Section A. Suppose we take another case. If we look under Section B we find a small bolt B/78. Now, three of these small

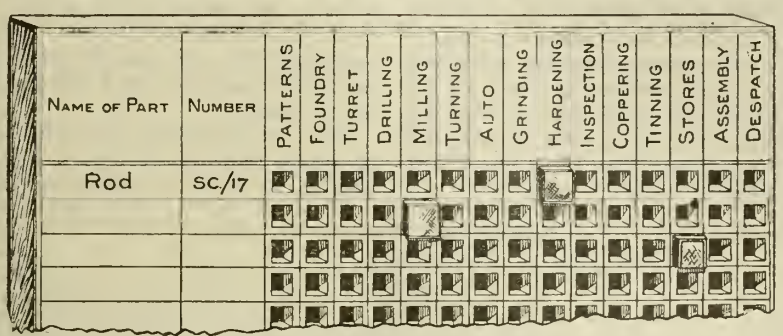


ILLUSTRATING THE IDEA, NOT ONLY OF THE BOARD, BUT THE STYLE OF INDIVIDUAL STRIPS USED.

bolts are required for each section. That fact is recorded on the strip for that bolt B/78, in the words "Number per Set —3." So that, altogether, 450 of the bolt B/78 are required for the whole 150 chassis.

What happens in this case is that each graduation represents three, so that when six of B/78 are completed the red line is blacked over as far as the second graduation, and so on right up to the 150 mark, which will then record the manufacture of 450 of these bolts.

This board was kept up to date by a reliable girl clerk. It may be added that she was responsible for taking care of the memoranda bearing the information from which the plan board was made up. These slips were bound in books of 100; they were filled in and detached by the progress clerk or chaser responsible for keeping in touch with that particular department. By having a definite routine of watching these components, complete information was available day by day.



ANOTHER STYLE PLAN BOARD WHICH DESERVES ATTENTION.

The plan board, needless to say, was extremely valuable to everybody concerned with production, and well worth the initial trouble and cost expended on it.

Another form of plan board, illustrated above, as used in another works, is operated as follows. It might be mentioned here that the product is also a motor-car chassis with a great number of parts.

The plan board is built round three walls of the office, the top being 5 feet 6 inches from the floor and the bottom 2 feet 6 inches, so that the board measures 3 feet in depth. It is divided into fifteen equal parts by vertical wooden ribs. Each section of this board represents a complete sectional assembly of the chassis, and the name of the section is printed across the top. Running down the left-hand side of each section of the plan board are, in the first column, the name of the component and, in the second, the part number of this piece. The remainder of the board is divided up into fifteen small pigeon-holes, each an inch square. Over each pigeon-hole is the name of a department, the order of these being the order in which the pads are carried by the progress chasers in their tour through the shops. At the end of the day, when the chaser makes his report, he fills in one of these pads. His procedure is as follows: If the rod, part SC/17, was in operation in the drilling department, say, he puts a red mark in the space opposite "Rod, SC/17," and under the heading "Drilling Department." If, on the other hand, this part has just been sent in to the drilling department, perhaps for working on the next morning, he will put an ordinary black-ink mark instead of the red.

All these reports have to be in the planning office before nine o'clock the next morning, and from these the board blue, are kept in a box. A clerk in the planning office, on receiving the reports, takes up the first and notes that the rod, part No. SC/17, is in operation in the drilling department, so he takes a red cube out of the box and fits it into the pigeon-hole in the plan board corresponding to the division on the sheet. This is done for every component every day.

The making-up of the board from these reports takes two girl clerks from a quarter of an hour to twenty minutes, at the outside, every morning. The board furnishes a very valuable guide to the work going on in the shops, and from it the production manager can see just where each part is.

COLOR SCHEMES FOR PLANT PIPING

By H. L. Wilkinson

The importance of some definite and unmistakable means of readily distinguishing between the various pipe and conduit lines and systems in the power plant has long been recognized by both designing and operating engineers. Particularly in large power plants in this question of vital importance, and it should be stated that in some of the well-ordered large power plants reasonably satisfactory systems have been installed. Also there has been some effort made to standardize this practice, a committee appointed by the American Society of Mechanical Engineers to investigate the question having reported upon the preferable distinguishing colours for the various divisions of piping systems in the usual power plant, so states the author at a recent meeting of the American Society of Heating and Ventilating Engineers.

While the importance of standardization in this detail of our power plants has been recognized, too little attention has been given to the matter of late, and the writer believes that its importance should not be overlooked. It is, therefore, suggested that the members of this society consider the following plan which is designed to apply to all piping systems.

It will be noted that the recommendation involves, in addition to piping lines, colour schemes for machinery, motors, hand-rails, dadoes, waste pails, elevator cages, etc., thus extending the usefulness of this distinguishing system to all parts of the industrial plant. It has been a revelation to the writer to find the cordial reception which this proposed colour scheme has received in many industries and concerns of national prominence, and the result is that new industries and concerns are taking it up continually. The application of this standardization might well be extended to the designating by distinguishing colours the tools used in various departments of a plant. This would bring about several benefits. In the first place, it would enable managers to hold each department of a plant responsible for its own tools. Then, because of the improved appearance of the tools, it would create more interest in their care on the part of mechanics. Last, but not least, it would surely be an insurance against tools being carried out of factories.

While the scheme designates definite colours for certain pipes, it is, of course, unnecessary to apply any one particular colour on any one pipe, the arrangement being flexible, so that an engineer may determine for himself his own design. In some cases, where there are as many as fifteen to twenty-five various pipe lines, it is necessary to use combination colours on some pipes, painting the straight pipe one colour and the joints, valves, elbows, etc., the alternating colour. Of course, some exceptions to personal selection will be found where an established custom has been in effect for some time, as in the case of sprinkler-pipes and all fire lines, where vermilion is the logical colour.

The advantage of this standardization will become readily apparent from the case of a certain plant where there was a stoppage or break in one of the pipe lines. The workmen carefully followed the line to the side wall where the trouble apparently existed, and opened up the wall for a considerable area, only to be confronted with everything but the line they sought. Of course the expense of ripping out the wall was nothing compared to the inconvenience and loss sustained, due to the suspension of operation until this repair was made. If this pipe line had been printed with a distinguishing colour and a small arrow placed on the wall where the pipe entered, indicating the direction the pipe took after enering the wall, all this difficulty would have been obviated.

WHAT OUR READERS THINK AND DO

LIGHT AIR HOISTS

By A Draftsman

The use of the light air hoist is already well known, but it is particularly adaptable in plants where there is a regular supply of compressed air at a pressure of about 70 lbs. per sq. inch.

The beauty of this type of hoist is that it can be hung over any spot where frequent lifting or lowering has to be accomplished, such as a dip tank. It may also be suspended from an overhead trolley if desired, the trolley running on a track in the usual manner. It may even be invented and modified to work a light lifting elevator of short lift. In fact the uses of such a hoist is very varied, and its uses prove the value of knowing how such a hoist is made.

Briefly its essential parts are a two-way valve, a strong cylinder with a top flange, cap and eyebolt, lower flange, cover or stuffing box, a cast iron piston equipped with cup leather, and a piston-rod with crosspiece and V bolt for attaching to hook.

The accompanying illustration show the main features of such a hoist from 2½ in. to 8 in. in diameter. In this

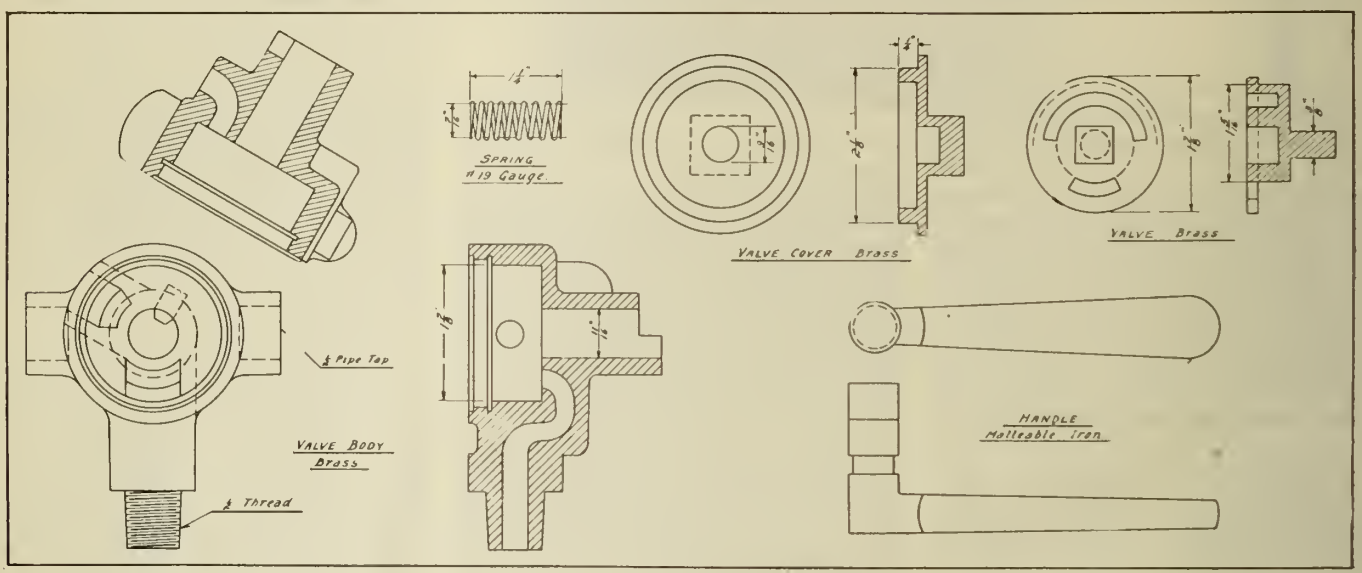


FIG. 1—DETAILS OF THE AIR VALVE.

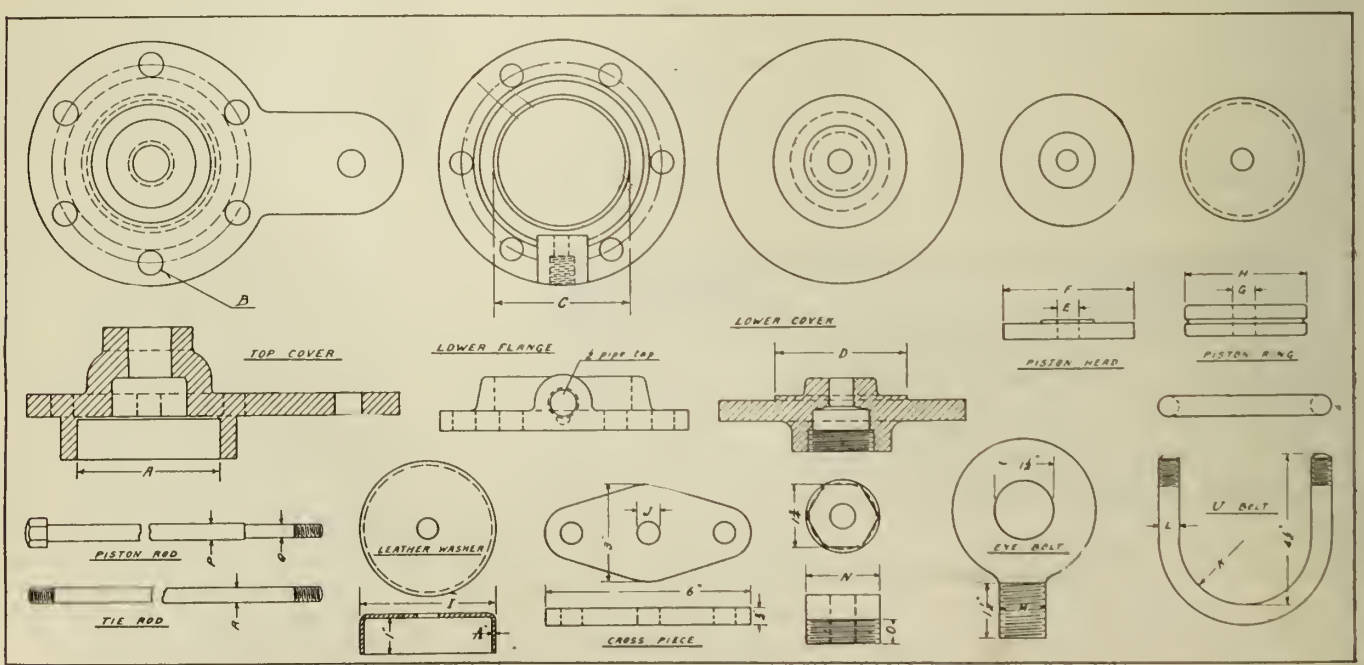


FIG. 2—VARIOUS OTHER DETAILS OF IMPORTANCE.

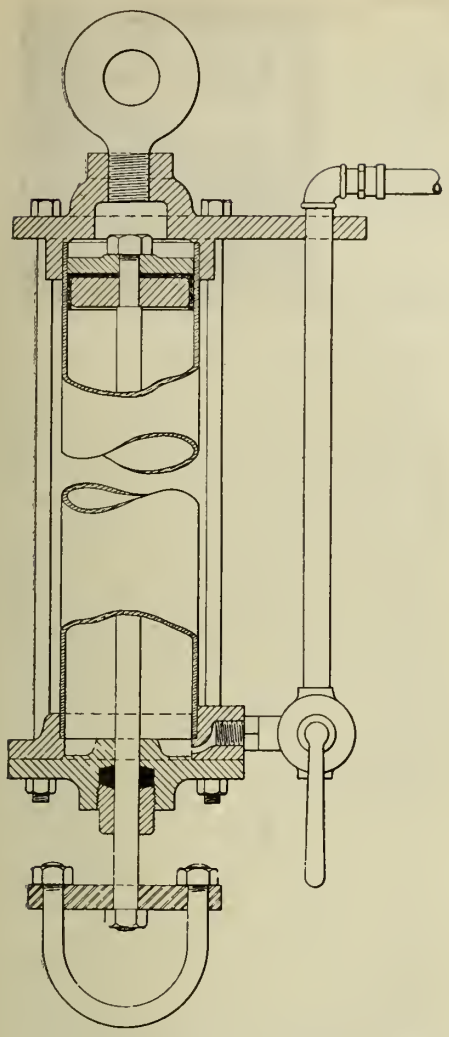


FIG. 3—THE ASSEMBLED VIEW OF HOIST.

type the cylinder is of commercial brass tube, ⅛ in. in thickness, to which the end flanges are held by longitudinal tie-rods. The two-way brass valve is common to all these sizes and its details can be noted clearly. For convenience of operations a light rod is often attached to the end of the valve lever.

At Fig. 1 is shown the details of air valve, while Fig. 2 illustrates the other necessary parts. The different parts are all named so that readers should have no difficulty in picking out the details. Fig. 3 shows the assembled view of the hoist. Fig. 4 gives the table of various dimensions from 2½ in. to 8 in. sizes.

THREADING AND BORING FIXTURE

By G. Barrett

The accompanying sketch illustrates a fixture that has been adapted to a lathe for the boring and threading of small headers. The boring bar B is held in a special holder, the base of which is provided with a slide that fits an ordinary tool slide that is secured to the face plate of the lathe. The bracket C is fitted to the saddle of the machine so that the front face is parallel to the face plate and at right angle to the travel of the carriage. Suitable holes are drilled in this bracket

SIZE OF CYL.	DIMENSION																	
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
2½	2¾	½	2¾	2½	½	2 15/32	½	2⅛	2½	⅝	2	½	⅝	1⅞	11/16	⅝	½	½
3	3¼	½	3¼	3	½	2 31/32	½	2⅝	3	⅝	2	½	1	1⅞	11/16	⅝	½	½
4	4¼	9/16	4¼	4	⅝	3 13/16	⅝	3⅝	4	¾	1 15/16	⅝	1¼	1⅞	11/16	¾	⅝	9/16
5	5¼	9/16	5¼	5	¾	4 13/16	¾	4⅝	5	1	1 15/16	⅝	1¼	2	11/16	1	¾	9/16
6	6¼	11/16	6¼	6	¾	5 15/16	¾	5⅝	6	1	1 15/16	⅝	1¼	2	11/16	1	¾	11/16
7	7¼	11/16	7¼	7	1	6 13/16	1	6⅝	7	1¼	1⅞	¾	1¼	2⅝	11/16	1¼	1	11/16
8	8¼	11/16	8¼	8	1	7 15/16	1	7⅝	8	1¼	1⅞	¾	1¼	2⅝	11/16	1¼	1	11/16

FIG. 4—TABLE SHOWING VARIOUS DIMENSIONS.

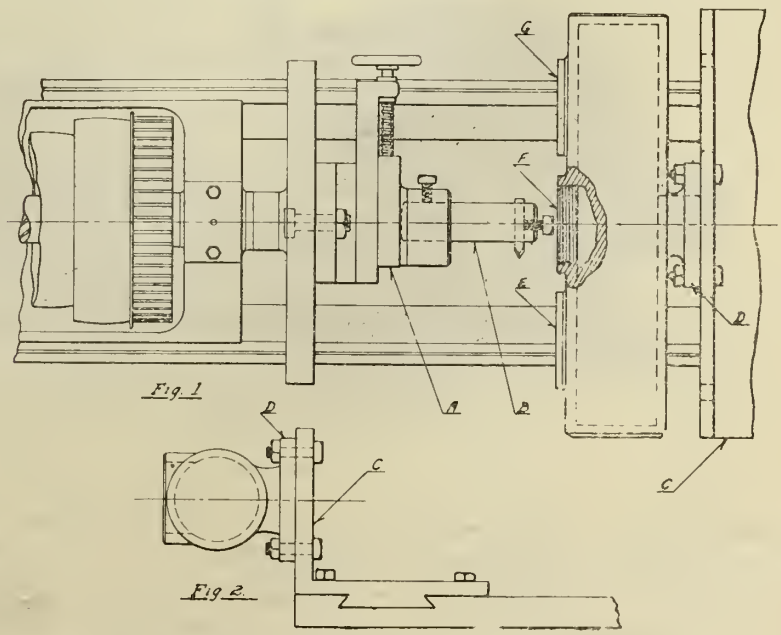
at three different points for bolting the flange D in the desired positions for locating the openings E, F and G in alignment with the spindle of the lathe. Fig. 2 is an end view of the fixture. The bore is finished to size by the adjustment of the tool by the handwheel shown. The cutting of the thread is accomplished in the usual manner, gearing the lathe for the desired pitch and manipulating the tool by means of the handle on the tool slide.

NON-DESTRUCTIVE METHOD OF BELT JOINING

An unusual problem in the handling of hot cement clinkers with a temperature of 200° and over, was recently solved at the plant of the Standard Portland Cement Company, Leeds, Ala., in an interesting and cost-reducing manner. The method decided upon for moving the clinker was a rubber conveyor belt, but the clinker could not be cooled sufficiently in the process previous to conveying, to prevent scorching of the belt and its rapid destruction. The answer to this problem was found by running the belt at an incline of 12 degrees, so that the lower pulley dipped into a trough of water, thus carrying a film of cold water upon the belt, on to which the hot clinker from the loading hopper was deposited.

At this point a new problem was encountered; namely, how to join the belt so that the belt's full strength would be retained, and in a way which would withstand the extremes of temperature, the wear on the pulleys and the abrasion of the clinker. For this purpose Crescent belt fasteners were adopted, because they brought the belt ends tightly together in a snug joint, which made the belt practically endless on the pulley side, so there was no opportunity for clinker ash to get into the joint and abrade the belt ends, and also because in this method of joining, no metal came in contact with the pulleys to cause wear, and a permanent joint was thus assured. Moreover, the exceptional strength of the heads of the rivets and the formation plates prevented destruction of belt joint through abrasion by the clinker.

In six months of operation, this conveyor has carried 61,000 tons of clinker, and the Standard Portland Cement Company credits the saving of $300.00 in belt cost alone to this conveyor. The belt used was Goodyear Hy-temp, which is made particularly to withstand temperatures up to 200°, and is adapted for work on conveying jobs in mines, coking plants and cement factories where heat resistance and ability to withstand hard wear are prime requisites.



PLAN VIEW AND DETAILS OF THE FIXTURE.

DEVELOPMENTS IN SHOP EQUIPMENT

HIGH POWER LATHE

The Joseph T. Ryerson & Sons, Chicago, Ill., have placed on the market their line of high power selective head engine lathes as illustrated. These machines can be used for quantity production as well as general machine shop work, and embody the most advanced design, high class workmanship and finish. Speeds and feeds are also well looked after.

A prominent feature is the method of driving. With hardly a change these lathes can be adapted to constant speed, single pulley drive, with or without spindle reversing attachment, or direct reversing motor drive. In this latter arrangement the motor is bolted to the bed and the armature shaft directly connected to the main driving shaft, doing away with belts, tension idlers, and chain drives with their consequent trouble and inefficiency.

All controls have been centralized on the apron. From here the operator may start, stop and reverse the spindle instantly, engage, reverse, or trip the feed, as well as traverse the carriage and cross slide.

The 12 spindle speeds are changed by means of two levers on the headstock, the one controlling the various sets of change gears and the other engaging the back gears. The action of both levers is instantaneous and all changes may be made while the lathe is in operation. The hand wheel visible on the headstock can be turned to any desired feed marked on its circumference, automatically selecting the feed indicated.

Headstock

The headstock is cast integral with the bed. This construction is more rigid as the two mutually reinforce each other and permit the use of a larger drive gearing. The bed also serves as a container for oil, into which part of the gears are placed, providing a perfect oil splash at all times.

The spindle is a .60 carbon alloy steel forging of exceptionally large diameter. This not only reduces all vibration to a minimum, but also increases the bearing surface considerably, and provides for a very large hole through spindle. A thrust ball-bearing which takes up all the heavy working strains is mounted on the spindle and an adjustable thrust bearing eliminates all longitudinal play. The phosphor bronze bearings are of the split conical type, adjustable for wear and accurately scraped to fit.

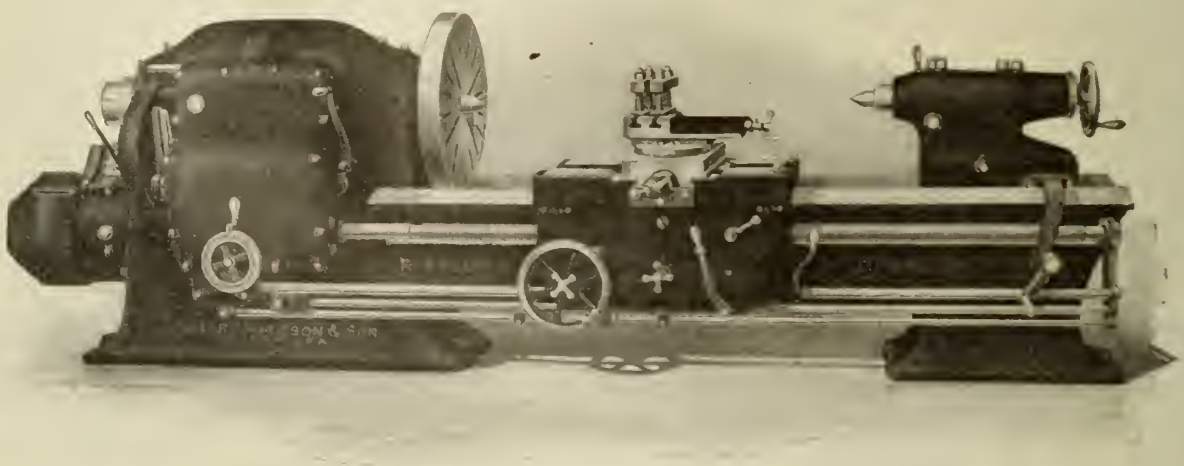
The belt driven machines have the pulley mounted on ball bearings which are carried on a stud, relieving the shaft of all bending strains. The reversing mechanism, which is of the planetary type, has one of its pinions extended sufficiently to receive the power directly from the pulley. The reversing attachment is omitted in the motor driven lathes and, instead, a reversible motor is mounted on the bed, applying the power directly to the primary shaft. A cone of six gears is connected to this shaft, the extension of which carries the back gears.

The change gears on the secondary shaft are of the internal friction band type and are operated by means of tapered keys and wedges controlled by a lever mounted in a shift plate which indicates the various spindle speeds. This secondary shaft also carries the driving pinion and the back gear engaging device, which is operated by friction bands and a lever conveniently located on the headstock. The back gears, as well as all change gears, are permanently in mesh and the various changes can be performed with great rapidity and without danger of engaging more than one set of gears at a time. The power is transmitted to the spindle through a phosphor bronze driving pinion and an exceptionally large herringbone gear.

The spindle drives a large spur gear connected to the feed reversing mechanism, which is operated from the apron, permitting the operator to engage, trip, or reverse the feed screw without changing his position. The 28 feeds are obtained by two sets of geared cones controlled by dive keys, which in turn are actuated by a hand wheel and lever on the headstock. Provision is also made for transposing and compounding gears, permitting the cutting of threads of almost any desired pitch.

Apron and Carriage

The apron and carriage are of exceptionally heavy construction and unusual design. The longitudinal and cross feeds are effected by independent sets of worm gears which are engaged by large friction cones. The positive feed consists of a large split nut made of phosphor bronze, and a very simple device pre-



GENERAL VIEW OF THE LATHE.

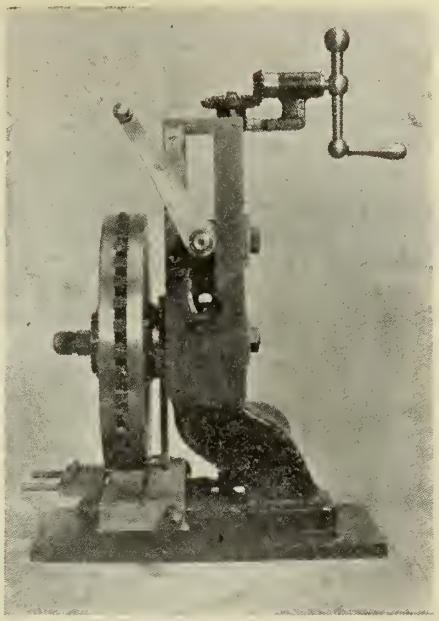
vents the engagement of friction and positive feeds simultaneously. One lever on the apron controls the starting, stopping and reversing of the spindle, and one lever controls the engaging, tripping and reversing of the feeds. On the bottom a lug with micrometer adjustment is attached to automatically trip either the friction or the positive feed at any point along the carriage travel. As the apron is of box section, all shafts are supported at both ends, insuring perfect alignment and durability. The rack feed pinion is heat treated and arranged to be withdrawn from the rack when chasing.

The carriage has a very large surface bearing on the ways and is guided by V's of unusual vertical depth. The cross slide traverse is regulated by hand and power. The tool post is mounted on a swivel base equipped with angular hand feed. Means are provided to adjust all sliding surfaces for wear and all parts are protected from dirt and chips. All gears throughout are made from .45 carbon steel with the exception of the worm gears in the apron, which are of phosphor bronze. All bearings, with the exception of the S. K. F. ball bearings, are renewable. All gears and bearings in the headstock and apron are automatically splash oiled.

MARKING MACHINE

J. Merey, 2842 N. Maplewood Ave., Chicago, Ill., has placed on the market what is known as a Stampograph. This is, as can be noted from the illustrations, a rotary machine for lettering and numbering and can be used on all kinds of metals or substances that are in their soft state.

The impression is adjustable and can be perfectly spaced and aligned. The

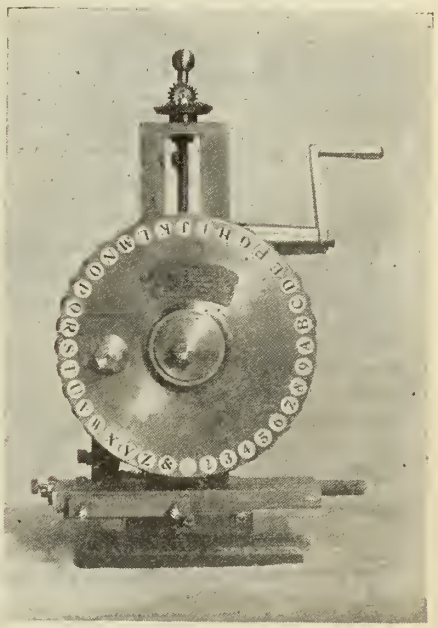


SIDE VIEW OF MARKING MACHINE.

machine has an automatic feed, subject to the sizes of the characters there being a fixed feed provided for each size. The disks for the characters are made from the very finest tool steel and carefully hardened and tempered.

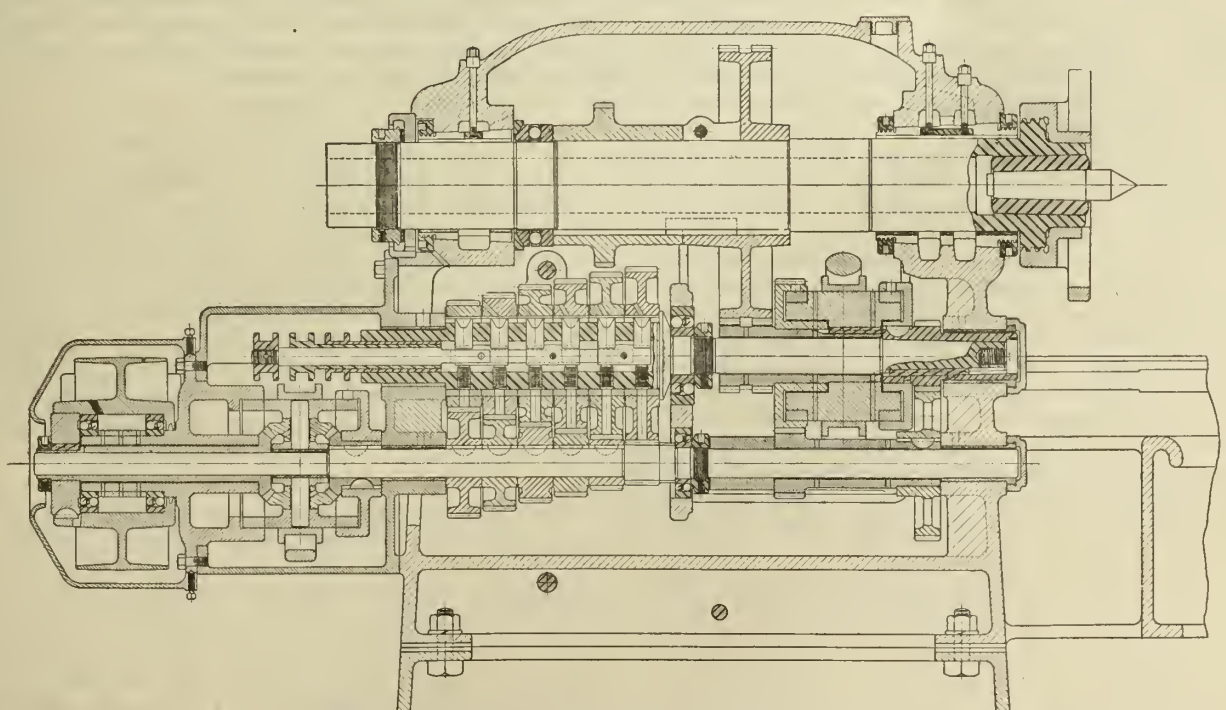
The feed is caused by means of cams and a multiple rack shaft; the impression is obtained by means of crankshaft connected with a handle and connecting rod, which is so constructed, that the characters should not break in case some part of the metal should resist, or from any other cause. The adjusting to obtain the impressions for various sizes of objects or work, can be gained by turning the ball handle in either direction and following the gauge affixed on the side until desired impression is obtained. The machine illustrated, as can be seen, is made for hand power. The machine as built for machine power weighs about 350 lbs. and requires space 2 x 2 feet, and can be run from a countershaft or motor driven. The handpower machine weighs about 200 lbs.

The power machines are only built on specification and the stock machines are fitted out with full alphabet, 1-16, 1-8, 3-16, 1-4 in.; numerals 1 to 0 in same sizes. Special multiple engraved dies can be furnished if desired. Both machines are outfitted with all engraved



FRONT VIEW OF THE MACHINE.

characters, and all necessary requirements, as cross table, vise and circular table with graduations to stamp in radius



SECTION VIEW THROUGH HEADSTOCK OF LATHE.

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Editorial Versatility

THE following question and answer in the Hamilton "Spectator" illustrate the fact that you can't stump an editor. The query is, "To settle a dispute, would you be so kind as to allow me to ask in your 'Knotty Points' column why the funnels on almost all steamers are painted with colors red, white, and black? Thanking you in advance, I remain, yours truly, Reader."

To which the busy editor replies: "The colors are most conspicuous."

While not disputing the fact that such a combination of colors is conspicuous, it would seem to us that the editor's lack of knowledge of the real reason was only equalled by his willingness to oblige the reader. This is, as every seafaring or shipping man knows, to identify the company the steamer belongs to. In the old days of the sailing ship, every line had their own house flag, and the hulls of the ships were painted with a particular color scheme. For instance, one large English sailing ship company made a rule of painting their ships white, from truck to water line, blocks, yards, masts and every fixture conforming to this color. They were known as the white ships. An Italian line of sailing ships was known by its fluted masts, the masts themselves being white, with the flutes picked out in light blue. Another line would have a white hull, with painted ports. With the introduction of the steamer, the funnel lent itself to distinguishing marks, and these were made as near as possible the same colors as the house flag, though of course this was not always the case.

For instance, the red funnel and black top, in conjunction with a square red flag carrying a golden lion and globe, is the symbol of the Cunard Line, while a cream-colored funnel with black top and a red swallow-tail flag with a white star on it signifies the White Star Line. The Allan Line and the Dominion Line both used a red funnel with a black top and a white band, the distinction being in the position of the band. In one case it was close up against the black, while in the other there was a band of red between the white and the black. Every line of any note has its own particular marks.

The reason the Hamilton reader concluded that red, white and black was the favorite color of the seas, is probably because a red funnel, with a white band and black top is the distinguishing mark of the Canada Steamship Lines, and in the thriving ocean port of Hamilton these are probably the most frequent visitors. We imagine our editorial friend, from his familiarity with nautical matters, must have just returned from reporting the America Cup races. While on the subject of funnels, we would like to ask him if a ship with two funnels goes faster than a vessel with one, or vice versa?

The Old System of Barter

An interesting story comes of Samuel M. Vauclain, president of the Baldwin Locomotive Works. While financiers talked of credits and exchange and the chances of opening trade with Europe, Mr. Vauclain went abroad and came back with orders that filled his plant. And the pay? He is taking it out in iron ore, grain, and oil. He probably finds that way of doing business easier than having to explain to the Rumanians, Serbians and Pole why United States take a bite out of their money when they want to spent it in the States. The armistice was not much more than signed when Vauclain was in Europe with a proposition to swap engines for oil, grain, ore, etc.

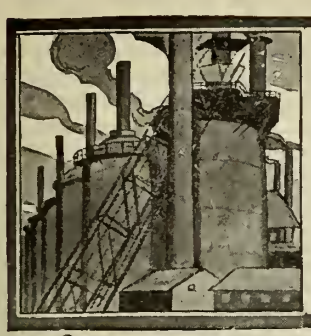
Where Do You Fit In?

Take 100 men at the age of 25. By 35, five of these have died; 10 are wealthy; 10 are well-to-do; 40 live on their earnings; 35 show no improvement. At 45 sixteen have died; one is wealthy; three are well-to-do; 65 live on their earnings; 15 are no longer self-supporting. At 55, 20 have died, one is wealthy; three are well-to-do; 46 live on their earnings, and 30 are not self-supporting. At 65, 36 have died, 1 is wealthy, 4 are well-to-do; 5 live on their earnings; 54 are not self-supporting. At 75 years, 63 have died; 1 is wealthy; 2 are well-to-do, and 34 are dependent. The estates of these men look like this: One leaves wealth, two leave comfort, 15 leave from $2,000 to $10,000, while 82 leave nothing.

What Strikes Cost

It is hard to realize just how much wealth and days of work are shot to pieces during the course of a strike. We have come to look upon strikes as part and parcel of our industrial life, while it is time that we started to regard many of the strikers as thieves and robbers that go about putting their hands in the pockets of the workers, taking out many times what they ever replace. For instance, strikes in Pennsylvania during 1916-17-18-19 meant 10,179,243 days' work lost, and wages lost amounting to $28,664,871. These figures do not take in coal or steel strikes.

A Canadian manufacturer has written to Canadian Machinery about the advisability of placing orders now for certain tonnages of iron and steel. If he can get his business taken on at Steel Corporation prices, then it is well to book, but if the purchasing is being done from the premium mills, buy only what is needed. It is not likely that prices will fall below the quotations of March 21, 1919, as many of the high cost mills claim they cannot produce at them and break even.



MARKET DEVELOPMENTS

Holiday Atmosphere in the Market Now

Business Reported Rather Quiet, But Improvement Is Looked For —Pittsburgh Still Piling Material and Making More Semi-Finished Than Finished—No Price Reductions in Machine Tools

Although the steel mills are turning out a decreased tonnage, they are still producing more than the railroads are taking away from them, so piling is still going on. The Canadian yards, although much in need of this material, report no improvement in the matter of deliveries. The Canadian steel mills are hard pressed for their own coal and coke supplies, and on this account are not able to do as much as they otherwise would in the way of relieving the situation locally. Some of the Canadian mills have labor troubles to contend with, which brings their production figures down to a very low level.

The business that is coming up in the machine-tool market is not in large volume. Dealers are able to show improvement in the matter of securing deliveries from the makers of several lines. There have been some cancellations, and it is often possible to fill an order in this way much ahead of the promised schedule. But all this brings the makers of machine tools nearer the place where they will once more be out actively soliciting business. For several years it has been more a matter of trying to get the orders filled and satisfy the customers for having to wait so long. Any suggestion that this turn of the market will mean lower prices to the buyer must be taken guardedly. One well known maker has this week sent notices to the trade covering this point by announcing that there will not be any reductions during the year 1920 so far as his line is concerned, the idea of this being to reassure buyers who might be holding off in the hope of better price treatment a little later on.

There is something not far removed from stagnation settling down on the scrap metal trade. Certain it is dealers are not anxious to get out and take on tonnages unless there is a distinctly favorable price attached. The large buyers are absent from the market, and obligations to deliver on contracts accounts for about all the business that is moving.

PITTSBURGH MILLS ARE NOT YET SHIPPING AS MUCH AS THEY MAKE

PITTSBURGH, Aug, 5. — Taking the blast furnaces and steel works as a whole, the shipments are somewhat improved, and thus the rail transportation situation as relates to the distribution of the iron and steel industry's products appears at least to have rounded the turn. The worst condition fell towards the end of April, and for some time afterwards there was improvement, but late in June conditions started growing worse again, not because the total volume of rail transportation did not continue to increase, but because cars were diverted from general movement to the movement of coal. The original coal mine preference order was dated June 21, and was run for 30 days, while a 30-day extension carries it to August 19. The blast furnaces and steel works were deprived of a considerable number of gondola cars, but with increasing transportation all around the handicap is being overcome. The time is now probably near at hand when the coal mines will be supplied with all the cars they can load, whereupon any further increase in the volume of transportation will bring benefits to the iron and steel and other industries.

The point has not yet been reached at which all the furnaces and mills are shipping as much tonnage as they make, but the additions to stock are at a smaller rate, and at some plants, though thus far at only a few, the shipments exceeded the production. The Chicago district had been doing very well in this respect, having cleaned up the larger part of its accumulation of steel at mill, when last week the coal mine strike in Illinois and Indiana effected a large curtailment in iron and steel production in the district, about half the blast furnaces having to bank. There was an immediate effect upon the rolling of steel at the Gary plant, on account of the mills depending for power upon blast furnace gas.

The policy has become still more general among steel mills of holding steel, when it cannot be shipped, in the semi-finished form, whereby the production of finished steel is less, proportionately, than the production of crude steel, and shipments are approximately equal to the finished steel output. At some mills special orders rolled in the past are being picked out for shipment, while the mills are rolling stock sizes, the object being to get into consumers' hands such finished steel as might be desirable for use at some later time, leaving the stocks at mill in more mobile form.

Light Demand Continues

The market demand for steel has been light for some time past, and prospects now are that this light demand will continue for some months to come, general business and financial conditions being distinctly unpropitious for bringing out a full demand for steel, particularly when productive capacity is 40 to 50 per cent. greater than before the war. There is railroad buying in prospect, but no large volume compared with the heavy purchases the railroads used to make, as in 1905 and 1906, in 1909 and 1910 and in 1912. With railroad buying extremely light in the recent past, even a fair volume of buying in the near future would not strike anything like the average that used to be common, and either in the next year or the next ten years the steel industry cannot expect the railroads to take nearly as large a percentage of the total steel output as they have in the past, although in point of tonnage the purchases may be fairly large.

In the matter of construction work generally the outlook for steel consumption is not particularly favorable, for even though the cost of steel can be shown

to be relatively moderate, the cost of other building materials, and the cost of labor, are very high, while there are vexatious delays in all construction work. Then, again, conditions as to financing new enterprices are rather unfavorable.

Equalization of Prices

It is a more common view than formerly that steel prices in general will decline to the level maintained steadfastly by the Steel Corporation since the Industrial Board arrangement of March 21, 1919. That there should be two or three markets is unprecedented, and is illogical, except for brief periods when there may be delivery premiums. That the corporation will not advance its prices was made clear long ago. Only recently Judge Gary issued a statement on business conditions in general, in which he took occasion to criticize in strong language the disposition of so many sellers of various commodities to exact the highest price obtainable and thus make inordinate profits. As to earnings the Steel Corporation's report for the second quarter of the year furnishes further testimony to the fact that the Industrial Board prices are quite profitable, for the earnings were far in excess of dividend requirements even though the shipments were much below capacity.

The second quarter earnings of the Steel Corporation, after payment of interest on subsidiary company bonds, but before depreciation allowances, sinking funds, etc., were $43,155,705, against $42,089,019 in the first quarter, and the surplus after dividends was $13,776,833.

Pig Iron Uncertain

The pig iron price outlook is particularly uncertain, because the market has no basis. Prices in the different districts are made from week to week by small transactions, while in steel products there is the stable basis afforded by the Steel Corporation' having adhered to the Industrial Board prices for over 16 months. The pig iron markets have advanced far above the Industrial Board schedule and thus are entirely out of line with steel prices. The markets as made of late have been made by demand for prompt iron, but generally of buyers having no inclination to buy for forward deliveries. Thus in the past fortnight the valley market has advanced $1 a ton on Bessemer, basic and foundry, on transactions of only a few thousand tons in each grade, and these small tonnages can hardly be considered adequate to advance the whole market for the future, when hundreds of thousands of tons will have to be traded in. What consumers are buying now is deliveries rather than pig iron. The only market that now exists is the prompt market, it being quotable, with the recent advances, at $47 for Bessemer and $46 for foundry or basic, f.o.b. valley furnaces, freight to Pittsburgh being $1.40.

POINTS IN WEEK'S MARKETING NOTES

Machine tool houses for the most part are having a fairly quiet session, and the chances are that it will remain this way until the holiday season is over. The arrival of more material would also help in the sale of equipment.

—

The supplies business is confined to small orders. Some railroad business is still pending, it not having been allotted yet.

—

One American house has sent out a circular letter announcing that there will be no reduction in its lines this year. The idea is to give confidence to the market, so that buyers will not hold back in the hope of a better price in a few months.

—

Deliveries of plate, sheets, bars, tubes, etc., are very poor. In some yards it is weeks since there has been a shipment in some of these lines. No improvement can be noticed in the matter of getting mill deliveries.

—

Several firms are paying a good deal of attention to collections now, and although they have their business in good shape, admit that they have more trouble in getting their money now than they did two or three months ago.

SELLING IS ONCE MORE A REAL THING

Machine Tool Dealers Report That Business is Quieter than for Some Months

TORONTO.—The week has been rather dull in all the iron, steel and machine tool lines. The holiday at the first of the week tended to emphasize this trend. One thing is becoming more noticeable, and that is the selling work that is being caried on by several of the leading houses. It has been said a good many times that the war experience, when every person was looking for the man who could secure equipment for him, had spoiled a lot of salesmen, and undoubtedly there was a certain amount of truth in the contention. It looks as though this spoiling period had been pretty well done away with. The buyer in many cases is not so keen as he was some month ago. He knows there is not likely to be the same demand for his finished product, and he also knows, if he is in the steel or iron line, that it is not going to be an easy matter for him to get the supplies he will need to keep up his output.

All this means that it is going to be more of a buyer's market than has been the case for some years now. The sellers have been in command for a long time. The change may bring a lower price in some instances, although mounting production costs, which are the common property of all the makers, will keep the market from sagging very seriously. Several cases have been heard of this week where quite attractive propositions were put up to prospective purchasers in order to get them to come into the market now and keep the firm's booking up to capacity.

Travellers for machine tool houses report that in a good many of the industrial centres in this district the trade is none too brisk. Several factories are seriously embarrassed by not being able to secure supplies, while lack of power is holding back operations in other centres.

Shipping Still Bad

The steel warehouses are not getting much better service than for some weeks past. It seems that deliveries secured are very often the result of serious effort on the part of the purchasers to get the stuff moving toward the Canadian border from the American mills. The Canadian mills turning out bars, etc., are not getting a large output now, and some of them are handicapped by having labor troubles on their hands—all this at a time when there is practically mountains of business to be secured.

Warehouses are having hard work to keep their monthly volume of business up to months when plenty of material was available. These figures are staying up remarkably well, but it must be admitted that in a good many cases it is the increased selling prices that fill up the blanks rather than the large tonnage that is being handled.

Watching Collections

"For the past few weeks," stated one warehouse to-day, "we have been paying special attention to getting our collections in shape, and the results have been very gratifying. There are some firms though, that we do business with who find their collections harder now than they were a short time ago, and on this account it is necessary for us to keep our payments well up. It is a very easy matter to get quite a large bill on your books. I think that is a point that a good many of your readers would do well to think about. It came as a surprise to us to see how quickly accounts grow. The present prices in the steel market are so much higher than they were for warehouse goods in past years that almost unconsciously these amounts grow to very large proportions."

The scrap metal dealers declare that there are days when they would be better off were their yards and offices closed up. Making all due allowance for that statement, there is little business moving at present, although increased activity in some of the foundries may make a call for small lots. But the big volume of trading is not being done, nor do the yards see where it is going to come from. The steel mills seem to be pretty well

supplied, and they are running short at best on account of not getting their usual supplies of coal and coke. Prices have not been changed, but it is only fair to say that the quotations may not always be paid this week. Yards at times will take on an offering, but it is generally found that when this is done, the deal has been put through at a price named by the yard.

NO REDUCTION IN PRICE THIS YEAR

American Firm Sends Word to the Trade In Regard to Several Lines

Black & Decker Mfg. Co., of Baltimore, are sending the following letter to the trade:—

"There will be no reduction in prices this year and starting January 1, 1921, we will protect you against loss through price reductions for 60 days after the purchase of goods.

We have recently had a number of inquiries from jobbers, asking if any reduction in price was contemplated in the near future. This has suggested to us, in line with our policy of co-operation with our jobbers, that we can work more closely with them in this respect.

There is no price reduction of any kind possible in our line at present and you may accept this letter as guaranteeing you against any decline in the price of Black & Decker, portable electric drills, electric valve grinder and electric air compressors between now and December 31, 1920.

Furthermore, we take this opportunity of advising you that after that time you will be protected against loss through price reduction for a period of 60 days after the purchase of our products. This does not mean if conditions make it possible for us to get a lower price on our products that we will give you 60 days' notice and defer the reduction for that length of time. If a reduction is possible it will be made promptly so as to give the ultimate purchaser the benefit and we will absorb any loss which would otherwise be caused the jobber who bought within 60 days before the change in price."

WILL RE-OPEN THE SHIPYARDS

Shutdown of Dominion Plant is Only a Temporary Affair

George McKellar, operating superintendent of the Dominion Shipbuilding Company, Toronto, which laid off a large number of its men on Friday and Saturday, instructing them to return on Tuesday for their wages, said that the yards would be in operation again within seven days. This was the only information which Mr. McKellar could give regarding the temporary shut-down of the plant, which has employed more than 1,500 men.

"Any further information will have to be got from the firm's solicitors, and they cannot be reached. They are in New York in connection with the matter. I understand that there will be a meeting of the directors of the company to-day, after which there might be a statement," said Mr. McKellar.

That the firm would resume operations within a week was the statement made by officials of the Shipbuilders' Union who sought some explanation of the lay-off when the men left the yards on Friday and Saturday.

BUYERS AND SELLERS OF IRON AND STEEL

Some Philadelphia iron makers declare it will be years before they get an adequate supply of cars.

Boston reports that pig iron users there are not at all keen about contracting for 1921 deliveries.

A thousand tons of Bessemer iron was sold to a Pittsburgh firm this week at $47 per ton.

Two furnaces in the Buffalo district have been forced to bank because they could not get coke.

Cleveland reports that practically no orders are being received for either foundry or malleable for next year.

Prices of coke continue to advance, and spot furnace is quoted in Pittsburgh at $18 to $19, ovens. Railway troubles and the desire of furnace interests to be covered causes the high price.

Some of the independents have withdrawn from the bar iron market as they are too heavily booked for fourth and first quarters.

Railroads are coming into U. S. steel market for big tonnage, but find it hard to place orders for definite delivery or to get shipment of material already bought.

There is an increasing export demand for steel plate. Some independents are asking 3.75 for export, being for 3-16 in.

On account of the outlaw miners' strike in Illinois, mills are underpowered at the Gary plant of the American Sheet and Tin Plate Co., and complete suspension is predicted.

Scrap dealers in the States are able to reload about one car in five of those received. They are having trouble in keeping their contracts covered.

Coal operators of Alabama are making a strenuous fight for the open shop. For several weeks strikes have been in progress at a number of domestic coal mines, and production has been seriously affected. The operators have started a systematic campaign for the open shop, and public sympathy is sought.

Good sized premiums are being paid for prompt delivery of sheets in the New York market. Blue annealed are bringing 6 to 7.50c in Pittsburgh.

READY TO START WORK AFTER FIRE

St. Thomas Plant Badly Scorched, But Preparations Made to Get to Work

St. Thomas was visited by one of the worst fires in recent history, early Thursday morning of last week, when the large two-storey brick structure used as a pattern storage department, pattern room and store room by the Canada Iron Foundries, Limited, was completely destroyed, as well as a large portion of the roof of the casting foundry and the material sheds and shipping room of the Dominion Brake Shoe Company. The total damage was roughly estimated by Stanley Gilbert, manager of the Canada Iron Foundry plant, at $100,000, partly covered by insurance. It is probable that this figure may be exceeded when a complete inventory of the contents of the buildings is available. Thousands of dollars worth of valuable patterns and material was destroyed.

Although the loss of virtually all their patterns, save those that were being used in the casting room, will seriously inconvenience the plant, Manager Gilbert stated that it was his policy to carry on the foundry as usual. In fact, even while the buildings were still burning, Mr. Gilbert had the Hydro-Electric workmen on the job repairing the power wires in order to enable the casting department to operate. The majority of the men in that department reported for duty at seven o'clock, and were soon engaged at their regular duties.

Sizes Up the Real Canadian Market

British Trade Commissioner in Ontario Points Out Chances for Trade Here—Japan Merchants Bidding for a Share of the Trade—Advises that More Advertising Should Be Done.

THE following are extracts from the reports on the trade of Canada and of Ontario by F. W. Field, British Trade Commissioner in Ontario, just issued as a British Government Blue Book:

Prominent Part For Canada

A review of the year which has elapsed since the signing of the armistice, suggests that economic, industrial and commercial conditions are sound, and that given more stable political and social conditions throughout the world than those obtaining at the beginning of 1920, the Dominion should achieve a degree of development far surpassing that achieved hitherto. Canada has gained a larger sense of nationhood through the war, and this feeling will become more pronounced as the time passes and conceivably find expression in the economic sphere. Her achievements in finances, in production of every kind, as well as those of her expeditionary forces, have engendered feelings of the kind mentioned. In common with her allies, she is confronted with grave problems, but is dealing with them with characteristic energy and hopefulness. With her vast resources she has reason to hope that in the difficult times ahead, she will create sufficient wealth to liquidate her heavy burden of debt and to play a more prominent part in world economy.

Market For British Manufactures

As a market for British manufactures Ontario presents an attractive field, more especially in the lines in which United Kingdom manufacturers have excelled for so long. The development of Canadian manufacturing, of which such a large proportion is carried on in Ontario, leads one to the conclusion that the greater part of British trade in this market will in future years be confined to the principal groups of manufactures which constituted the business here of United Kingdom firms before the war.

Japanese Activities

The activities of the Japanese continued during the past year and every effort is being made to obtain business in the Canadian market. A large range of samples of goods sold here have been obtained by the representatives of Japanese manufacturers and agreements made to duplicate them at a much lower price than quoted by their competitors.

A number of factors are operating against the acquisition by Japan of a large volume of trade in this area, including such matters as terms and methods of doing business, deliveries, quality, etc., but it would be a mistake on the part of United Kingdom manufacturers to ignore the growing strength of this competition. There are those who believe that this was done in some instances in past years when Germany commenced to gather information and samples in various markets, and to obtain a foothold in trades in which severe competition had not generally been anticipated.

Agencies in United States

It is still a matter for the consideration of certain United Kingdom firms as to whether their agency arrangements for Ontario, and Canada generally, should be treated as part of their United States agency arrangements. At least one British firm with branch works in the United States has now established a branch in Ontario. The tendency of United States firms with trade connections in Canada is to establish separate units in Canada, either branch works, offices, or agents, to deal with their Canadian trade.

Machinery Sales and Service

There appears to be an opportunity for increased sales of machinery of various kinds in this market, including air compressors, hoisting machinery, mining equipment, textile machinery, and various other lines in which United Kingdom firms have proved specialists. Three of the factors operating against greater business are the lack of sufficient local representation and active salesmanship, the failure of United Kingdom manufacturers to keep in constant touch with those who have purchased their machines, and the inability to effect repairs and supply spare parts at short notice. While the business in any one line may not be large enough to justify the establishment of a proper local organization, which should remove the difficulties noted, it might prove feasible for several manufacturers of non-competing machinery to have joint representation here, with a technical man to look after repairs; a good sales organization, which would adopt the American "follow up" system, as it is termed; and a stock of the spare parts which are most likely to be needed. Unless some such system is adopted, it is to be feared that the imports of United Kingdom machinery to this market will become continually smaller.

Advertising

There is room for much more advertising by the majority of United Kingdom firms doing business here. The local agent among others should be consulted as to the best methods of expending the advertising appropriation.

From War to Peace

The transition of industrial works from a war to a peace basis is being effected gradually and with varying results. Foundries and machine shops in some instances appear to have had difficulty in securing sufficient business to occupy their capacity since the armistice. Many works were enlarged to cope with the demand for munitions, and the increased capacity has not always been utilized, partly on account of labor troubles, dull market conditions in certain lines, and the sale of second-hand machinery previously used in munition shops. Labor troubles, market conditions, and the organization necessary for the establishment of export trade have retarded the manufacturing progress of industrial firms. On the whole, however, few adverse effects were apparent during the year as a result of post-war conditions.

A note of the actual position of a few typical industries in Ontario, which devoted their energies to war work, will be of interest:—

(a) Firm of founders, crane makers and machinists:—Sufficient business has not been obtained to occupy full capacity. The firm is now in a position to handle the lines previously made and one or two new ones, including machine tools.

(b) Firm making drop forgings and drop forged tools. The capacity of the works was doubled during the war. The company is operating to full capacity and is making several new lines.

(c) Firm making marine and heavy forgings. The works were enlarged by about 500 per cent. during the war, the product being mostly forged steel shell cases. The shell plant has been scrapped and is standing idle. The production of marine forgings and locomotive parts is being continued, but owing to a decline in the demand for these lines, the works are operating under capacity.

(d) Firm making small machinery, etc. The entire works were devoted to war work. Its plans for the future, after the armistice, were laid aside on account of the unrest in the ranks of the metal workers, causing a disorganization which in November, 1919, was still apparent.

(e) Firm making locomotives. This firm continued its regular lines during the war, making also shell forgings and finished shells. The forging and machining plant was sold, the buildings remodelled as blacksmith and tank shops for the company's regular work.

(f) Firm making motor cars. During the war, the company's works were applied to the manufacture of aeroplane

A Complete Line 8 in. to 50 in. Swing
with or without tapping attachment

BARNES

Upright Drills
Horizontal Drills
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Accuracy—Strength
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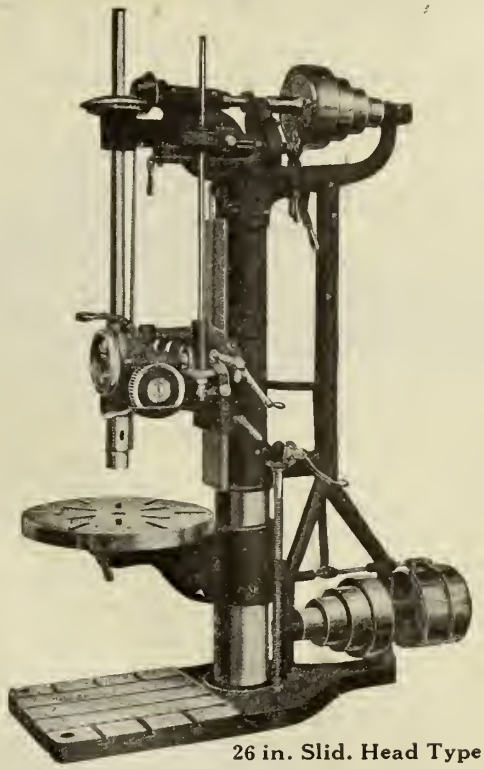
If it's machinery write "Williams"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There is unusual strength, accuracy, speed, convenience and range in

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Drilling Machines

You can use them to great advantage on any work in your shop that's suitable for a machine tool of this kind. The operating is easy and the labor cost comparatively low.

Drop a line for full particulars and specifications.
Stationary Head Sizes 20"—21"
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The Aurora Tool Works
AURORA, INDIANA, U.S.A.

Don't blame the Mechanic.

Use
P.H. or Imperial
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"They cut faster and wear longer."

Be File-wise.

Ingersoll File Company, Limited.
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INGERSOLL

If interested tear out this page and place with letters to be answered.

engines, 200 men being employed. The company is now making motor cars, its plans calling for the production of 15,000 cars during the twelve months ending October, 1920; 1,000 men are employed.

(g) Firm making shrapnel tubes during the war. The company is now making bushings for motor cars and is doing a domestic and export business to the United States.

(h) Firm making shells during the war. The company is now making motors for phonographs and lighting fixtures.

(i) Firm making shells during the war. The company is now engaged in the manufacture of agricultural tractors and is seeking export as well as domestic business.

(j) Firm making machinery and shells during the war. The company's works were purchased by a United States firm for the manufacture of tungsten products.

(k) Machine and stamping company. After the completion of munition contracts, this concern commenced the manufacture of several lines, one department being devoted exclusively to the making of gears and transmission cases for motor cars. In the near future, bevelled gears and differential cases for a similar purpose will be made. A heat treating plant to harden and heat gears has been established. The company is also making phonograph motors and gramophone cabinet hardware, such as hinges, lid supports, needle cups, etc. Other departments are making spark plugs for motor cars, and bicycle chains. In addition, the company is doing a commercial business in small stampings and automatic screw machine products. All these lines have been taken up and developed since the armistice.

Production Costs

The production costs in Canadian factories are generally reputed to be higher than those in the United States, although there are notable exceptions. In an Ontario factory making certain small brass goods, the cost is estimated at from 30 to 40 per cent. more than in the parent works in the United States.

The progress of manufacturing in Canada has been exemplified by the number of lines now made here which were previously imported, and the number of lines already made here, but the manufacture of which has been commenced by additional firms.

Among the new lines added by Ontario manufacturing firms in 1919 were the following: Standard structural shapes up to and including 15-in. beams and channels; car axles, glove silk fabric, rough woollen cloths, worsted yarn spun by French process, pumps, high speed planer (in experimental stage), mine forgings and drop forged tools, such as wrenches, screw drivers, etc., axes, hammers, carpenters' tools, school seats, lawn mowers, bushings for motor cars, pulp and paper machinery, water-proof paper, spark plugs, bicycle chains, gramophone and piano hardware, safety razor parts, motor car axles, motor car transmission gears, differentials and radiators, heavy chains, knitted silk cloth for glove manufacturers, chamoisette cloth, collapsible tubes, steel wire rope, soda ash, forging bars, oxygen for industrial purposes, and heavy steel castings made by electric furnaces.

Several new lines of knitted fabrics, such as jersey cloth and fabric, were produced during the year by an Ontario woollen mill. They are particularly adapted for ladies' dresses, suits and skirts in the jersey cloth and for men's light overcoats and golf suits in the fabric.

An Ontario company, which had confined its production to Kraft pulp and Kraft building paper, commenced the manufacture of Kraft wrapping paper early in 1919.

United States Branch Factories

The past year was notable for the number of United States companies making inquiries in this area with regard to the proposed establishment of branch works.

The Industrial Commission of an Ontario city, in close proximity to the United States, was in correspondence as to this matter in November, 1919, with over a hundred United States firms. In many cases a decision was made to erect such works, and construction was commenced.

The character of these enterprises varies from small assembling plants to large factories employing several thousand hands. This action has been taken for the following reasons among others:

(a) To handle the Canadian market at close range.

(b) To grow, as a Canadian industry, with the expanding market and increasing purchasing power.

(c) To enjoy, as a Canadian industry, the benefits of any special trade arrangements made for the units of the British Empire.

(d) To handle the export orders, received by the parent company in the United States, for shipment to the United Kingdom and other points in the Empire.

In addition, several United States concerns with small works in Ontario, have been seeking sites for the establishment of larger factories.

United Kingdom Factories in Ontario

The inquiries of United Kingdom manufacturers as to the establishment of branch works in Ontario were more numerous in 1919 than ever before. Works were established for the production of elastic hosiery and abdominal belts, felts for paper-making machines, and silk labels.

Alterations and additions were commenced on large branch works of a Welsh tinplate mill, which acquired one of the national manufacturing works at Toronto of the Imperial Munitions Board.

Representatives of many United Kingdom manufacturers visited Ontario to investigate conditions for local factories. While several branch works of United Kingdom firms may be erected in 1920, the number of such plants will probably never equal that of United States firms with branches here.

Assistance to Ontario Firms

The British Trade Commissioner at Toronto has been of assistance to Canadian importers and manufacturers in various ways. Lists of United Kingdom manufacturers, importers and exporters have been furnished locally, introductions to the Department in London handed to business men proceeding overseas, inquiries of Ontario concerns for quotations of United Kingdom firms forwarded and information as to the establishlishment of Canadian branch works in the United Kingdom. Ontario firms have made use of the office as a general source of information as to British trade matters. A number of letters received from His Majesty's Consular officers in various parts of the world have been transmitted to local firms making inquiries abroad. Acknowledging the receipt of such a letter, a Toronto firm wrote:—"The information supplied is of considerable assistance to us and it will avoid us incurring expenses in that territory which would eventually prove unprofitable."

On account of war conditions, more direct trading has developed during the past few years. Large Canadian imports of tea, for example, have come to Vancouver from the tea plantations rather than through London. Canadian buyers have established direct relations with hide and skin suppliers in Australia, the market previously being centered in London. While the United Kingdom, for many reasons, will continue to be an important centre for re-export trade, the changes which have occurred in the position during the war will undoubtedly leave their mark.

Acknowledgments

It is gratifying to be able to record the continued assistance and support which have been given throughout Ontario to the work of the British Trade Commissioner's office at Toronto. It is not possible to mention, in the space available here, the names of all those who have helped, but among others this expression of thanks applies to the Dominion and Ontario Government authorities, other public bodies, Canadian manufacturers and their associations and officials, the Boards of Trade and their secretaries, industrial commissioners, bankers, the railway companies, many local trade organizations, including the Toronto branch of the Canadian Association of British Manufacturers and their representatives, the daily press and the trade journals. Their assistance has been greatly appreciated by this office and has given a much more substantial value to the work than otherwise would have been the case.

GEOMETRIC

Adjustable Collapsing Taps

Have overcome all the expense and annoyance of tapping screw threads with a solid tap.

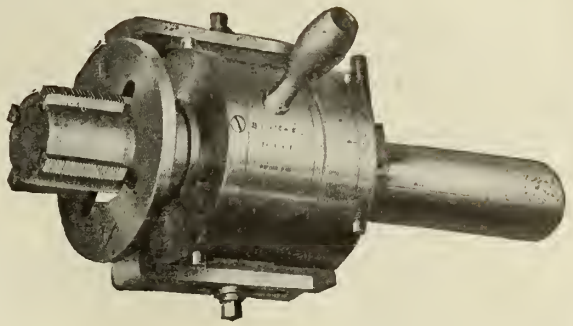
Anyone doing thread tapping knows what backing out a solid tap each time means. It usually means low production, poor threads, and worn out taps. The mechanism of the Geometric Taps takes care of adjustment to correct diameter each time a thread is tapped, it collapses the chasers automatically, leaving a thread clean cut and perfect.

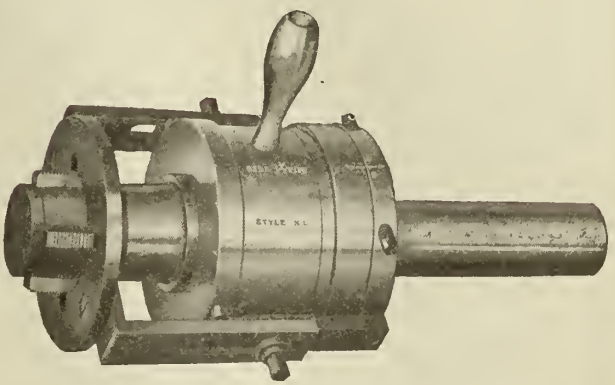
The chasers are readily reground, and when finally used up, are renewed at comparatively small cost, leaving the tap as efficient as when new.

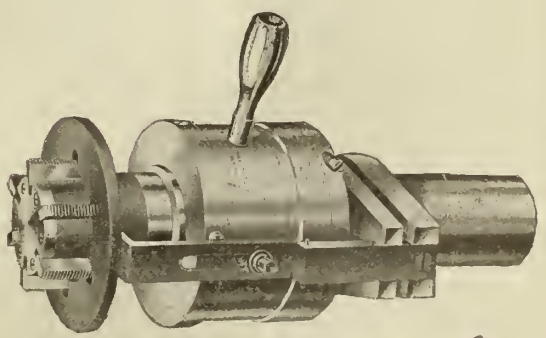
The manufacturers of the Geometric line of Collapsing Taps and Self-opening Die Heads are justly proud of the distinction which is theirs:—

The Originators
and the
Largest and Best Known Manufacturers
of
Automatic Threading Tools

For cutting all classes of screw threads, internal and external, of any diameter and form.







The Geometric Tool Company

New Haven Conn., U.S.A.

CANADIAN AGENTS:

Williams & Wilson, Ltd., Montreal; The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg and St. John, N.B.; Canadian Fairbanks-Morse Co., Ltd., Manitoba, Saskatchewan, Alberta.

If interested, tear out this page and keep with letters to be answered.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$42 40
Lake Superior, charcoal, Chicago	57 00
Standard low phos., Philadelphia	50 00
Bessemer, Pittsburgh	43 00
Basic, Valley furnace	42 90
Toronto price:—	
Silicon, 2.25% to 2.75%	52 00
No. 2 Foundry, 1.75 to 2.25%	50 00

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	$ 5 50
Steel bars, base, Toronto	5 50
Iron bars, base, Montreal	5 50
Steel bars, base, Montreal	5 50
Reinforcing bars, base	5 00
Steel hoops	7 00
Norway iron	11 00
Tire steel	5 75
Spring steel	10 00
Band steel, No. 10 gauge and 3-16 in. base	6 00
Chequered floor plate, 3-16 in.	8 40
Chequered floor plate, ¼ in.	8 00
Bessemer rails, heavy, at mill	....
Steel bars, Pittsburgh	3 00-4 00
Tank plates, Pittsburgh	4 00
Structural shapes, Pittsburgh	3 00
Steel hoops, Pittsburgh	3 50-3 75
F.O.B., Toronto Warehouse	
Small shapes	4 25
F.O.B. Chicago Warehouse	
Steel bars	3 62
Structural shapes	3 72
Plates	3 67 to 5 50
Small shapes under 3"	3 62
	C.L. L.C.L.

FREIGHT RATES

Per 100 Pounds.

Pittsburgh to Following Points		
Montreal	33	45
St. John, N.B.	41½	55
Halifax	49	64½
Toronto	27	39
Guelph	27	39
London	27	39
Windsor	27	39
Winnipeg	89½	135

METALS

	Gross. Montreal	Toronto
Lake copper	$25 00	$24 00
Electro copper	24 50	24 00
Castings, copper	24 00	24 00
Tin	62 00	65 00
Spelter	11 50	12 00
Lead	10 75	11 00
Antimony	13 00	14 00
Aluminum	34 00	36 00

Prices per 100 lbs.

PLATES

Plates, 3-16 in.	$ 7 25	$ 7 25
Plates, ¼ up	6 50	6 50

PIPE—WROUGHT

Price List No. 44—April, 1920.

STANDARD BUTTWELD S/C

	Steel Black	Steel Galv.	Gen. Wrot. Iron Black	Gen. Wrot. Iron Galv.
⅛ in.	$6 50	$ 8 50	....	....
¼ in.	5 13	7 26	$ 5 43	$ 7 56
⅜ in.	5 13	7 26	5 43	7 56
½ in.	6 84	8 42	7 27	8 84
¾ in.	8 45	10 58	9 03	11 16
1 in.	12 50	15 64	13 35	16 49
1¼ in.	16 91	21 16	18 06	22 31
1½ in.	20 21	25 30	21 59	26 68
2 in.	27 20	34 04	29 05	35 89
2½ in.	43 00	53 82	....	....
3 in.	56 23	70 38	....	....
3½ in.	71 30	88 32	....	....
4 in.	84 48	104 64	....	....

STANDARD LAPWELD S/C

	Steel Black	Steel Galv.	Gen. Wrot. Iron Black	Gen. Wrot. Iron Galv.
2 in.	$30 90	$37 74	$34 60	$41 44
2½ in.	45 34	56 16	51 19	62 01
3 in.	59 29	73 44	66 94	81 09
3½ in.	73 14	90 16	82 34	99 36
4 in.	86 66	106 82	97 56	117 72
4½ in.	0 98	1 23	1 24	1 49
5 in.	1 15	1 44	1 44	1 73
6½ in.	1 49	1 86	1 87	2 25
7 in.	1 94	2 43	2 42	2 90
8-L in.	2 04	2 55	2 54	3 05
8 in.	2 35	2 94	2 92	3 51
9 in.	2 81	3 52	3 50	4 21
10-L in.	2 61	3 26	3 25	3 90
10 in.	3 36	4 20	4 18	5 03

Prices—Ontario, Quebec and Maritime Provinces

WROUGHT NIPPLES

4" and under, 60%.

4½" and larger, 50%.

4" and under, running thread, 30%.

Standard couplings, 4-in. and under, 30%.

Do., 4½-in. and larger, 10%.

OLD MATERIAL

Dealers' Average Buying Prices.

	Per 100 Pounds. Montreal	Toronto
Copper, light	$15 00	$14 00
Copper, crucible	18 00	18 00
Copper, heavy	18 00	18 00
Copper wire	18 00	18 00
No. 1 machine composition	16 00	17 00
New brass cuttings	11 00	11 75
Red brass cuttings	14 00	15 75
Yellow brass turnings	8 50	9 50
Light brass	7 00	7 00
Medium brass	8 00	7 75
Scrap zinc	6 50	6 00
Heavy lead	7 50	7 75
Tea lead	4 50	5 00
Aluminum	19 00	20 00
	Per Ton	Gross
Heavy melting steel	18 00	18 00
Boiler plate	15 50	15 00
Axles (wrought iron)	20 00	20 00
Rails (scrap)	18 00	18 00
Malleable scrap	23 00	25 00
No. 1 machine east iron	32 00	33 00
Pipe, wrought	12 00	12 00
Car wheel	26 00	26 00
Steel axles	22 00	20 00
Mach. shop turnings	11 00	11 00
Stove plate	26 50	25 00
Cast boring	12 00	12 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, 7-16 and up	+10
Carriage bolts, ⅜-in. and less	Net
Coach and lag screws	—15
Stove bolts	55
Wrought washers	—25
Elevator bolts	+10
Machine bolts, 7-16 and over	+10
Machine bolts, ⅜-in. and less	+10
Blank bolts	Net
Bolt ends	Net
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	+25
Machine screws, fl. and rd. hd., brass	net
Machine screws, o. and fil. hd., brass	net
Nuts, square, blank	+25 add $2 00
Nuts, square, tapped	add 2 25
Nuts, hex., blank	add 2 50
Nuts, hex., tapped	add 3 00
Copper rivets and burrs, list less	15
Burrs only, list plus	25
Iron rivets and burrs	40 and 5
Boiler rivets, base ¾" and larger	$8 50
Structural rivets, as above	8 40
Wood screws, O. & R., bright	75
Wood screws, flat, bright	77½
Wood screws, flat, brass	55
Wood screws, O. & R., brass	55½
Wood screws, flat, bronze	50
Wood screws, O. & R., bronze	47½

MILLED PRODUCTS

(Prices on unbroken packages)

	Per Cent
Set screws —20% 25 and	5
Sq. and hex. hd. cap screws	12½
Rd. and fil. hd. cap screws	plus 25
Flat but. hd. cap screws	plus 50
Fin. and semi-fin. nuts up to 1-in.	12½
Fin. and Semi-fin. nuts, over 1 in., up to 1½-in.	—5
Fin. and Semi-fin. nuts over 1½ in., up to 2-in.	+12½
Studs	+5
Taper pins	—12½
Coupling bolts	+40
Planer head bolts, without fillet, list	+45
Planer head bolts, with fillet, list plus 10 and	+55
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	+60
Collar screws	list plus 20, 30
Thumb screws	40
Thumb nuts	75
Patch bolts	add +85
Cold pressed nuts to 1½ in.	add $1 00
Cold pressed nuts over 1½ in.	add 2 00

BILLETS

	Per gross ton
Bessemer billets	$60 00
Open-hearth billets	60 00
O.H. sheet bars	76 00
Forging billets	56 00-75 00
Wire rods	52 00-70 00

Government prices.

F.O.B. Pittsburgh.

NAILS AND SPIKES

Wire nails, base	$6 10
Cut nails, base	7 00
Miscellaneous wire nails	50%

ROPE AND PACKINGS

Plumbers' oakum, per lb.	0 10¼
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 35½
British Manila rope	0 28
New Zealand hemp	0 28

POLISHED DRILL ROD

Discount off list, Montreal and Toronto ..... net

ATKINS

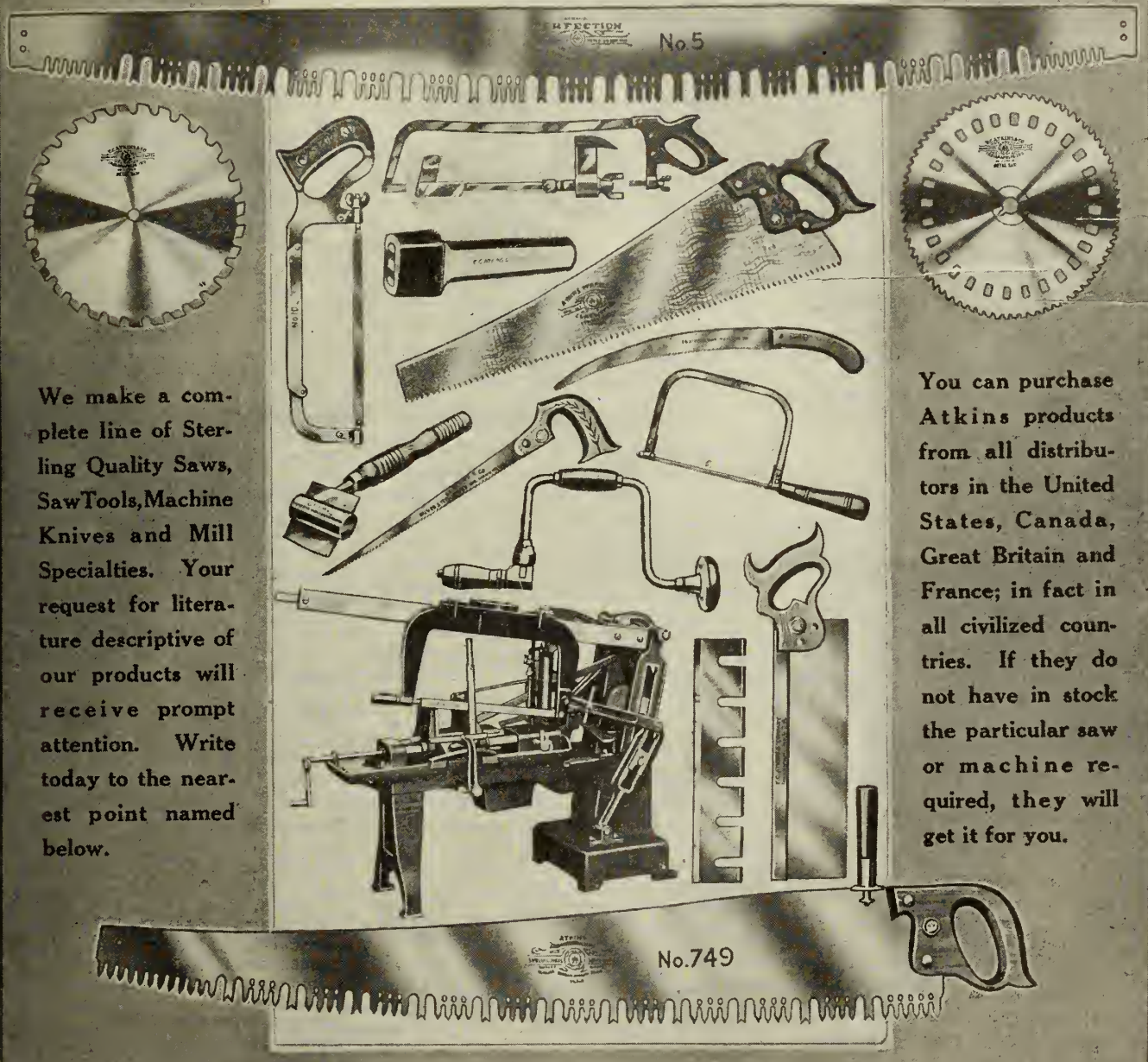
STERLING QUALITY

SAWS and TOOLS

A Perfect Saw for every Purpose

"Finest on Earth"

"Finest on Earth"



We make a complete line of Sterling Quality Saws, SawTools, Machine Knives and Mill Specialties. Your request for literature descriptive of our products will receive prompt attention. Write today to the nearest point named below.

You can purchase Atkins products from all distributors in the United States, Canada, Great Britain and France; in fact in all civilized countries. If they do not have in stock the particular saw or machine required, they will get it for you.

If you have difficulty in obtaining Atkins Saws and other products through your regular service, write

E. C. Atkins & Company

Established 1857

Canadian Factory: HAMILTON, ONTARIO *Branch:* VANCOUVER, B. C.

MISCELLANEOUS

Solder, strictly	$ 0 35
Solder, guaranteed	0 39
Soldering coppers, lb.	0 62½
White lead, pure, cwt.	20 35
Red dry lead, 100-lb. kegs, per cwt.	16 00
Gasoline, per gal., bulk	0 38
Pure turp., single bbls., gal.	3 15
Linseed oil, raw, single bbls.	2 37
Linseed oil, boiled, single bbls.	2 40
Wood alcohol, per gal.	4 00
Whiting, plain, per 100 lbs.	3 00

CARBON DRILLS AND REAMERS

S.S. drills, wire sizes	32½
Can. carbon cutters, plus	20
Standard drills, all sizes	32½
3-fluted drills, plus	10
Jobbers' and letter sizes	32½
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	50
Sleeves	50
Taper pin reamers	25 off
Drills and countersinks	net
Bridge reamers	50
Centre reamers	10
Chucking reamers	net
Hand reamers	10
High speed drills, list plus	10 to 30
Can. high speed cutters, net to plus	10
American	plus 40

COLD ROLLED STEEL

[At warehouse]

Rounds and squares	$7 base
Hexagons and flats	$7.75 base

IRON PIPE FITTINGS

	Black	Galv.
Class A	60	75
Class B	27	37
Class C	18	27

Cast iron fittings, 5%; malleable bushings, 22½%; cast bushings, 22½%; unions, 37½%; plugs, 20% off list.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$8 50	$10 50
Sheets, Blue ann., No. 10	8 50	9 50
Canada plates, dull, 52 sheets	8 50	10 00
Can. plates, all bright	8 60	9 00
Apollo brand, 10¾ oz. galvanized	....	....
Queen's Head, 28 B.W.G.	11 00	....
Fleur-de-Lis, 28 B.W.G.	10 50	....
Gorbal's Best, No. 28	....	....
Colborne Crown, No. 28.	....	....
Premier, No. 28, U.S.	11 50	11 60
Premier, 10¾-oz.	11 50	12 00
Zinc sheets	16 50	20 00

PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13.00; 5-16, $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅞ in., $9.20; ¾ in., $9.30; ⅝ in., $9.50; 1 in., $9.10; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $13.00; 5-16 in., $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.50; ¾ in., $9.30.

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

BOILER TUBES.

Size.	Seamless	Lapwelded
1 in.	$27 00	$.....
1¼ in.	29 50	.....
1½ in.	31 50	29 50
1¾ in.	31 50	30 00
2 in.	35 00	30 00
2¼ in.	35 00	29 00
2½ in.	42 00	37 00
3 in.	50 00	48 00
3¼ in.	.. ..	48 50
3½ in.	63 00	51 50
4 in.	85 00	65 50

Prices per 100 ft., Montreal and Toronto

OILS AND COMPOUNDS.

Castor oil, per lb.	
Royalite, per gal., bulk	27½
Palacine	30½
Machine oil, per gal.	54½
Black oil, per gal.	28
Cylinder oil, Capital	82½
Petroleum fuel oil, bbls., net	18

BELTING—No 1 OAK TANNED

Extra heavy, single and double	6½
Standard	6½
Cut leather lacing, No. 1	2 00
Leather in side	2 40 3 00

TAPES

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	$4 60
Polishing wheels, bull-neck	2 00
Emery in kegs, Turkish	09
Pumice, ground	06
Emery glue	30
Tripoli composition	09
Crocus composition	12
Emery composition	11
Rouge, silver	60
Rouge, powder, nickel	45

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	.08½
Grits, 80 and finer	.6

BRASS—Warehouse Price

Brass rods, base ½ in. to 1 in. rod	0 34
Brass sheets, 24 gauge and heavier, base	$0 42
Brass tubing, seamless	0 46
Copper tubing, seamless	0 48

WASTE

XXX Extra	.24	Atlas	.20
Peerless	.22½	X Empire	.19½
Grand	.22½	Ideal	.19
Superior	.22½	X Press	.17½
X L C R	.21		

Colored

Lion	.17	Popular	.13
Standard	.15	Keen	.11
No. 1	.15		

Wool Packing

Arrow	.35	Anvil	.22
Axle	.28	Anchor	.17

Washed Wipers

Select White	.20
Dark colored	.09
Mixed colored	.10

This list subject to trade discount for quantity.

RUBBER BELTING

Standard ... 10% Best grades... 15%

ANODES

Nickel	.55 to .60
Copper	.38 to .40
Tin	.70 to .70
Zinc	.16 to .17

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	$42 50	$43 00
Copper wire, list plus 10		
Plain sheets, 14 oz., 14x60 in.	46 00	44 00
Copper sheet, tinned, 14x60, 14 oz.	48 00	48 00
Copper sheet, planished, 16 oz. base	46 00	45 00
Braziers', in sheets, 6 x 4 base	45 00	44 00

LEAD SHEETS

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$10 75	$14 50
Sheets, 3½ lbs. sq. ft.	10 50	14 00
Sheets, 4 to 6 lbs. sq. ft.	10 25	13 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS

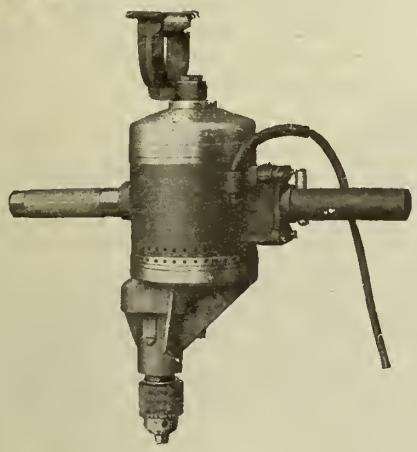
Acid, boracic	$ .23
Acid, hydrochloric	.04
Acid, nitric	.11
Acid, sulphuric	.04
Ammonia, aqua	.15
Ammonium, carbonate	.23
Ammonium, chloride	.22
Ammonium hydrosulphuret	.75
Ammonium sulphate	.30
Arsenic, white	.14
Copper, carbonate, annhy.	.41
Copper, sulphate	.15
Cobalt, sulphate	.20
Iron perchloride	.62
Lead acetate	.30
Nickel ammonium sulphate	.20
Nickel carbonate	.32
Nickel sulphate	.22
Potassium sulphide (substitute)	.42
Silver chloride (per oz.)	1.30
Silver nitrate (per oz.)	1.25
Sodium bisulphate	.14
Sodium carbonate crystals	.06
Sodium cyanide, 127-130%	.38
Sodium hyposulphite per 100 lbs	8.00
Sodium phosphate	.15
Tin chloride	.80
Zinc chloride, C.P.	.30
Zinc sulphate	.10

Prices per lb. unless otherwise stated

Aikenhead's

Time-Saving Equipment

The Headquarters in Toronto for Van Dorn ELECTRIC TOOLS



You can save days—and dollars wherever holes are being drilled by employing Van Dorn portable electric drills. Inside or outside, fair weather or stormy weather, wood, or armour plate makes no difference to the Van Dorn, it will stay on the job as long as your most earnest workers, cutting fast and cutting clean.

The Van Dorn operates on either Direct or Alternating Current and will drill 50% more holes at one-third the cost for power, than the best pneumatic drill of similar rated capacity. Not a claim without foundation, but a fact that we would like to prove again by demonstration in your plant.

Sent on ten days trial. Booklet and prices on request.

Capacity in Solid Steel

DAOOO	3/16 in.	DA1	½ in.
DAOO	¼ in.	DA1X	5/8 in.
DAOOX	5/16 in.	DA2	7/8 in.
DAO	3/8 in.	DA2X	1 in.

Wahlstrom Tapping Attachment

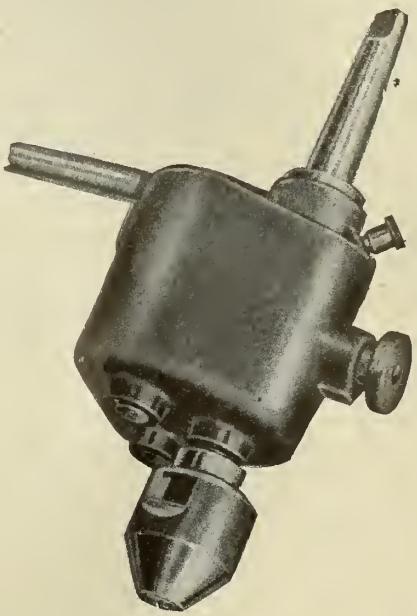
Does Your Tapping Ten Times Faster

Why stick to the old slow and expensive practice of Hand tapping when you can do the same work in one-tenth the time with a Wahlstrom Automatic Tapping Attachment? It imitates the simple to-and-fro motion of hand tapping and will tap holes as squarely as they could be drilled.

The Wahlstrom is constructed of hardened and ground parts and has nothing whatever that can get out of order. Attached to any type of drill press this Wahlstrom device will pay its cost in short order.

The Wahlstrom is made in two sizes: No. 1 takes taps of all sizes from 5-40 to ½ inch standard. No. 2 takes taps from ¼ inch to ¾ inch.

You can get the Wahlstrom at Aikenhead's. Send for our free trial offer.



A Positive Cure for Tap Breakage

Canada's Leading Tool House

Aikenhead's

17, 19, 21 Temperance Street
TORONTO, CAN.

Quality Tools for All Purposes

If interested, tear out this page and keep with letters to be answered.

HAVE SECURED NEW RULING ON SALES TAX ON RETURNABLE PACKAGES

The Canadian Manufacturers' Association Has Sent Out the Following Notice:—

The sales tax regulations applying to returnable packages, in its original form, created unnecessary labor and expense to manufacturers who ship goods to their customers in returnable packages. Under the regulation, manufacturers were compelled to collect and make monthly returns of a sales tax on the total invoice price including charge for the container, with the understanding that when such containers were returned, credit for the amount of the sales tax paid thereon might be taken.

The Association arranged for a deputation of manufacturers to visit Ottawa to lay before the Government the unnecessary labor and expense caused by this troublesome system of dealing with the tax.

After hearing and admitting the justice of the Association's case, the following ruling was approved and issued by the Department of Customs and Inland Revenue, viz:

Re Federal Sales Tax on Returnable Packages

"That manufacturers dealing in goods shipped in returnable packages may make to the Government, not later than the end of March in each year, an annual sales tax return as to such packages, instead of monthly returns; and the sales tax so payable to the Government by the manufacturer shall be paid on the difference between the amount charged for the returnable containers shipped during the year and the equivalent amount rebated for containers returned during the same period; and it shall be optional with the manufacturer to charge the sales tax on the value of returnable containers in invoices to the purchaser subject to credit when returned, or to pay such sales tax himself."

Yours faithfully,
(Sgd.) J. R. K. Bristol,
Manager Tariff Department.

A NEW FILLING METAL

There are frequent calls for a filling material to repair cracks and small holes in very light castings, which cannot well be welded. Various methods have been used for this purpose, but the latest is in the nature of a metal having a very low fusion point, and a comparatively high tensile strength. The new metal is known by the name "Metaloid." The composition of the metal is a trade secret, but in appearance it is about the color of solder, but is remarkably light in weight, being of less specific gravity than aluminum. In making a repair, the casting is heated to a temperature of 200 degrees Fahrenheit, and the bar of "Metaloid" is rubbed over the part to be repaired. It adheres closely to the casting, and makes a strong and satisfactory repair. The "Metaloid" requires no heating, and it also provides a guide to the correct temperature of the casting. If the latter is too hot, the "Metaloid" will give off a blue flame when applied to it. If too cold, the "Metaloid" will not run at all, while at the correct temperature it flows quite readily with no sign of burning. Holes in castings have been filled, and the casting afterwards subjected to 300 lbs. per square inch water pressure, the Metaloid showing no signs of leakage. The new metal has been largly used in the repairing of crank cases and radiators of automobiles, and should be of great use in the general engineering field. At the present time it is being tested out by the engineering department of a large Canadian sulphite mill with a view to determine its acid resisting qualities.

"Metaloid" is handled in Canada by Messrs. Kennedy & Kennedy, Tyrell Building, King Street E., Toronto.

HE HAS TRIED OUT THE WESTERN COAL

Orillia Man Has Some Shipped Down and Seems Satisfied With the Results Secured

Orillia.—W. W. McBain has this week received by express a small shipment of coal from his brother's mine near Edmonton. It is firm and bright, burns without making much smoke, does not dirty the pots, and leaves very little ash. It is announced that negotiations are now on foot with the railways to carry this coal at a rate that will enable it to be placed on the Ontario market at a reasonable price. The coal sells for $5 a ton at the mine, and with a $7 freight rate, could be retailed in Ontario for about $15 a ton. As many of the mines in Alberta are working only to about 25 per cent. of their capacity during the summer months, it would appear that they should be able to give material assistance in relieving the situation and preventing a coal famine. There is a mistaken idea that this coal, which is classified as semi-bituminous, will deteriorate if stored for any length of time. It can be kept for any length of time if placed under cover, in cellars or sheds. People will watch with much interest developments in the direction of getting a supply of coal for Ontario from the Western Provinces.

MOTOR-DRIVEN HAMMER

C. C. Bradley, Inc., of Syracuse, N.Y., are now making a motor-driven helve hammer, which is controlled in the usual manner by means of a foot treadle. The blow is regulated by the pressure of the loose running belt against the idler pulley.

PAPER DEARNESS

Effect on the Press

In view of the suggested further advance in wages and the very serious situation which must arise in that event, the British Weekly Newspaper and Periodical Proprietors' Association has issued a memorandum regarding the high cost of production in which it is pointed out that since 1914 proprietors have had to meet a continued succession of increases in cost of production and distribution; increases which, since the armistice, have been intensified. The conditions under which they are at present laboring include:

1.—High price of paper, blocks, contributions, and illustrations.

2.—Higher salaries and wages.

3.—Altered conditions as to working hours, overtime, holidays, and so forth.

4.—Higher railway and other transport rates.

Before the war newsprint (paper for newspapers) cost 2c per lb., whereas it is now 12½c per lb. and over; and there have already been eleven separate advances in printing charges, which have thereby increased by 120 per cent. to 200 per cent.

For a 32-page weekly paper, with a circulation of 150,000, this means an increase in the cost of printing alone of between $25,000 and $30,000 per annum.

A publication using 20 tons of paper per week was spending in the purchase of paper before the war $880 per week—just under $50,000 per annum. The present cost of the supply for one week's issue for a paper of the same size at 12½c per lb. is $5,780, an advance of $4,850 per week, or $252,200 per annum.

Attempts have been made to cope with these increases by reducing the size of publications, raising the sale price, and by considerably increasing advertisement rates. These efforts have, however, been quite inadequate to meet the increased charges, and many of the publications are, in fact, now running at a substantial loss.

These conditions necessarily affect a very large number of smaller firms to a much greater extent than they do the big corporations, and it must be realized that in the aggregate these smaller firms employ far more labor than the larger concerns, so that when, as is inevitable if conditions do not improve, many of the smaller papers drop out as their reserves are exhausted, unemployment must ensue.

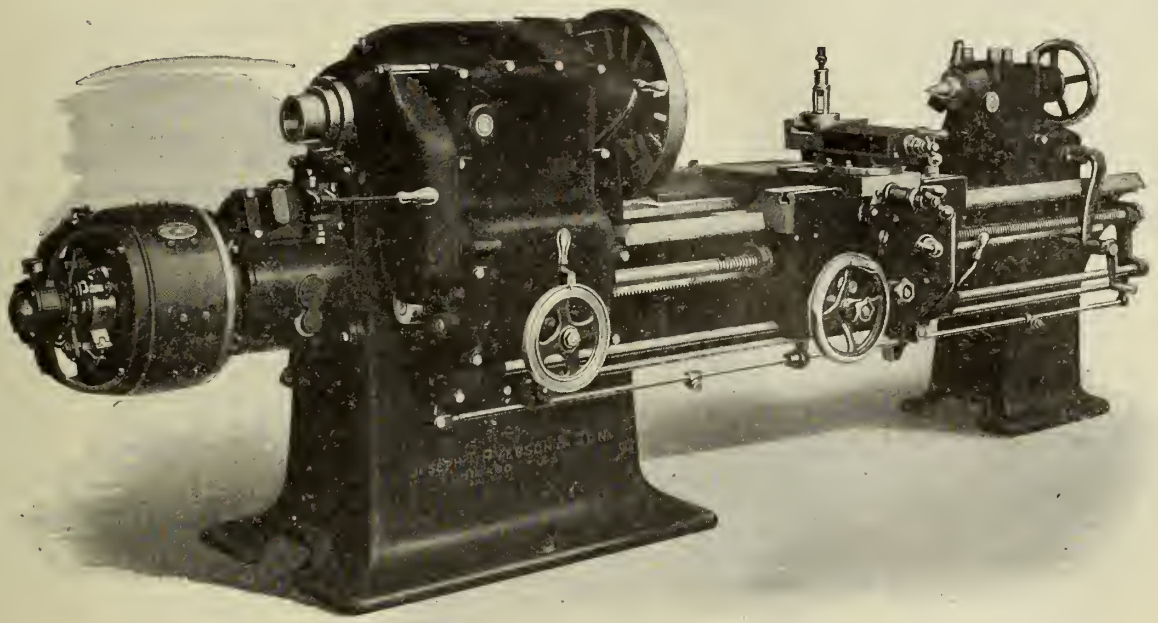
The Trans-Pacific tells of a most peculiar strike. It comments as follows:

About 4,000 employees of the great Tata mills in India went on strike, demanding a special bonus because of an announcement that Sir Doradji Tata, head of the concern, had been presented with a son. It appears that the announcement was incorrect, but the workers refused to believe it, and decided to continue the strike and hold out for the bonus, son or no son.

Ryerson-Conradson Lathes

In Stock for Immediate Shipment

U.S. AND FOREIGN PATENTS



22-Inch Selective Head Engine Lathe Arranged for Direct Motor Drive

These lathes represent the latest development in machine design for accuracy and production. In justice to your shop—get the facts—know something about the exclusive features in the design of the Ryerson-Conradson Lathes.

Headstock cast integral with bed.

Splash oiling system. (All gears running in bath of oil).

Extra large spindle and spindle bearings. (Note large hole through spindle in illustration).

Herringbone gear drive to spindle.

Exceptional speed range. (12 speeds, 28 feeds).

All gears permanently in mesh.

The new Bulletin No. 1301 describes completely the special features and advanced design of the Ryerson-Conradson Lathes. Write for it.

ESTABLISHED 1842 INCORPORATED 1888

JOSEPH T. RYERSON & SON

CHICAGO, ILL., U.S.A.

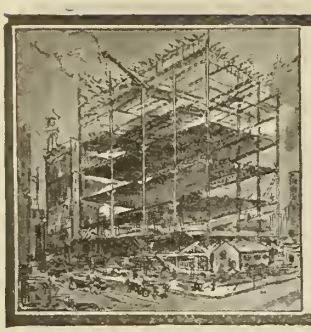
MACHINERY

Canadian Representatives:

GARLOCK-WALKER MACHINERY CO., 32-34 Front Street, TORONTO

MONTREAL WINNIPEG

If interested, tear out this page and ... letters to be answered.



INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS PERSONAL AND TRADE NOTES

TRADE GOSSIP

Want Equipment.—A western firm is in the market for spring making machinery. In the list of requirements the following equipment is mentioned—rolls, for rolling automobile springs, shears for cutting same, drill presses, etc. We shall be glad to supply the name and address to firms in a position to supply this equipment if they will communicate with the Editor.

May Close Shops.—The Gananoque manufacturers have replied to the recent letter from Gananoque Lodge, No. 4, of the Amalgamated Association of Iron, Steel and Tin Workers of North America, requesting that they meet the executive committee of the Union for the consideration of the question of an 8-hour day. In their reply they state that if the men persist in their demand the factories of the town will all have to close down.

Better in Hamilton.—Except for the steel mills in Hamilton the coal shortage is causing no great worry there. The majority of the plants are able to get along during the summer without coal, using power to run the plants, says a Hamilton report. And as for the steel plant, officials there state that at present there is no probability of closing through lack of coal. The other plants, using the little they do, report that they are quite prepared for a shortage, and, unless the shortage happens in the winter, will not be seriously affected by it.

Brantford Needs Power.—There is considerable worry on the part of Brantford officials owing to the inability to secure Hydro power. It is pointed out that several new industries have been landed for Brantford, and are nearly ready for production, but the Hydro Commission will accept no more new customers, and power cannot be got. Ald. F. C. Harp, chairman of the Fire and Light Committee, declared that a special meeting of the City Council would be called shortly, and a fight would be initiated to secure a supply of power even if other interests had to suffer for a time.

Making Extensions.—The L. & P. Mfg. Co., Niagara Falls, Ont. are extending their enterprise by the addition to their foundry of a machine shop completely equipped for the production of standard and special machinery. An outstanding feature of their production will be the Blystone line of concrete machinery and foundry equipment, on which they have secured Canadian rights. They are also placing on the market, and have ready for delivery a metal plower, 48 in. x 48 in. x 14. equipped for direct drive or direct motor connection. In addition to these they propose manufacturing a line of small tools for garage and machine shop use.

To Meet in St. Thomas.—St. Thomas delegates to the Pere Marquette system federation convention held at Grand Rapids, Mich., have returned to St. Thomas, bringing with them the news that the next convention will be held in St. Thomas, the second week in July of next year. The delegates to these conventions number about 40 and represent 2,000 men employed in the allied crafts, including the metal trades and the carmen on the entire P. M. system. Working conditions, safety plans and all movements for the betterment of the men and the advancement of the company's interests are discussed at these gatherings. The delegates from St. Thomas were: H. Dukes, blacksmiths; George McKenzie, electricians; John King, boiler makers; A. Whalls and A. MacDougall, machinists, and Charles Spitler, carmen.

That Collingwood Plant.—The Collingwod Steel plant has caused a lot of worry to Collingwood town council and to many of the citizens as well. It was lately reported that the plant was to be scrapped and on Monday last when it was found that a couple of freight cars had been put on the siding at the plant, it looked as if this were so. The town immediately stepped in and attached the plant for taxes, $64.000, is the amount alleged to be due the town. The seizure was made and thus the movement of the machinery and equipment was staved off for a few days at least. The mayor went to Toronto to consult with the owners, and the result of the interview is not yet known. The plant is a big one and until a few months ago it was owned by Wm. Kennedy and Sons, of Owen Sound. The plant was in commission during the war and turned out a very large amount of steel for the making of munitions.

COMPANIES MUST GIVE ALL THE INFORMATION ASKED BY THE BOARD

Peterboro.—Judge Gunn, who presided as chairman of the Conciliation Board to inquire into the differences between the C.G.E. and their striking employees, is serving in the same capacity on a board nominated by the Department of Labor to adjust differences between Ottawa employers and their carpenters.

It appears that several of the millowners have failed to appear and give evidence required by the Conciliation Board, and in this connection Judge Gunn has made an important ruling that they can be compelled to do so. And His Honor gives these mill owners in question till to-day to appear before the Board; otherwise, he declared, they and every member of their staffs are liable to be subpoenaed and forced to give the required information.

"We are a tribunal appointed by the Minister of Labor to investigate this dispute—and there seems to be a lot to investigate. We have the power to get the information," said Judge Gunn. He further stated: "All well-regulated bodies submit to such a board by sending representatives. If those interested do not do so in this case we will subpoena the whole staffs and members of the firms if they do not come at our invitation."

Full Investigation

"This investigation," continued His Honor, "is a public one, in the interests of the public, at the request of our city council, and we want full information. Four hundred and fifty workmen, who have been in the service of these companies for years, walking the streets, is not a refreshing state of affairs in a community of this size."

PERSONALS

Mr. Darrow, who has been connected with the Wilt Twist Drill Co., for some years, has been appointed assistant superintendent of the plant at Walkerville, in charge of production. Mr. Darrow, during the past few months has spent considerable time in Toronto territory and several other Canadian districts, making a study of plant problems, particularly as they had to do with drills, reamers, cutters, etc.

"Ill have no more guessing--Make Morrow Drills standard throughout the Plant --then we ***Know*** *we're right."*

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GUELPH ONTARIO

CRUCIBLE STEEL CO. LOCATE IN WELLAND

Atlas Crucible Steel Co. of Dunkirk, N.Y. Secure Interest In Canadian Business

Welland.—Mr. T. J. Dillon, president of the Dillon Crucible Alloys of this city, announced that the Atlas Crucible Steel Company of Dunkirk, N. Y., has acquired a substantial interest in the Welland business, which will now be known as the Canadian Atlas Crucible Steel Company.

The Canadian Atlas Crucible Steel Company, Limited, has an authorized capital of 10,000 shares of 8 per cent. cumulative preferred stock, par value $100, and 10,000 shares common stock, no par value.

Arthur H. Hunter, president of the American company, will become chairman of the Board of Directors, and T. J. Dillon will remain as an officer active in the management of the business.

The Atlas Crucible Steel Company, through Mr. Hunter, considered all the different commercial centres of the Dominion, and decided on Welland as the logical place to make a connection, owing to its close proximity to the sources of supply of raw materials and its unsurpassed facilities for the distribution of its finished products, both by rail and by water.

INCREASE OUTPUT IN NOVA SCOTIA

Montreal.—R. M. Wolvin, president of the Dominion Steel Corporation, who has returned to Montreal after a two weeks' inspection tour of the company's extensive coal and steel operations in Nova Scotia, says that the output of coal in the Nova Scotia mines is to be considerably increased. To secure this the sum of five and a half million dollars is to be expended in further developg and extending the properties of the company in that Province. This increased output, he believes, will do a great deal to meet the urgent needs of the country for coal.

Owing to prevailing high costs for material and labor, construction work at present will be much more expensive, but Mr. Wolvin stated that he believed that coal consumers of the country prefer a moderate and gradual increase in prices rather than face a serious coal shortage later, with its attendant abnormally higher prices.

Compared with current prices of coal at the mines both in England and the United States, Nova Scotia coal is selling at $1.00 to $2.00 lower per ton f.o.b. cars at the point of shipment, and consumers in Eastern Canada have been regularly supplied at the lower prices. While the manufacturer of Central and Western Canada had been paying from $15 to $18 per ton for coal, his competitor in Eastern Canada has been fully supplied at an average delivered price of $9 to $10 per ton, he stated.

WHAT IS THE PURPOSE OF A HEAT-TREATING PROCESS?

Continued from page 136

perature, as measured by a thermocouple within the furnace, exceeds certain predetermined limits. These contacts are operated with certainty by the small motor which adjusts the potentiometer and operates the recording pen. No current flows through the galvanometer needle, which serves only as a mechanical trigger to guide the adjustment of the potentiometer. The currents controlled by the switches are sufficient for the operation of a standard commercial relay panel, as illustrated on page 24 and shown in the diagram of connections opposite.

The automatic control mechanism holds the temperature of the furnace within a range of + 5° F. A chart supplies a continuous record of the temperature and therefore serves as a clock upon the correct operation of the automatic devices. The variations in temperature of the work are necessarily less than those of the furnace, as the energy is supplied to the heating element of the latter intermittently and diffuses gradually to the work. Once the work has been brought up to the drawing temperature, the current is on for short periods only, as for 30 seconds at intervals of 30 minutes approximately.

Due to the thorough insulation of the furnace and the fact that a continuous stream of air has not to be heated, the amount of energy consumed is very small, the current being on for perhaps less than two per cent. of the whole time. The furnace walls have a high heat-storage capacity which prevents rapid or extreme fluctuations of temperature. The winding of the resistor element is so proportioned that the temperature is uniform throughout the furnace.

For quantity production the work is usually placed upon holders for convenience in handling and for uniformity in the distribution of the charge in the furnaces. Overhead trolleys or telphers with hand or electric hoists can be arranged for lifting these holders in and out of the furnaces and baths. The various illustrations accompanying this article will show clearly other points of interest to this system of heat-treatment.

The latent power of the waterfalls in Iceland is estimated at 1,000 million horse-power. There is now a prospect, according to the "Economic Review," that these large resources may be utilized in the near future. The Icelandic Waterfall Commission is at present considering the granting of a concession to a Danish-Norwegian company for this purpose. It is intended to use the power for the production of nitrogen, and for an extensive scheme of electrification. Among other schemes is one for the construction of a 200-kilom. electric railway, running from Reykjavik, east and south through the agricultural district, which, if carried out, would be Iceland's first railway.

MARINE

Collingwood.—The sixth oil tanker was successfully launched at the yards of the Collingwood Shipbuilding Co. The vessel is being built to the order of the Standard Oil Company of New Jersey and is fo special service at Buenos Aires. She was gracefully christened by Miss Susan Smith, daughter of Mr. G. H. Smith, president of the Intrenational Petroleum Company of Toronto. The launching party included Captain and Mrs. Wilkie, Mr. and Mrs. Slenns and Master Slenns, Messrs. G. H. Smith, J. L. Englehart, Lauren Mayer, H. Stewart, S. Dyment, Turnley, Blyth, Fred Stark, H. B. Smith, S. H. Lindsay, F. C. Brunks, Master Foster and Misses Mayer, Frances Mayer, Mary Mayer, and Susan Smith.

INCORPORATIONS

The Superheater Company of Canada, Transportation Building, Montreal, and with works at Sherbrooke, Que., has been incorporated to manufacture steam superheaters for all classes of service. The company is giving special attention to locomotive, marine and stationary equipment and have Canadian rights for manufacturing the "Electo" Superheater. Equipment for stationary power plants is designed to suit each installation and this is particularly true in case of stationary power plants, the superheaters being applicable to any type o fwater or fire tube boilers. Superheaters of the type manufactured by this company are now in general service in locomotive and marine and stationary plants throughout the world. The company uses a patented form of bending the tubing in its superheater which is termed a forged return bend which is formed from the metal of the pipes themselves without any autogeneous welding. This is also being largely sought after for use in various styles of pipe coils and condensers.

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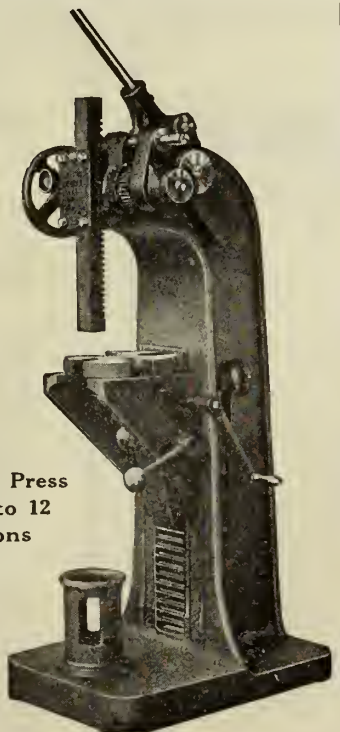

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2—20" Excelsior Drills.

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CLEARANCE LINE—GENUINE "SLOCOMBE" Drills are offered at a sacrifice, sizes "C," "E," "F," and "G." Wholesalers and dealers will find it of interest to communicate their requirements to Box No. 692, Canadian Machinery. (ctfm)

FOR SALE—HARDWARE MANUFACTURERS —the patent rights, or Canadian manufacturing rights of letters patent No. 201,327, relating to self-contained soldering iron. This tool generates its own fuel and would be a boon to mechanics and motorists. Fred Mayor, 36 O'Leary Ave., Toronto. (c7m)

MACHINERY FOR SALE—MOTOR, 66 CYCLE, 220 Amp., 90 H.P., 220 Volt, 3 Phase Speed, no load, 1015 R.P.M., 14" Diameter Drive Pulley, 17" face, complete with starter and base. Apply Midland Woodworkers, Limited, Midland, Ont. (c7m)

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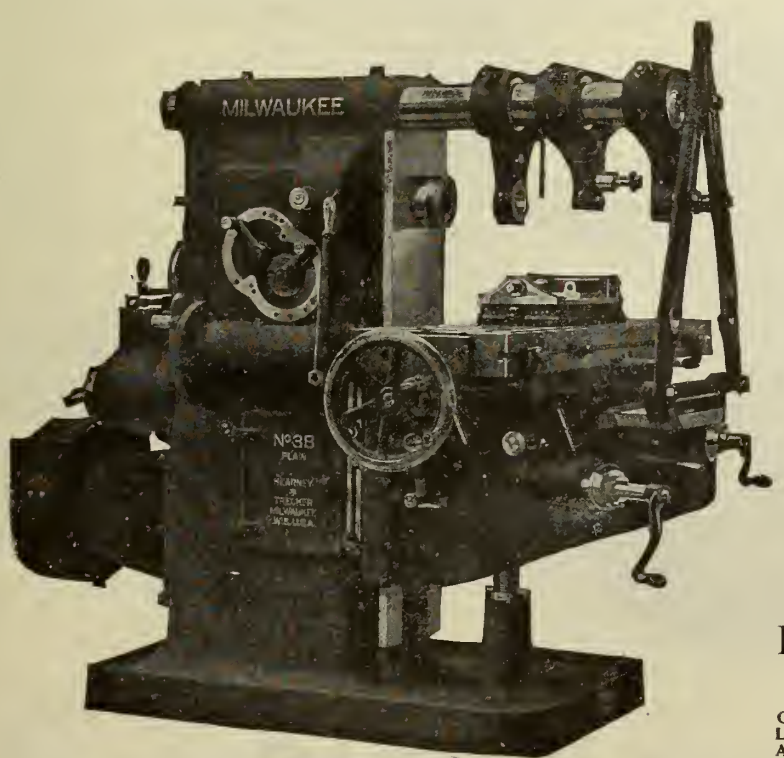

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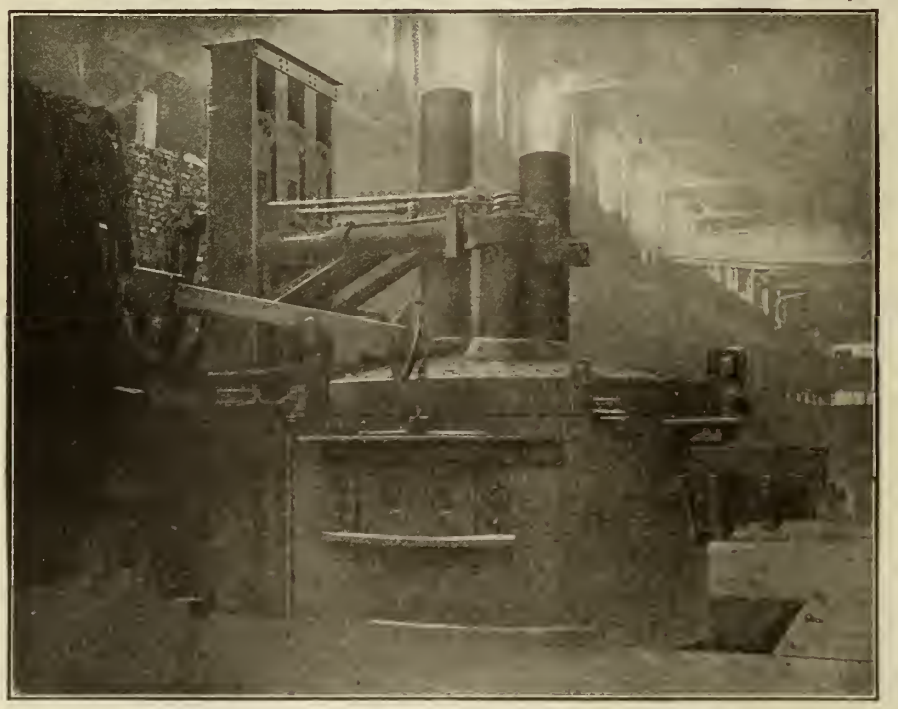

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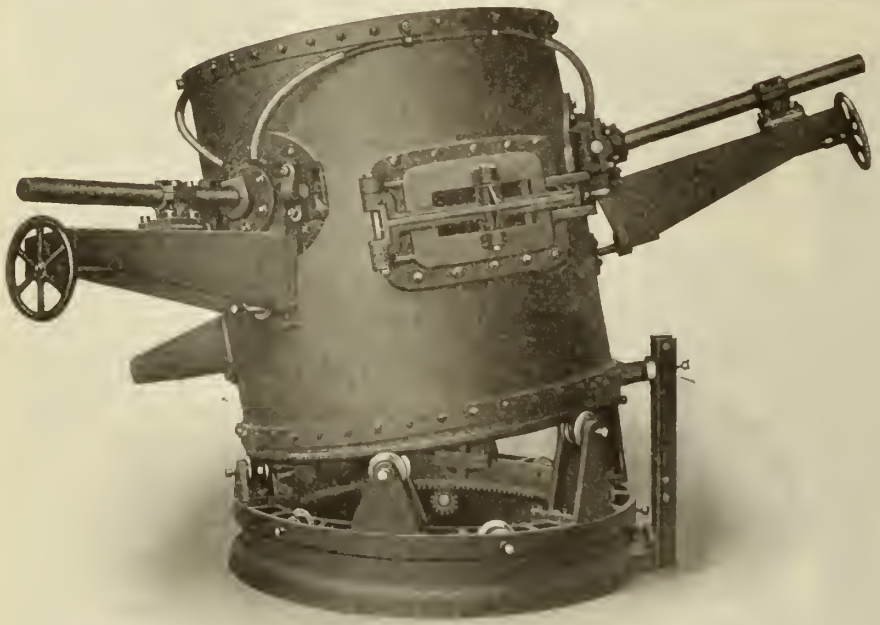

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Type "S.L." from 500 to 3500 lbs. Capacity

Save time, expense and trouble in your lifting and hauling operations by installing a "Volta" Electric Winch in your shop. The "Volta" is simple and strong in construction and can be depended upon to do its work quickly, efficiently and economically.

There is a "Volta" for every purpose such as lifting material from one floor to another, operating doors, charging storage bins, spotting cars, loading or unloading cars or wagons and many other purposes. "Volta" Winches are self-locking and when used for lifting purposes are equipped with magnetic brakes, also nigger heads when desired. Circular giving sizes and capacities on request.

The Volta Manufacturing Co., Limited

WELLAND, ONT.

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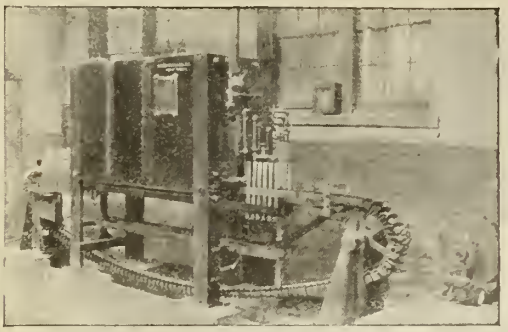

Automatic Tube Annealing Furnace.
An example of "Quantity Production of Quality Product," made possible by use of Automatic Furnace.

AUTOMATIC FURNACES
WILL THEY HELP ME?

That depends on the kind and quantity of material you handle per day, the regularity of its flow, layout of plant and machinery, fuel available, etc.

Having designed and built hundreds of Automatic Furnaces for many industrial heating requirements, we can help you determine whether the automatic furnace and continuous method of heat-treating would improve your product and lower its cost.

Many interesting applications of the continuous method to the field of industrial heating are shown in Bulletin 217-T. This bulletin illustrates and describes both the furnaces and the heating and handling methods employed in a great variety of manufacturing operations.

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We Make Industrial Heating Furnaces for Every Requirement.

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by the
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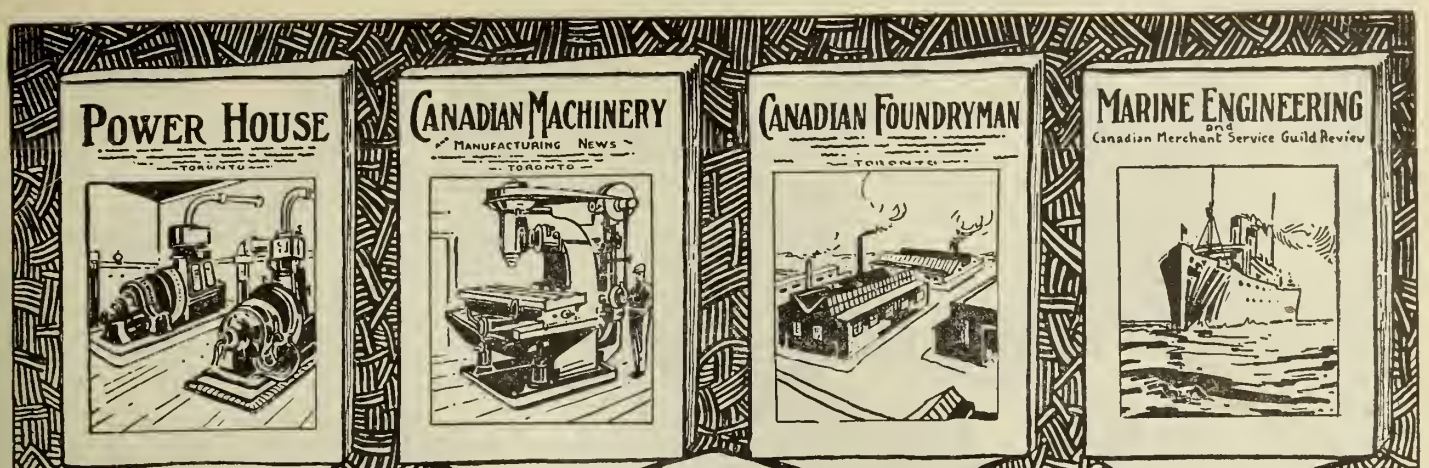

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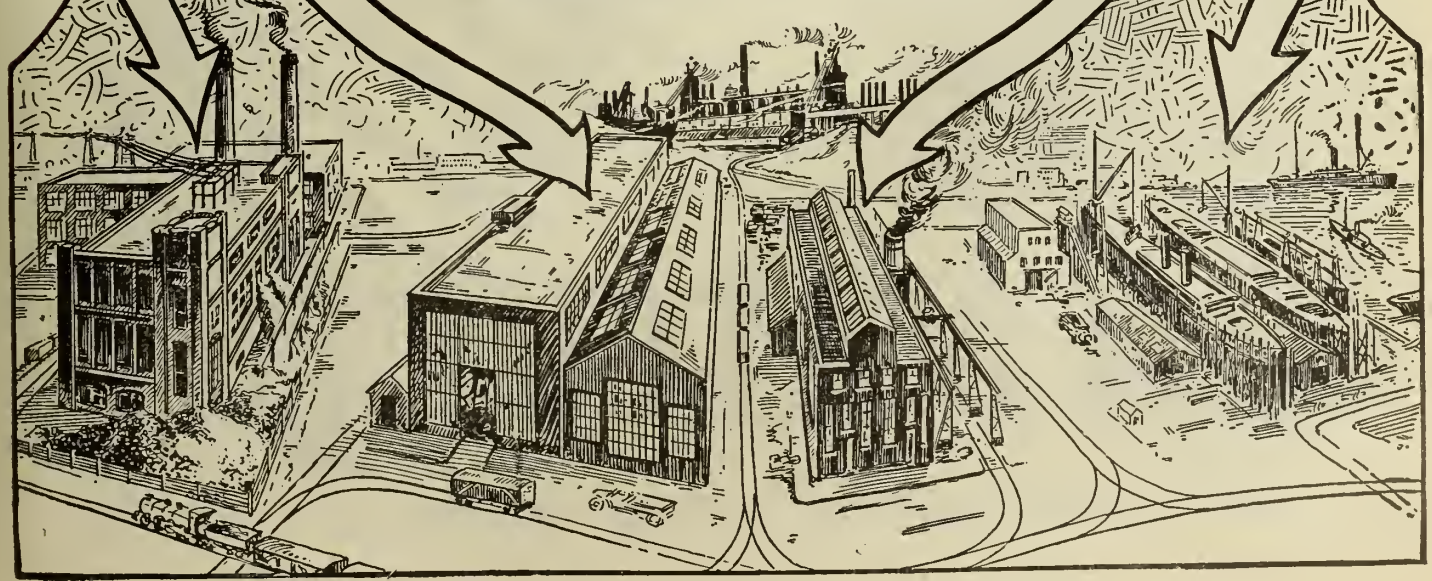

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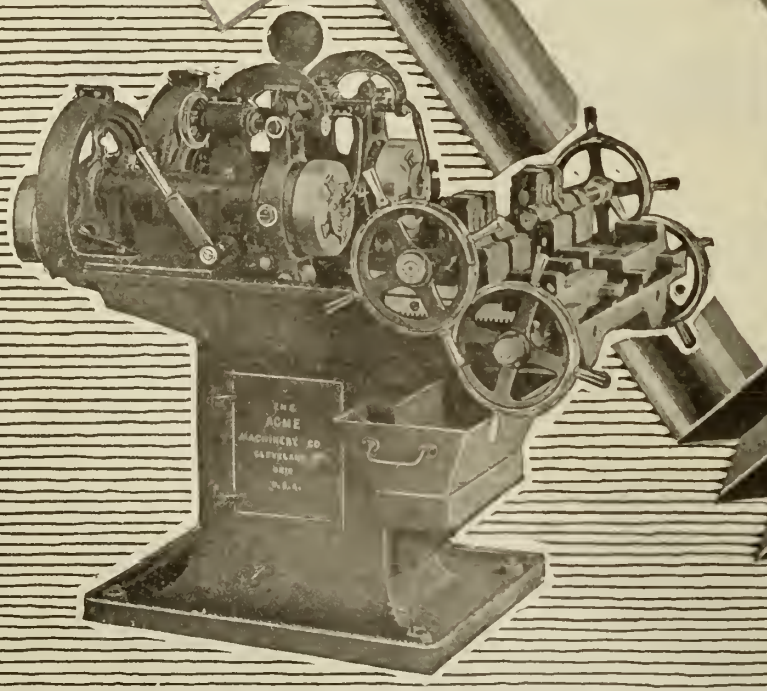
SQUARE HEXAGON TEE-HEAD



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are made in various sizes for cutting bolts from ¼ to 1 in. diameter. Their heads allow micrometer adjustments while they are in motion. The dies can be changed from one size to another in less than one minute and produce clean, accurate, highly-finished threads.

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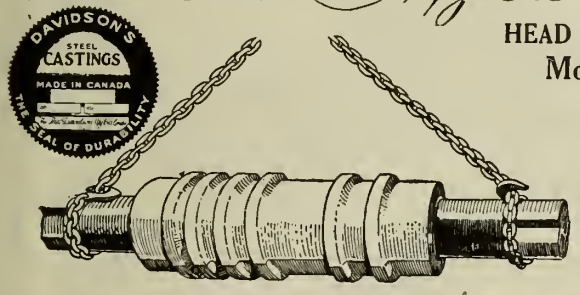

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"BOTH of these operations and half another — I'll show you later—completed in the time our old taps took to do one; that, I guess, is why we continue to use your Victor Collapsible Taps."

It was the often-heard story of time saved, of costs lowered, of all threads clean and smooth. And it was pleasant to hear.

Victor Tool Company
Waynesboro, Pa.
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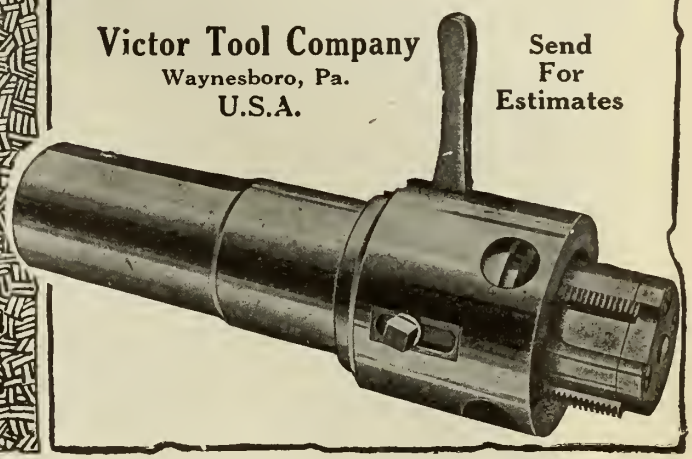
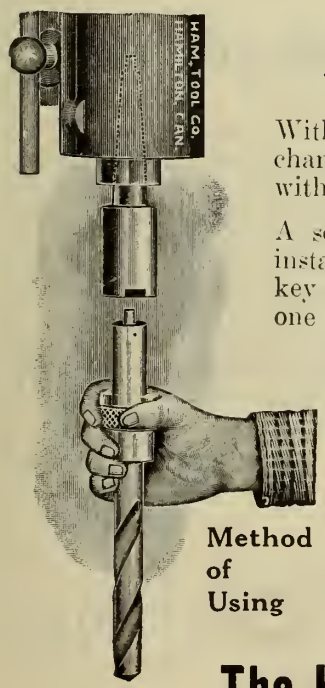


THE BEAVER CHUCK AND COLLET



Method of Using

New Time-Saving Tool

With the Beaver Chuck and Collet you can interchange your Drills, Reamers, Counterbores, etc., without stopping the machine.

A self-contained device releases Collet and tool instantly, requiring neither hammer, wrench, nor key to operate. The change is made easily with one hand—nothing to catch or shock the operator.

The Beaver Chuck and Collet is simple in construction and positive in operation. Made of high grade tool steel throughout. It practically converts a Single Spindle Machine into a Multiple Spindle Machine with as many tools as you may have operations in any piece of work.

Consider the time you can save with the Beaver Chuck and Collet! Write for full particulars.

The Hamilton Tool Co., Limited, Hamilton, Ont.

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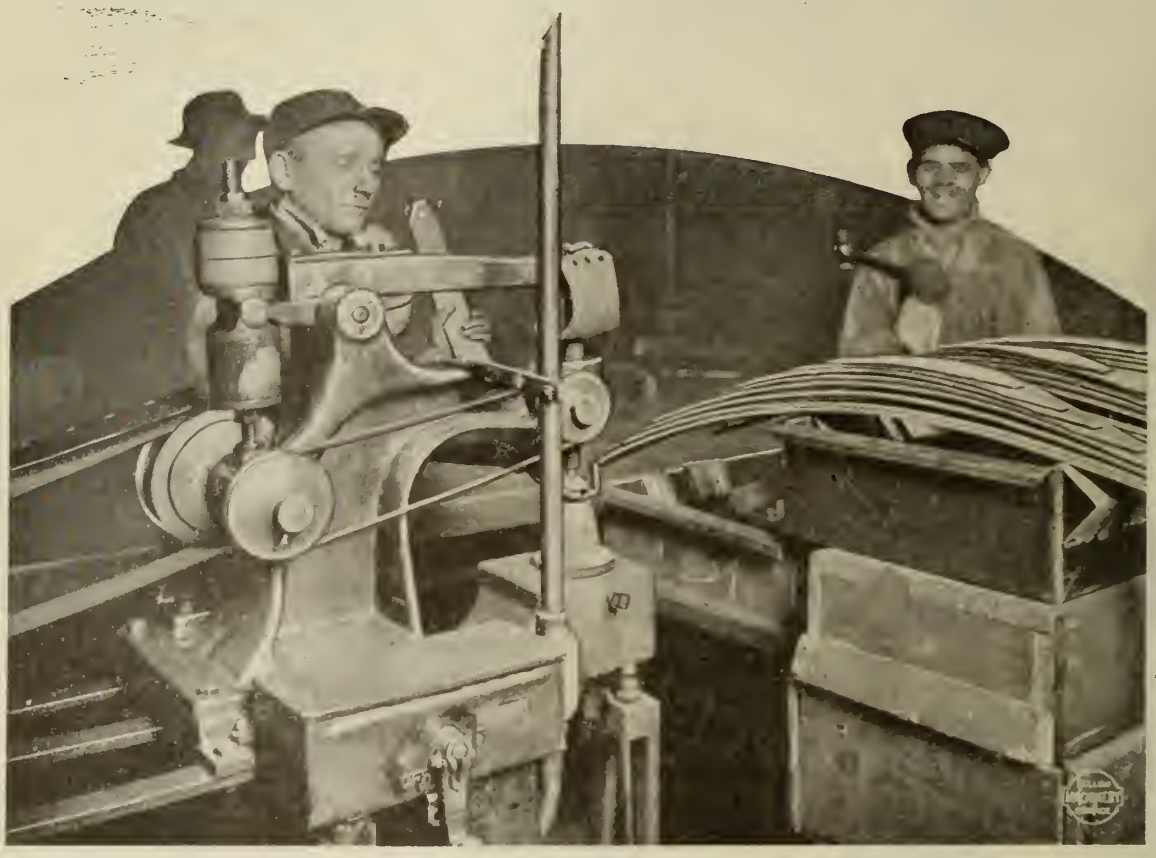
on Auto Springs



There Are Six of a Kind in This Cleveland Plant

This auto spring assembling scene is reproduced six times simultaneously in the plant of the Perfection Spring Company, Cleveland, Ohio. Six high-speed riveting hammers work in self-contained departments at the same job. The operation consists of riveting rebound clips into auto springs with $\frac{3}{8}$" diameter steel rivets. Though the work is heavy, production is four springs per minute, as the actual riveting time is but eight seconds. We build high speed hammers in sizes to head rivets cold, from the smallest to $1\frac{1}{2}$" in diameter. Can you afford to do without them?

You are invited to submit your riveting problems to us. Send sample with loose rivets or sketch showing dimensions, size and location of rivets, we will do the rest.

THE HIGH SPEED HAMMER CO., Inc.
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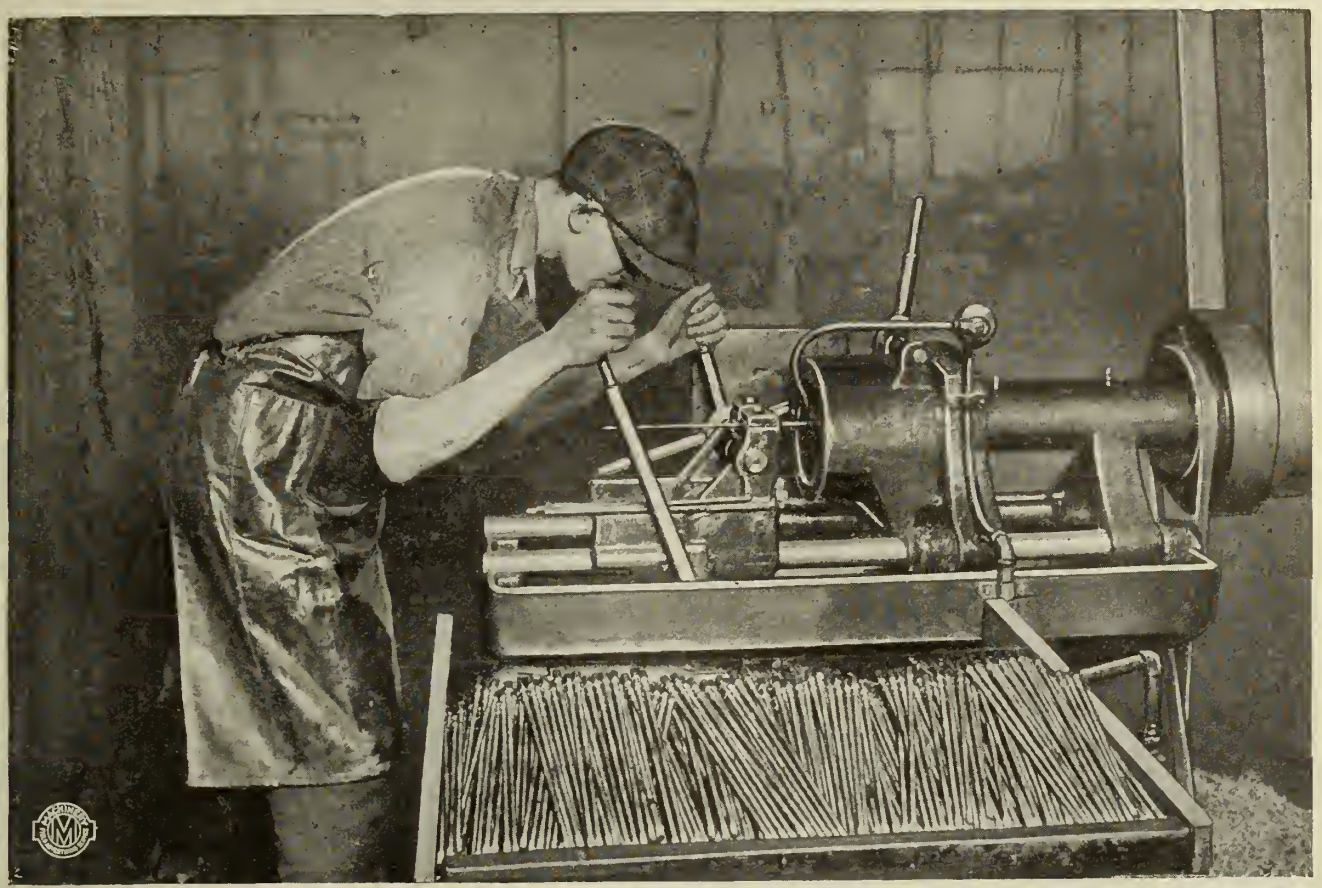

A Difficult Problem— Solved With A Landis Threading Machine

This material, as the man in the shop would say, "is funny stuff." It is quite hard, yet so tough that a lot of hammering only bends it a little. Given enough power and one of these pieces can be tied in a knot, yet it won't break. This is the stuff that is put into airplanes.

Imagine trying to thread it on a quantity-quality basis. The superintendent here tried it without success, until the Landis Threading Machine arrived. That was nearly a year ago, and now all's changed; the work proceeds without a hitch. There are 24 threads per inch, diameter is 5 16-in., and length of thread 5/8-in. Approximately 3,000 pieces are turned out each eight-hour shift.

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Catalog No. "3" of tools for metal workers and machinists sent free on request.

42-51

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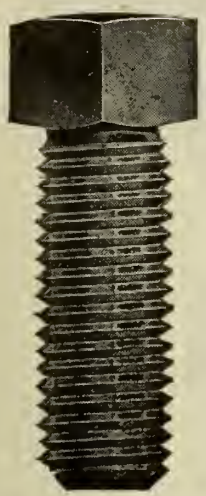

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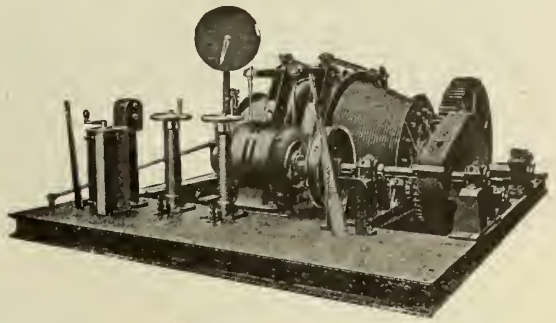

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We represent the manufacturers of all the best line of tools, and solicit enquiries as to price and delivery.

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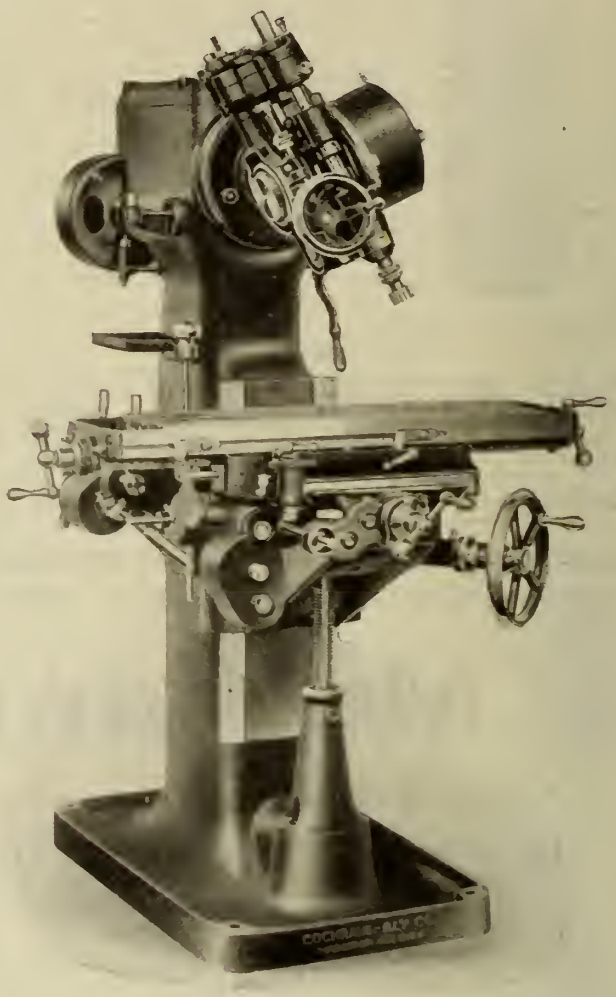
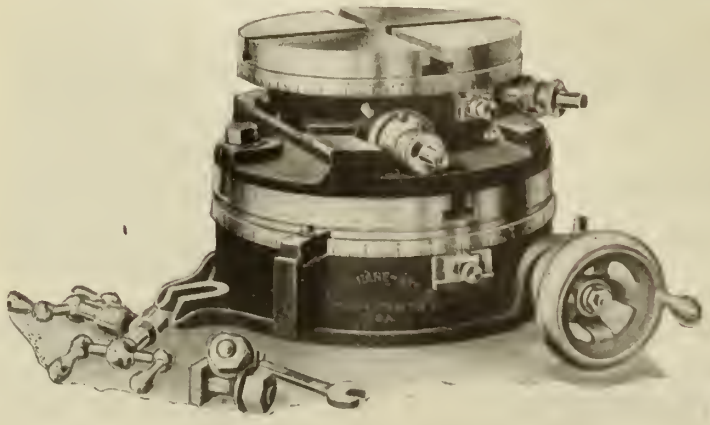
No. 14 Universal Vertical Miller

Head is adjustable 360 degrees right and left and 45 degrees front and back of center. Drilling, boring and milling operations can be performed at any angle and by use of circular and compound tables, from any number of centers at one setting of the work.

Milling spindle has 3½″ vertical adjustment with micrometer gauge screw. Spindle is hollow and will hold sleeves and collets for straight or taper shank cutters, drills, etc. Power feeds are 18½″ longitudinal and 9″ transverse, vertical adjustment 18″.

The above machine is a strictly high-grade precision tool and very efficient on dies, jigs, fixtures, templates, gauges, metal patterns, and many operations on machine parts.





The Circular Tables as shown make it possible to work at any angle and from any number of centers or on five sides of a cube at any setting of the work.

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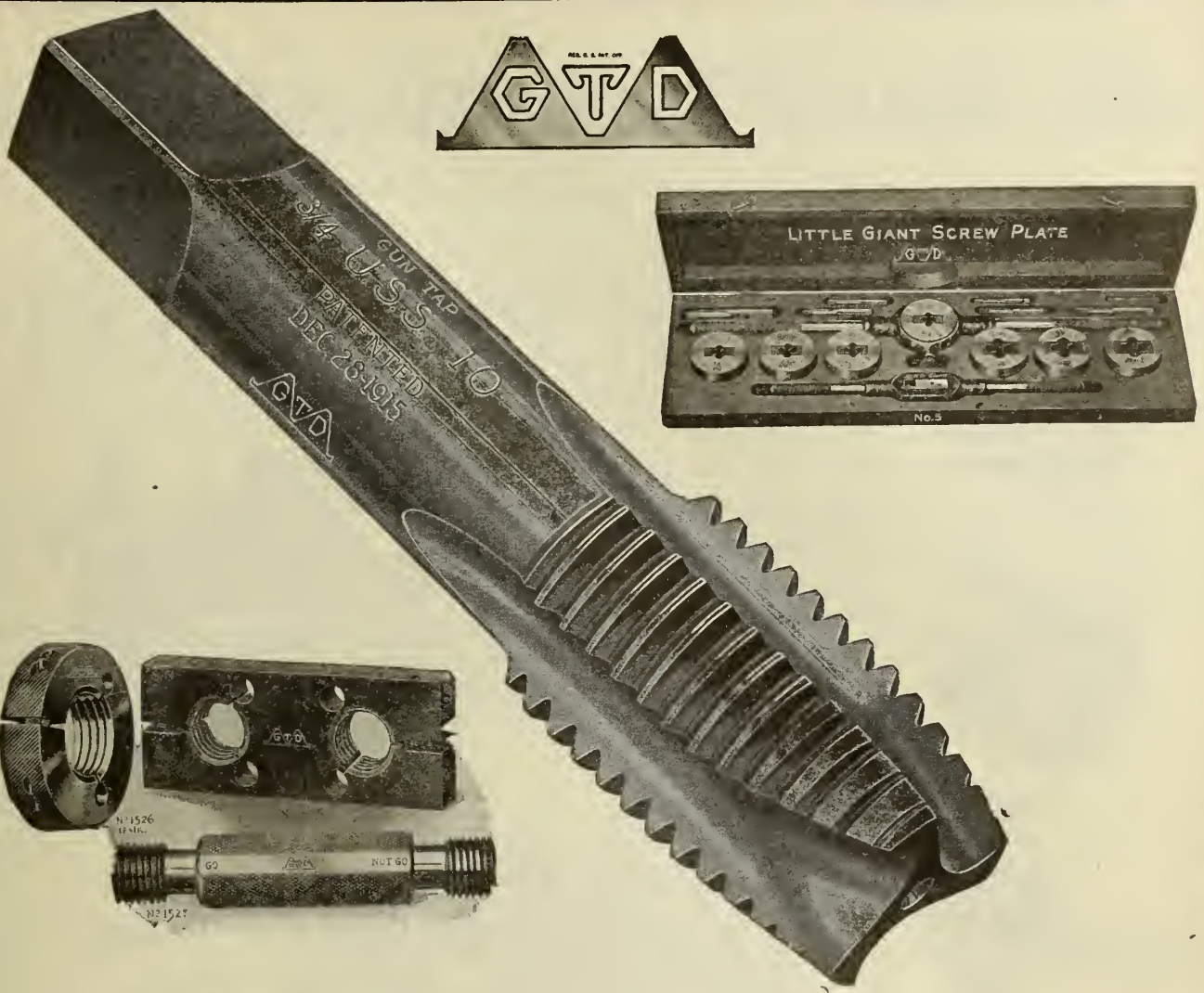
Cochrane-Bly Co.

Rochester, New York



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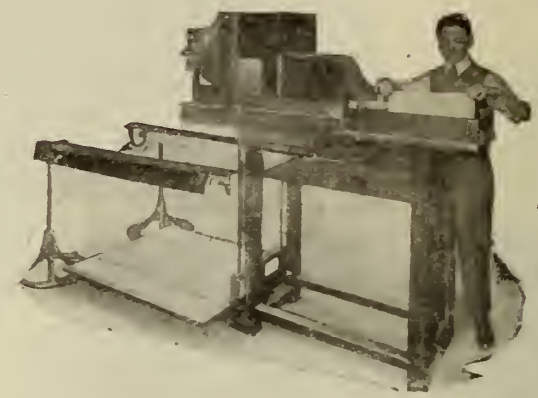

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Gear Cutting With the "IFS" Left Out

The Gear Shaper Way

A production manufacturer knows that he will secure good gears IF he has an accurate cutter, an accurate machine and a machine working on the correct principle. The whole question of good gears is resolved in this one little word "IF."

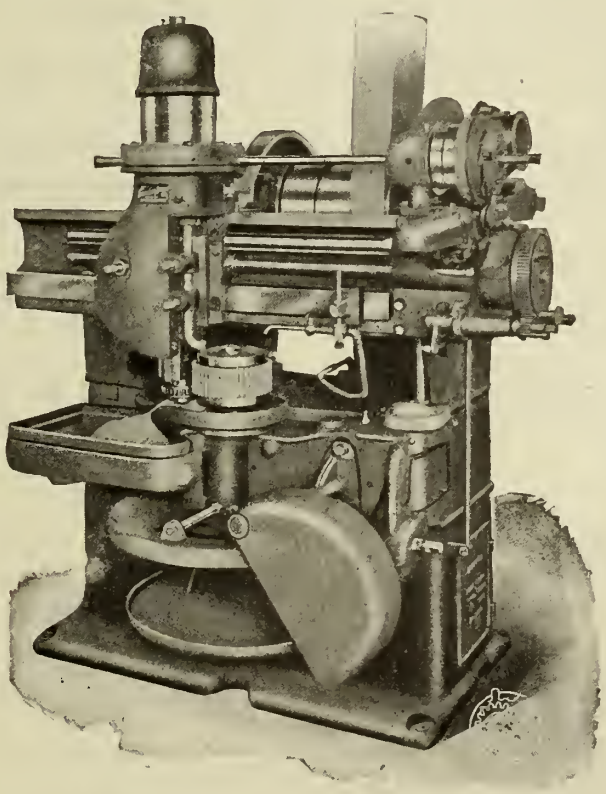
When the Gear Shaper was originally designed, the question of "IF" was taken into consideration and every possible means known to mechanical engineering was employed to eliminate the "IFS" from gear cutting.

That we have been successful in solving the problem is evidenced by the fact that each ensuing year sees a larger number of manufacturers adopting the Gear Shaper method.

How the Gear Shaper has accomplished this is clearly explained in our general catalog "Commercial Gear Cutting," which is a treatise on the subject of:—

Gear Cutting with the "IFS" Left Out.

Send for your copy to-day.



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The Fellows Gear Shaper Company

Springfield, Vermont, U.S.A.

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"MOLY"
Our Trade Name for Chrome-Molybdenum Steel

The publicity being given to Molybdenum as an alloying element for commercial steels is pleasing to us in that it serves to direct attention to a very meritorious alloy steel.

The first Molybdenum Steel made in the United States in commercial quantities was produced in our open hearth and electric furnaces. We have made more Molybdenum Steel than any other alloy steel manufacturer in the world.

Our success in making Molybdenum Steels is undoubtedly due to our long specialization in alloy steel manufacture.

United Alloy Steel Corporation Canton, Ohio.

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That You Want To Reach

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If you have a message for the Canadian hardware trade there is no more direct or economical way of reaching practically the whole Canadian trade than through Hardware & Metal. Its circulation is audited by the Audit Bureau of Circulations—the only Canadian hardware paper that is.

HARDWARE & METAL

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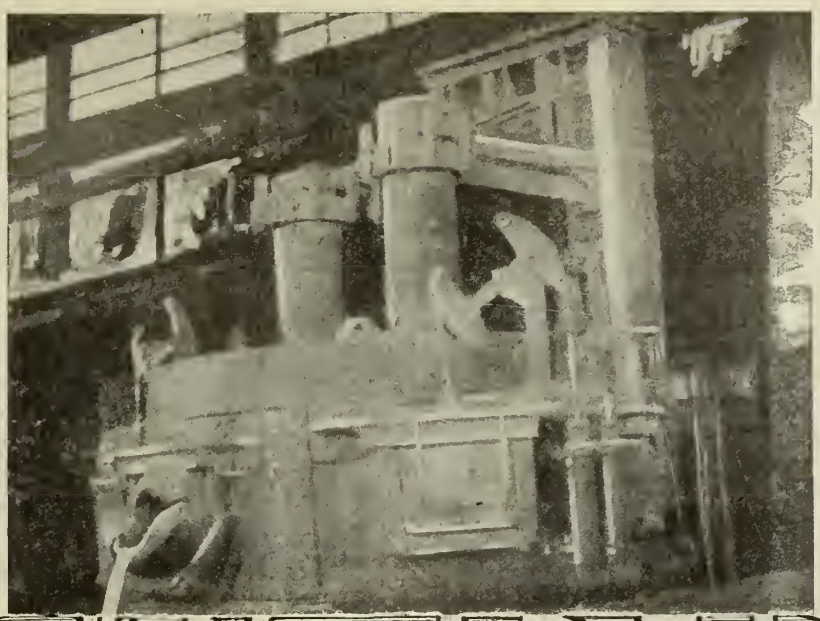
Southam Building, Montreal - Union Trust Bldg., Winnipeg



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High Speed Steel

SEVERAL factors combine to make this high-speed steel a triumph of the steel-maker's art; Electric Furnaces — entirely infallible, automatically regulated, delivering the same result time after time. Uranium — This rare element, cousin to Radium, effects a profound change in the texture and quality of the steel.

Added to these, the constant care and skill of years of steel-making experience make the result of each melt a foregone conclusion.

Latrobe Electric Steel Co.

LATROBE, PENN.

URANIUM

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JUST as "the spirit of a single mind makes that of multitudes take one direction," so does the excellence of a manufactured product influence every purpose for which it is used.

Inherited pride in the maintenance of Red Cut Quality has descended as one generation of masters in the art of Tool Steel making has followed another. Each has fulfilled his part in perpetuating the perfection of the sacred legacy received from his ancestors.

"Red Cut Superior"

The Nationally Known—First Quality

HIGH SPEED STEEL

The Best for All Machine Work

Are Your Tools Made of "Red Cut"?

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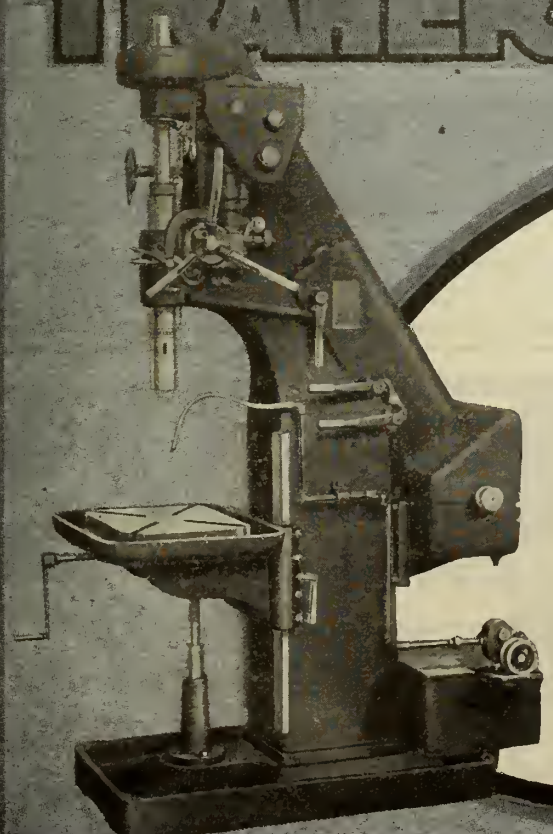
TRAHERN PUMPS



A TRAHERN PUMP

on the Barnes 22" Self-Oiling All-Geared Drill

Barnes Drills are known through the industry as Quality Tools and we are proud of the fact that Trahern Rotary Geared Coolant Pumps were selected by the Barnes people as being the most efficient for installation on their product.

Ninety per cent. of sales of Trahern Rotary Geared Circulating Pumps are to Machine Tool Manufacturers who furnish them as regular equipment on their product. They take the initiative, install Pumps which are KNOWN to be efficient, and thus leave nothing to chance.

May we send you a sample pump at our expense?

TRAHERN PUMP DIV.

Geo D. Roper Corp.

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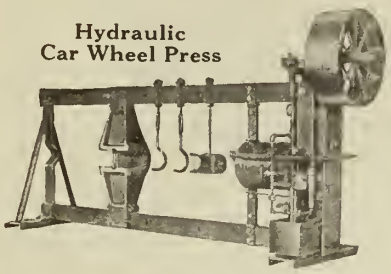
LOURIE HYDRAULIC PRESSES

For Every Purpose Requiring Pressure

Hydraulic Car Wheel Press



We manufacture a complete line of presses for bending, straightening, forcing, forming, broaching, welding, baling, and many other purposes.

Hydraulic Bulldozer

Write for Catalogue

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Electric and Oxy-Acetylene
WELDED TUBING
Also BUTT SEAM TUBING

We have a thoroughly equipped plant for Welding by Electric and Oxy-Acetylene processes. Oxy-Acetylene Welded Tubing is recommended for bending purposes; Electric for straight, or slight bends. Butt Seam Tubing is also one of our specialties. Tubing made hot or cold rolled finish.

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Let us advise you of the kind of tubing that will best suit your requirements. Inquiries gladly answered.

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Theoretically Correct

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ELECTRIC STEEL AND IRON CASTINGS

ALLOY STEEL GRAY IRON

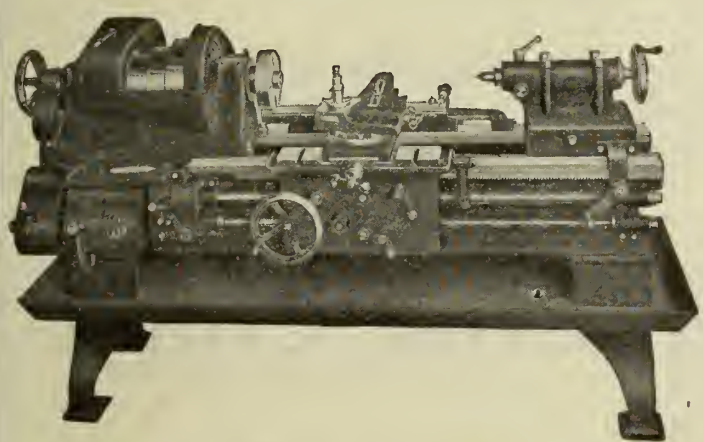
High grade steel castings of every description. Send us your drawings for estimates.

Our motto is quality and quick service.

Canada Electric Castings Co., Limited, Orillia, Ontario

"LEHMANN LATHES"

Will Put the Same Degree of Efficiency Into *Your* Shops as They Have in Many Others



TWO SIZES—16", Swing 18¼" and 18", Swing 20¼"

Because they are constructed "right" of the best material, workmanship and design, and therefore are adaptable to all conditions, whether it be work requiring accuracy to the highest standards or for the heavy duty where power, strength and rigidity are required.

Convince yourself of these facts! Let us send you complete specifications of this superior lathe and the names of some of the larger concerns who are using "LEHMANN LATHES" for better results.

We know you are interested, so don't put off writing us. Do it to-day. Now!

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Why?

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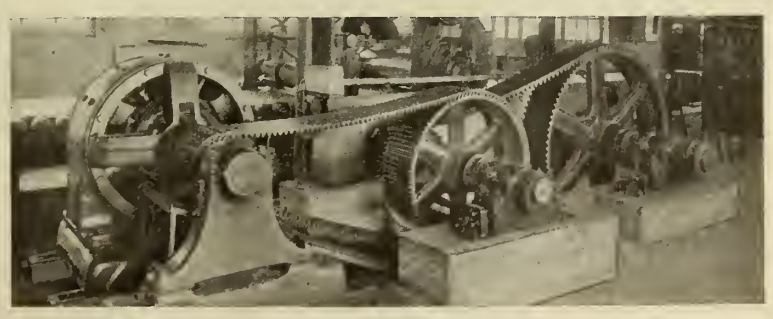

80 H.P. Morse Drive to Rolls, reverses direction every 45 seconds

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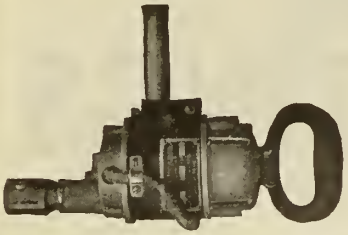
Save Time, Labor and Money



They can be attached to any lamp socket.

For drilling in metal they are superior to any other kind of portable drill. Cost 50% less to run than air drills.

3 SIZES
3-16 in., W.G.T., 6 lbs.
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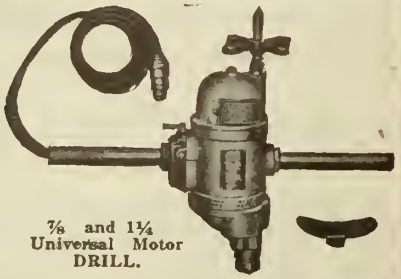
All motors wound for 110 or 220 volts.

Direct or alternating current.

Try a few of our Electric Drills and Grinders and you'll send us an order for more. Our guarantee protects you.



⅞ and 1¼ Universal Motor DRILL.

For Sale By
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THE UNITED STATES ELECTRICAL TOOL CO.
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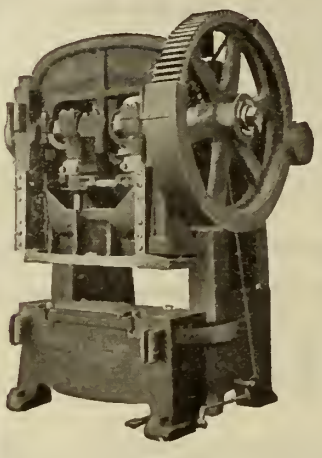

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Over 250 sizes adaptable to all requirements of general sheet metal and drop forged work.

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Free Tool Grinding Chart

Grind your cutting tools in exactly the right way to get best results—and you save time. That's obvious. It is precisely that that this Tool Grinding Chart enables you to do.

It has been adopted as standard by many firms that found it a long way better than guess work.

CANADIAN MACHINERY would like to see this Chart in every shop in the Dominion. Mail the coupon below for your copy to-day.

Shows at a glance Correct Clearance and Rake Angles for Cutting Tools

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Please send me / us free, one of your tool grinding charts.

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City .....

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Do Your Castings Cost Too Much?

A rearrangement of your patterns might cut their cost 25%; a different method of molding them might double your production at no increase in molding cost. *We can advise you* and we have expert metal and wood patternmakers who are able to make any changes that may commend themselves to you.

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send us a sample, blueprint or sketch, and ask for our advice. It won't cost you anything. If our advice is good and commends itself to you, it is only fair to assume that our work will be equally satisfactory, and we need the work as badly as you need the patterns.

We are in a position to do turning, boring, drilling or other semi-finishing operations on castings supplied by us.

ASK US

Measuring Tapes, Steel Rules, Straight Edges, Surveyors' Band Chains, Engineers' Tools

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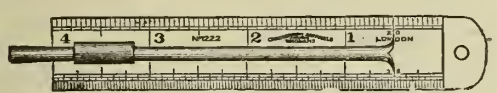
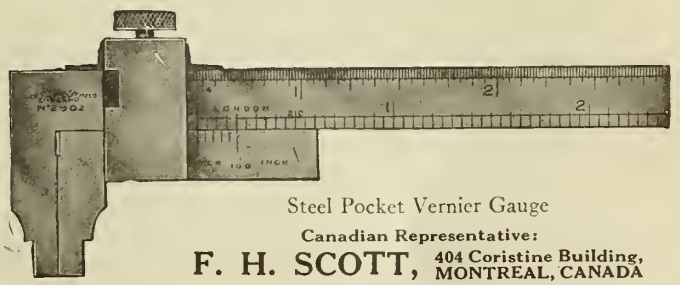
Wind-up Measures, Steel, Linen and Metallic. With Improved Patent Flush Handle

Chesterman tools are the highest standard of accuracy and the quality of steel and substantial build guarantee a maximum of servies and economy.



Steel Depth Gauge



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A New and Better SAW TABLE

Saves Time and Space

This New McKenzie Saw Table has several outstanding features which make it the best machine of its kind to buy. Does the same work as machines of larger dimensions, costs less, takes up less space and produces work faster. It is 23½" x 30". Distance from saw to ripping fence is 13". Floor space 30" x 36". Furnished with belt, ripping fence, two mitre fences and 9" saw.

Specially suitable for pattern shops, technical and manual training schools. **Write for prices and full particulars.**

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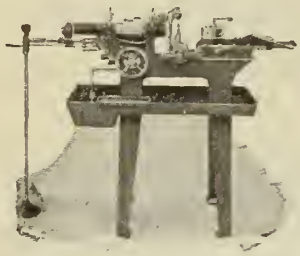

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SIX SIZES

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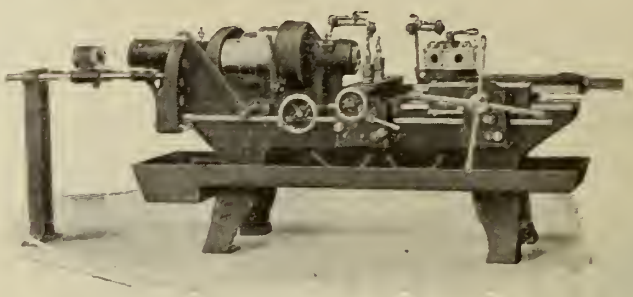

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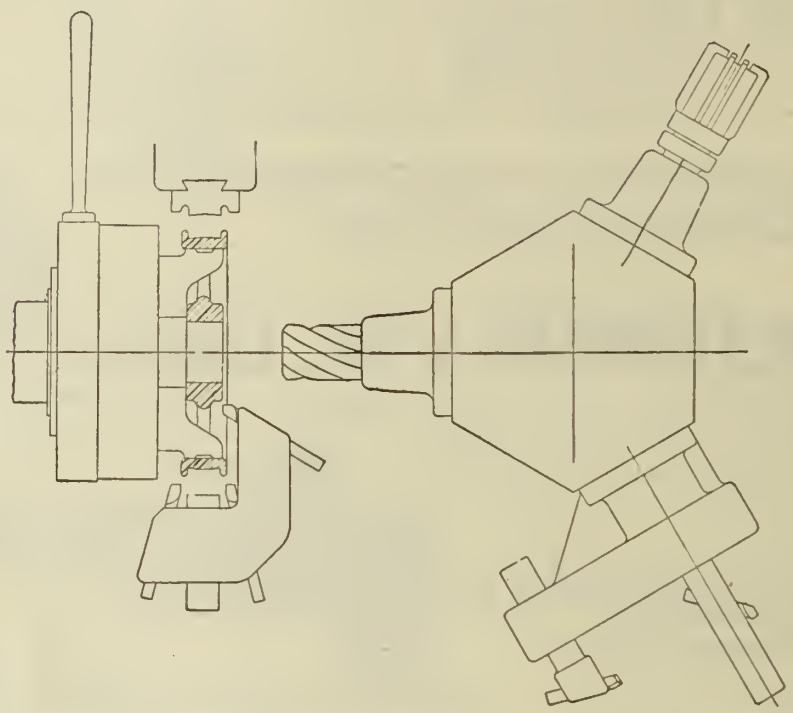

YOU WANT PRODUCTION---WE SELL IT

Production is an engineering proposition. It is a matter of the right equipment and the right method adapted to your work. The machine must be chosen for capacity, power and ease of operation. The tools must be designed for maximum production.

Our engineering staff is at your service. They are one of the *forces behind your production.*

LET US GET TOGETHER.

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If It's Rubber—We Make It

In every factory, office, store and household some article of rubber is used daily as an important part of the equipment. Few users recognize its utility or its quality—to them the important item is price.

When you buy rubber goods be certain that you get a Dominion Rubber System Product. It is your assurance of superior quality and satisfactory service. These products include rubber goods for every conceivable purpose, in standard stock sizes, or specially made to meet your needs in factory, mill, mine, lumber-camps, shipbuilding, marine and other industry.

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No matter what rubber goods you may need, or what your problem may be, our technical experts can remove all element of doubt and save you many dollars in time and costly experiments.

Phone or wire our nearest service branch for information or catalogue.

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Our Dominion Hose, Packing and Industrial Rubber Goods are all the Same High Standard as Dominion Friction Surface Belting

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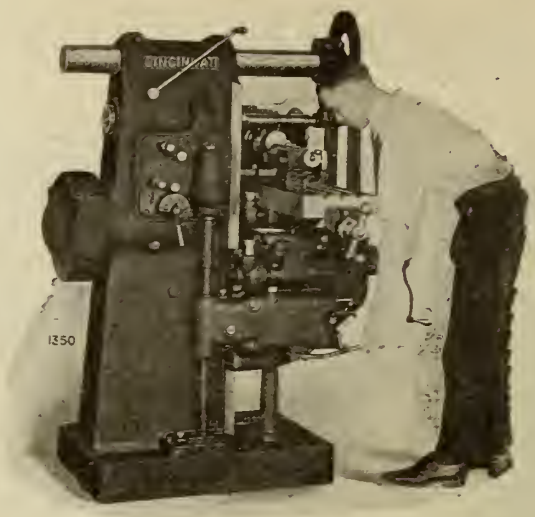
CHANGING the Feed and Speed, and starting and stopping the Machine are accomplished from the operator's usual working position on the

NEW CONSTANT SPEED DRIVE



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CINCINNATI MILLING MACHINE COMPANY .·. CINCINNATI, O., U.S.A.

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SaBeN ExTrA HIGH SPEED STEEL

The Highest Achievement of British Tool Steel Metallurgy.

H. A. DRURY COMPANY LIMITED STEEL

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Agents for British Columbia :
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3

"MEAD-MORRISON" Electric Car Puller

Made in Canada

Mounted alongside the track, it will pull one loaded and one empty coal car easily.

How do you get the empties back on the siding?

Requires only ONE man to operate.

Agents

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CANADIAN MEAD-MORRISON CO
LIMITED
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Get along without the Switching Locomotive.

"Hisco" Machine—Molded Gears

The fact that "Hisco" Machine Molded Gears require no pattern is a factor of considerable importance when the price of lumber and labor is so high. "Hisco" quality insures accurate dependable gears. Remember—**the price of "Hisco" gears does not include the cost of patterns.**

We are also manufacturers of Steel, Chrome, Manganese and Nickel Steel Castings, Annealed and Unannealed; Cement Mill and Mining Machinery; Castings; Stamp Mills; Crushing Plants; Excavating Outfits; Steel Car Wheels; Locomotive Driving Wheels and Frames, etc.

Let us know your requirements—we do the rest

Hull Iron & Steel Foundries, Limited
HULL, Quebec

OILGAS

Industrial Furnaces, burning "OILGAS," under the well-known Sklovsky patents, have been installed by this Company in such typical and efficiently administered concerns as:

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O I L G A S

Think what these names represent in the industrial life of Canada. Consider the engineering ability at the command of such companies—yet, with all their resources, they have found it wise to entrust the designing and building of their furnaces to our experts, and the results have proved the wisdom of their choice.

O I L G A S

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"OILGAS" Furnaces will cut your furnace operating costs in two.

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"Experts in the economical combustion of Liquid Fuels."

OILGAS

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MARGOT TENNANT, even in youth, was a startling note in the staid atmosphere of the Victorian Era. She was a young girl in revolt against all the hampering conventions of the times. But she was not an ordinary young girl, she was noted for her brilliance even in youth. She had sat on Tennyson's knee while he read to her. She was one of the originators of "The Souls," a group of congenial spirits who gathered together from time to time, a group that took in many of the names that were then, or have since become household words. Then she Married Herbert Asquith, and as wife of Britain's Liberal Prime Minister, gained a new insight into affairs.

There has always been something of novelty in what Mrs. Asquith has done. She has a large circle of friends, and a considerable gathering of hearty enemies, one of whom stigmatized her some years ago as "The Woman with the Serpent's Tongue." Mrs. Asquith has been many things, but she has never been commonplace or uninteresting.

Mrs. Asquith's Story Begins in the August 1st MacLean's

It is a fearless, interesting vital story, that will be one of the literary sensations of the year.

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These are only a few of the articles that will make this issue one of unusual interest.

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"CANADA'S NATIONAL MAGAZINE"

Owing to the paper scarcity, editions of MacLean's Magazine will be limited. There are two ways in which you may be sure of your copy. Tell your dealer to reserve one for you or send $3 for a year's subscription to MacLean's Magazine, 143 University Avenue, Toronto.

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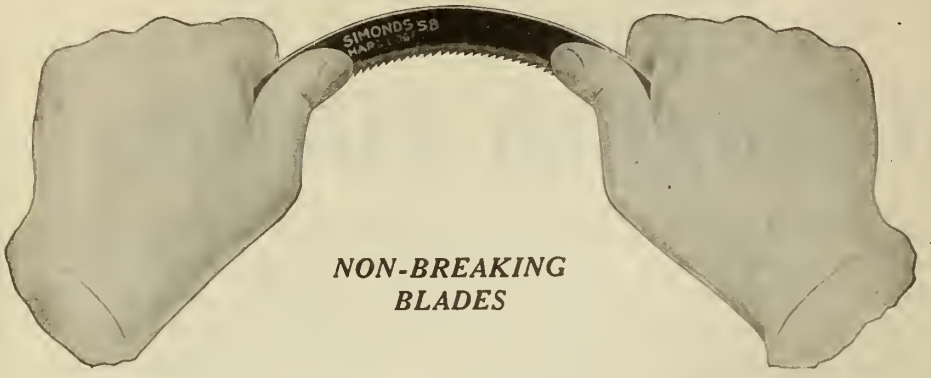

NON-BREAKING BLADES

CUT CUTTING COST

For Machine or Hand Use
Any Size or Length

Simonds Canada Saw Co.
LIMITED
MONTREAL
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Die Castings

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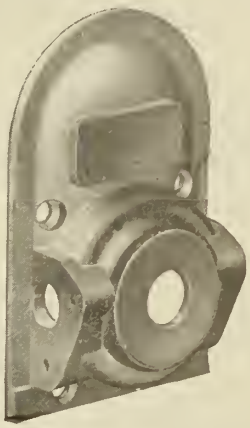

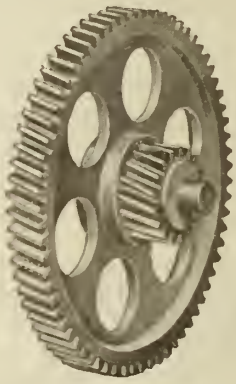

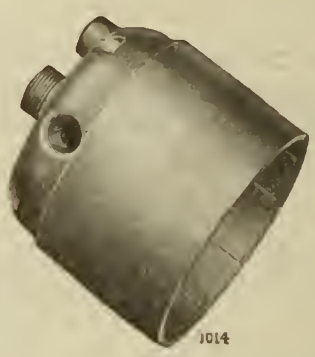

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Doehler Quality

We have purchased the Canadian right for the Doehler process of Die Casting and are now producing these castings in our plant in Hamilton.

Send in Blue Prints or samples stating quantities required and we shall be pleased to quote you.

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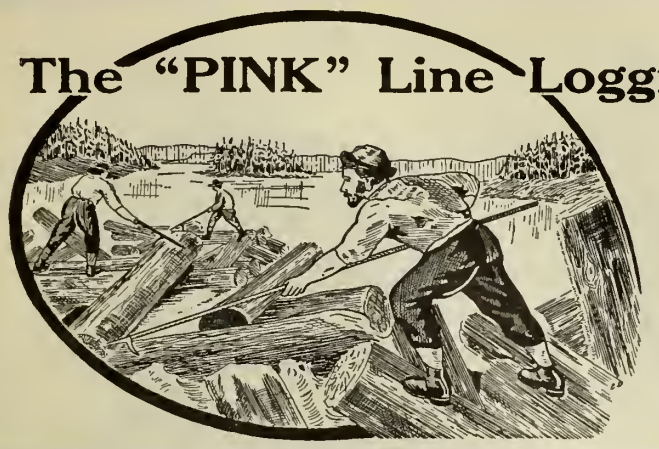
The "PINK" Line Logging Tools and Handles



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In every lumber camp in Canada you'll find PINK'S famous lumbering tools. They are the favorites there and have won the esteem of all woodsmen through their superior merit. They are world-renowned and are extensively used in Australia, New Zealand and other countries where the lumbering industry thrives.

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We export the same good quality of lumbering tools that have made PINK'S TOOLS a by-word in the matter of good tools in all Canadian lumber camps. Enquiries cordially solicited.

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This Bank has 695 Branches, of which 600 are located in Canada from the Atlantic to the Pacific Coast. Write for a complete list of Branches and for terms respecting a Canadian account.

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Capital and Reserves $35,000,000 **Total Resources $587,000,000**

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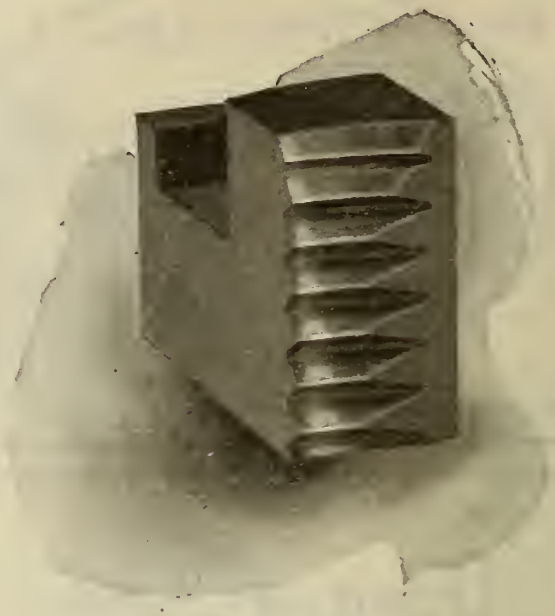
The Acknowledged Leader

In every field of industry there is one acknowledged leader by which all others of its type are judged.

The Chasers of the HARTNESS AUTOMATIC DIE hold this enviable position. Their superior efficiency is not a mere claim, but the verdict of expert mechanics based upon exhaustive tests covering many years of service.

For precision work, we can furnish chasers with a lead guaranteed within 0.001 inch per inch of thread.

Quantity and quality of output are the predominant factors upon which their reputation is built.



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(DIE DIVISION)

SPRINGFIELD, VERMONT

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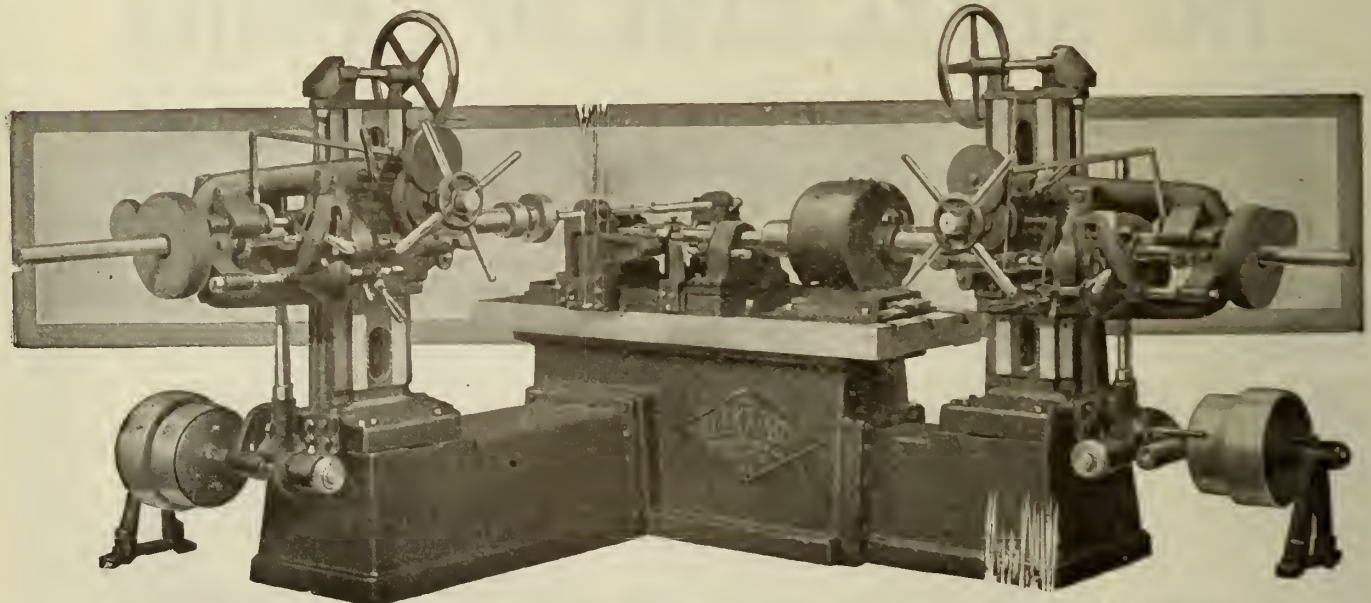
For Automobile Manufacture

This tool is unusually rapid and accurate in the boring of crank cases, transmission cases and rear axles. Has two heads at right angles to each other. Spindles bore longitudinal and cross holes in work simultaneously.

Send us blue prints of your boring work and we will give you figures on the "Rockford's" ability on it.



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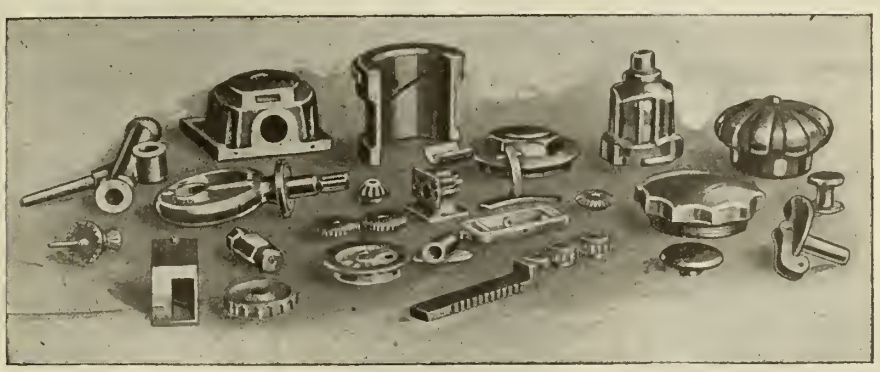

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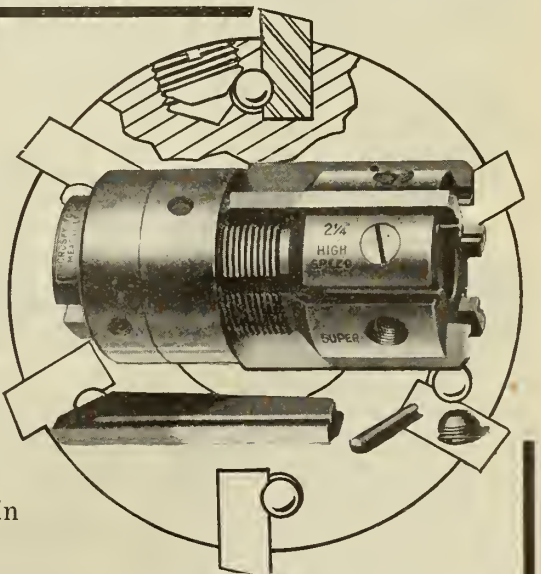

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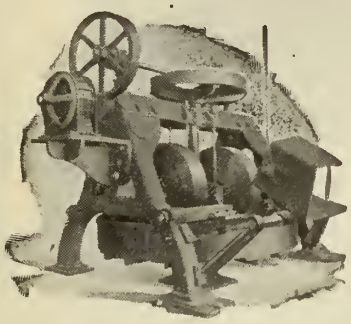

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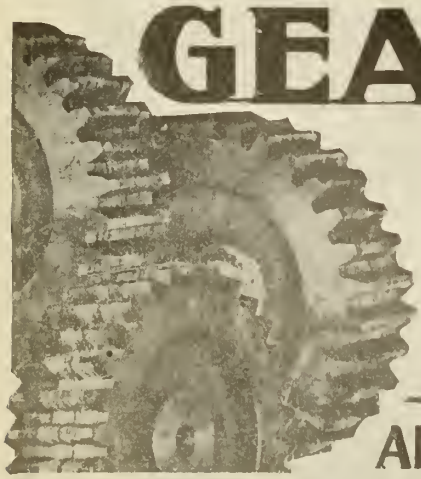

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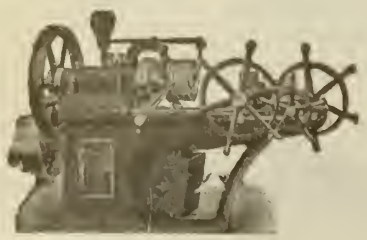

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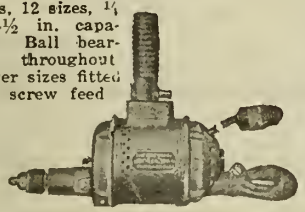

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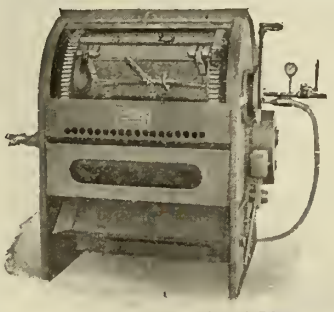

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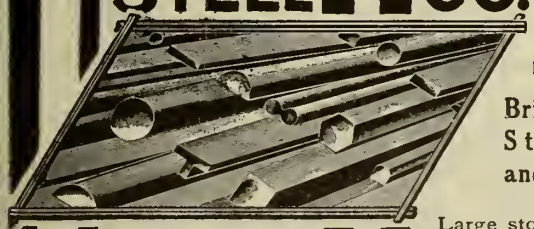

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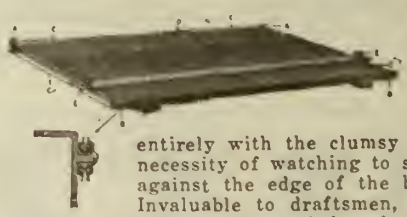

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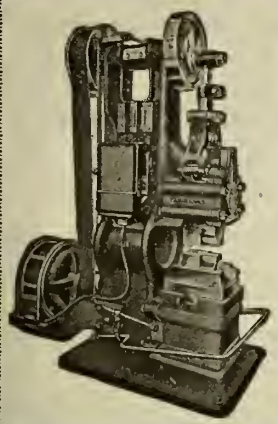

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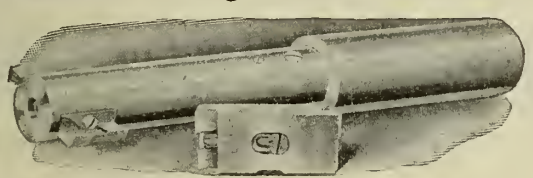

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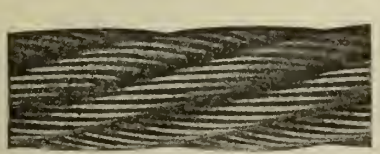

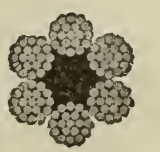

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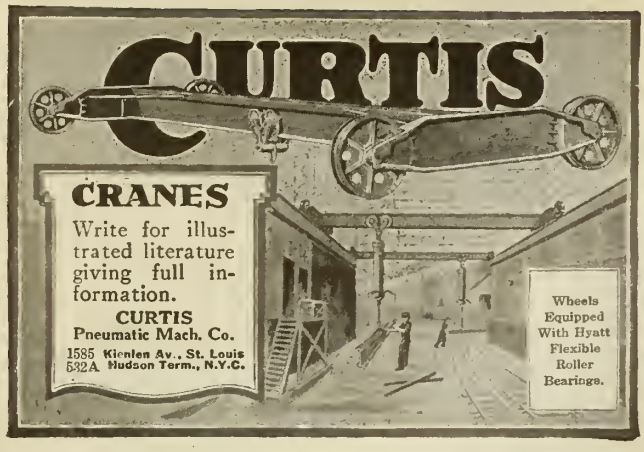

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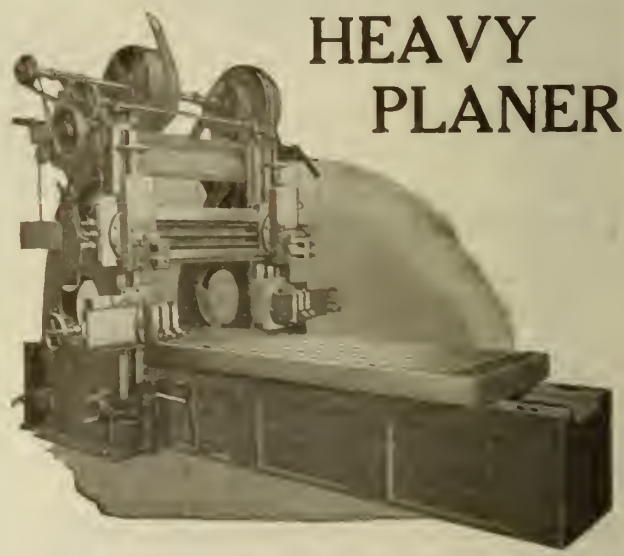

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Lyman Tube & Supply Co., Montreal, Que.
Marshall, Son & Bunney, Toronto.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

BAROMETERS
Taylor Instrument Co., Rochester, N.Y.

BARRELS, SAND-BLAST
Pangborn Corp., Hagerstown, Md.

BARRELS, STEEL SHOP
Baird Machine Co., Bridgeport, Conn.
Cleveland Wire Spring Co., Cleveland.

BARRELS, TUMBLING
Baird Machine Co., Bridgeport, Conn.
Katie Foundry, Galt, Ont.
Northern Crane Works, Walkerville, Ont.
Petrie, Ltd., H. W., Toronto.

BARS, BORING
Gisholt Machine Co., Madison, Wis.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Williams & Co., J. H., Brooklyn, N.Y.

BARS, CONCRETE REINFORCING
Algoma Steel Corp., Sault Ste. Marie

BARS, MERCHANT
Algoma Steel Corp., Sault Ste. Marie.
Peckovers, Ltd., Toronto, Ont.
United Alloys Steel Corp., Canton, Ohio.

BASE FACING MACHINES
Victoria Foundry Co., Ottawa, Ont.

BATTERIES
Northern Electric Co., Ltd., Montreal Que

BEADING MACHINES
Quickwork Co., St. Marys, Ohio.

BELT CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto.
Summer & Co., New York, N.Y.
Williams Mchy Co., A. R., Toronto, Ont.

BEARINGS, DIE CAST
Franklin Mfg. Co., Syracuse, N.Y.

BEARINGS, GRAPHITE BRONZE
Lyman Tube & Supply Co., Montreal, Que.

BEARINGS, ROLLER
Lyman Tube & Supply Co., Montreal, Que.

BELT-LACING MACHINES, HOOKS AND PINS
Clipper Belt Lacer Co., Grand Rapids

BELT LACING LEATHER
Aikenhead Hardware Co., Toronto, Ont.
G. F. Foss Mchy. & Sply. Co., Montreal.
Graton & Knight Mfg., Worcester, Mass.
Rice Lewis & Son, Toronto, Ont.

BELTING, BALATA
Federal Engineering Co., Toronto, Ont.

BELT HOOKS, WIRE
Clipper Belt Lacer Co., Grand Rapids

BELTING, RUBBER
Can. Consolidated Rubber Co., Montreal.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto.
Goodyear Tire & Rubber Co., of Canada, Ltd., Toronto.
Gutta Percha & Rubber Ltd., Toronto, Canada.

BELTING, CHAIN
Can. Fairbanks-Morse Co., Montreal.
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Petrie, Ltd., H. W., Toronto.
Renold of Canada Ltd., Montreal.
Whitney Mfg. Co., Hartford, Conn.
Williams Mchy Co., A. R., Toronto, Ont.

BELTING, CONVEYOR
Can. Consolidated Rubber Co., Montreal.
Can. Link-Belt Co., Ltd., Toronto, Ont.
Canadian Fairbanks-Morse Co., Montreal
Federal Engineering Co., Ltd., Toronto.
Gutta Percha & Rubber, Ltd., Toronto, Canada.
Graton & Knight Mfg., Worcester, Mass.
International Mchy. Spls., Ltd., Montreal.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
McLaren Belting Co., J. C., Montreal.
Morse Chain Co., Ithaca, N.Y.
Petrie, Ltd., H. W., Toronto.
Quaker City Rubber Co, Philadelphia, Pa.
Rice, Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.
Sumner & Co., New York, N. Y.
Williams Mchy Co., A. R., Toronto, Ont.

BELTING, FRICTION AND SURFACE
Can. Con. Rubber Co., Ltd., Montreal.
Gutta Percha & Rubber, Ltd., Toronto.

BELTING, HAIR
Sumner & Co., New York, N.Y.

BELTING, LEATHER
Can. Graton & Knight Mfg. Co., Montreal
Gutta Percha & Rubber, Ltd., Toronto, Canada.
Sumner & Co., New York, N. Y.
John Tullis & Son, Glasgow, Scotland.

BELTING, RUBBER
International Mchy. Spls., Ltd., Montreal.
Quaker City Rubber Co, Philadelphia, Pa.

BELTING, STITCHED COTTON DUCK
Dominion Belting Co., Hamilton, Ont.
Gutta Percha & Rubber, Ltd., Toronto.

BELTING, WOVEN
Federal Engineering Co., Ltd., Toronto
Sumner & Co., New York, N.Y.

BENDING MACHINERY
Bertrams, Ltd., Edinburgh, Scotland.
Bertram & Sons Co., John, Dundas
Brown-Boggs Co., Ltd., Hamilton, Ont.
Can. Blower & Forge Co., Kitchener.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Mach. Co., Toronto.
Petrie, Ltd., H. W., Toronto.

BLAST GATES
W. S. Rockwell Co., New York, N.Y.

BLASTING MACHINES, SAND
Garlock-Walker Machinery Co., Toronto
Jardine, A. B., & Co., Hespeler, Ont.
National Mach. Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Toledo Machine & Tool Co., Toledo
Williams Mchy Co., A. R., Toronto, Ont

BILLET MARKERS
Matthews & Co., Jas. H., Pittsburgh, Pa.

BILLETS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Swedish Steel & Importing Co., Ltd., Montreal.
Algoma Steel Corp., Sault Ste. Marie
Kayser-Ellison & Co., Ltd., Montreal
Marshall, Son & Bunney, Toronto.
United Alloy Steel Corp., Canton, Ohio.

BILLETS, FORGING
Dominion Foundries & Steel Ltd., Hamilton, Ont.
Kayser-Ellison & Co., Ltd., Montreal.

BINS, STEEL
Dennis Wire & Iron Works, London, Ont
Dominion Bridge Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Toronto Iron Works, Ltd., Toronto, Ont.
Wilkinson Hamilton Co., Peterboro, Ont.

BLACKSMITH WORK
The Thos. Pink Co., Ltd., Pembroke.

BLOCKS, CHAIN
Oliver Engineering Co., Montreal.

BLOOMS AND SLABS
Algoma Steel Corp., Sault Ste. Marie
United Alloy Steel Corp., Canton, Ohio.

BLOWERS
Can. Blower & Forge Co., Kitchener, Ont.
Chicago Flexible Shaft Co., Chicago, Ill.
Garlock-Walker Machinery Co., Toronto.
MacGovern & Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto.
Sturtevant Co., B. F., Galt, Ont.

BLOWING ENGINES
General Combustion Co., Ltd., Montreal, Que.

BLOW PIPES AND REGULATORS
Carter Welding Co., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Welding & Supplies Co., Montreal, Que.

BLUE PRINTING MACHINERY
Commercial Camera Co., Providence, R.I.

BLUE PRINT PAPER
Hughes, Owens Co., Ltd., Montreal, Que.

BOARDS, GLASS CUTTING
Lufkin Rule Co., of Can., Windsor, Ont.

BOARTZ
Joyce, Koebel & Co. Inc., New York.

BOLT CUTTERS
Greenfield Tap & Die Corp., Greenfield Mass

BOILER TUBES
Lyman Tube & Supply Co., Montreal, Que

BOILER BREECHINGS
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Williams Hamilton Co., Peterboro, Ont.

BOLT CUTTERS
Fellows Gear Shaper Co., Springfield, Vt
Greenfield Tap & Die Corp., Greenfield Mass.
Wells Bros., of Can., Galt, Ont.
Petrie, Ltd., H. W., Toronto.

BOILERS, RANGE
Can. John Wood Mfg. Co., Ltd., Toronto Ont.

BOILERS
Dominion Bridge Co., Montreal, Que.
MacGovern & Co., Montreal, Que.

BOILERMAKERS' TOOLS
Holden Co., Ltd., Montreal, Que.

BOLT CUTTERS AND NUT TAPERS
Aikenhead Hardware Co., Toronto, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto
Landis Machine Co., Waynesboro, Pa.
A.B. Jardine & Co., Ltd., Hespeler, Ont.
Rice Lewis & Son, Toronto, Ont.
Wells Bros. Co. of Canada, Galt, Ont.
Petrie, Ltd., H. W., Toronto

BOLTS
Aikenhead Hardware Co. Toronto, Ont.
London Bolt & Hinge Wks., London, Ont.
Morrow Screw & Nut Co., John, Ingersoll.
Rice, Lewis & Son, Toronto, Ont.
Steel Co., of Canada, Ltd. Hamilton.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Co., J. H. Brooklyn, N.Y.

BOLTS, COUPLING
Galt Machine Screw Co., Ltd., Galt, Ont.

BOLTS, STAY
Morrow Screw & Nut Co., John, Ingersoll.

BOLTS, SPRING SHAKLE
Can. Winkley Co., Ltd., Windsor, Ont.
Morrow Screw & Nut Co., John, Ingersoll

BOLTS, PATCH
Morrow Screw & Nut Co., John, Ingersoll.

BOLT AND NUT MACHINERY
Barber Mchy. Co., Ltd., Toronto, Ont.
Bertram & Sons Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Gardner & Son, Robt., Montreal.
Landis Machine Co., Waynesboro, Pa.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ohio.
Universal Mach. Co., Bowling Green, O.
Williams Machinery Co., A. R., Toronto

BOLT THREADING MACHINERY
Jardine & Co., Ltd., . B., Hespeler.
Landis Machine Co., W esboro, Pa.
National Acme Co., Cleveland, Ohio.
Victor Tool Co., Waynesboro, Pa.

BONDING MACHINES
(Electric Railway)
The Lincoln Electric Co., Toronto, Ont.

BORING MACHINES, PNEUMATIC CYLINDER
Cleveland Pneumatic Tool Co., Toronto.
Canadian Fairbanks-Morse Co., Montreal
Can. Ingersoll-Rand Co., Sherbrooke Que
Garlock-Walker Mach. Co., Toronto.

BORING MACHINES, UPRIGHT AND HORIZONTAL
Barber Mchy. Co., Ltd., Toronto, Ont.
Bertram & Sons Co., John, Dundas.
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto
Gisholt Machine Co., Madison, Wis.
Herbert, Ltd., Alfred, Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Hoefer Mfg. Co., Freeport, Ill.
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Oliver Mach'y Co., Grand Rapids, Mich.
Rockford Machine & Tool Co., Toronto.
Rockford Drilling Mchs. Co, Rockford, Ill

BORING AND TURNING MILLS
Barber Mchy. Co., Ltd., Toronto, Ont.
Bertram & Sons Co., John, Dundas.
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Foss Mch. & S'ply Co., Geo. F., Montreal
Herbert, Ltd., Alfred, Toronto, Ont.
Knight Metal Products, Toronto.
Oliver Mach. Co., Grand Rapids, Mich.
Niles-Bement-Pond Co., New York.
Strelinger Co., C. A., Windsor, Ont.

BOXES, CAST IRON
Brown & Sharpe Mfg. Co., Providence, R.I.

BOXES, STEEL SHOP AND TOTE
Cleveland Wire Spring Co., Cleveland.

BRAKES
Brown, Boggs & Co., Hamilton, Can.
Electric Steel & Metals, Ltd., Welland.

BRASS—SHEETS, ROLLS, PLATES, and RODS
Brown's Copper and Brass Rolling Mills, New Toronto.

BRASS ALLOYS
British Smelting & Refining Co., Ltd., Montreal, Que.

BRASS AND COPPER TUBING
Lyman Tube & Supply Co., Montreal, Que.

BRASS FOUNDERS
Canada Metal Co., Toronto.
St. Lawrence Welding Co., Montreal.
Tallman Brass & Metal Co., Hamilton.

BRASS GOODS
Crane, Ltd., Montreal, Que.

BRASS PIPE AND TUBE
Crane, Ltd., Montreal, Que.

BRASS WORKING MACHINERY
Barber Mchy. Co., Ltd., Toronto, Ont.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machinery Co., Toronto.
Warner & Swasey Co., Cleveland, O.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Pratt-O-Lite Co., Inc., Toronto, Ont.
Wood Turret Machine Co., Brazil, Ind.
Williams Mchy. Co., A. R., Toronto.
Brown's Copper and Brass Rolling Mills, New Toronto.

BRAZING EQUIPMENT
Chicago Flexible Shaft Co., Chicago, Ill.

BRICKS, FIRE
Elk Fire Brick Co., Can., Ltd., Hamilton, Ont.

BRIDGES, RLY. AND HIGHWAY
Canadian Mead-Morrison Co., Limited, Montreal, Que.
Dominion Bridge Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.

BROACHING MACHINES
Strelinger Co., C. A., Windsor, Ont.

BRONZE—SHEETS, ROLLS, PLATES, and RODS
Brown's Copper and Brass Rolling Mills, New Toronto.

BRONZE, NAVAL
Canada Metal Co., Toronto.
Tallman Brass and Metal Co., Hamilton.

BRONZE COPPER
Canada Metal Co., Toronto.

BRUSHES, CARBON
Lyman Tube & Supply Co., Montreal, Que.

BUFFING AND POLISHING MACHINERY
Ford-Smith Mach. Co., Hamilton.
Foss Mchy. & S'ply Co., Geo. F. Montreal
Garlock-Walker Machinery Co., Toronto.
Petrie, Ltd., H. W., Toronto.

BUCKETS, DUMP
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
St Lawrence Welding Co, Ltd , Montreal

BUCKETS, ELEVATOR
Can. Link-Belt Co., Toronto, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
...nce Welding Co. Ltd., Montreal

BUCKETS, CLAM SHELL, CRAB, DUMP
Brown Hoisting Machinery Co., Cleveland, Ohio.
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Ltd, Walkerville.

BULLDOZERS
Bertram & Sons Co., John, Dundas.
Canada Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machinery Co., Toronto.
Lourie Manufacturing Co., Springfield, Ill
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

BURNERS, OIL AND NATURAL GAS
Northern Crane Works, Ltd., Walkerville.
W. S. Rockwell Co., New York, N.Y.

BURRS, IRON AND COPPER
Parmenter & Bulloch Co., Gananoque,.

BUSHINGS, BRONZE
Morrow Screw & Nut Co., John, Ingersoll.

CALIPERS
Brown & Sharpe Mfg. Co., Providence, R.I.
Pangborn Corporation, Hagerstown, Md.

CABINETS, SAND BLAST
Pangborn Corporation, Hagerstown, Md.

CABLE, ELECTRIC
International Machinery & Supply Co., Ltd., Montreal, Que.

CABLES, TRANSMISSION AND TELEPHONES
Northern Electric Co., Ltd., Montreal.

CALKS, BOOT
Luftin Rule Co., of Can., Windsor, Ont.

CANNERS' MACHINERY
Bliss, E. W. Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Can.

CANNERS' CONVEYORS
Can. Link-Belt Co., Toronto, Ont.

CARBIDE
Carter Welding Co., Ltd., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.
Union Carbide Co., of Canada, Limited, Weland, nt.

CARBONIZING BOXES
Can. Driver-Harris Co., Ltd., Walkerville
Katie Foundry, Galt, Ont.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.
Swedish Crucible Steel Co., Windsor.

CARRIERS, PNEUMATIC TUBE
Jones & Glassco, Montreal.

CARS, INDUSTRIAL
Can. Blower & Forge Co., Kitchener, Ont
Can. Fairbanks-Morse Co., Ltd, Montreal
Elec. Steel & Metals, Welland, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

CAR MOVERS
Holden Co., Ltd., Montreal, Que.

CASES, FILING
Economy Drawing Table Co., Adrian, Mich.

CASTINGS, ALUMINUM, BRASS BRONZE, COPPER, AND GUN METAL
Algoma Steel Corp., Sault Ste. Marie.
Franklin Mfg. Co., Syracuse, N.Y.
Canada Metal Co., Ltd., Toronto, Ont.

CASTINGS, DIE CAST
Canada Metal Co., Ltd., Toronto, Ont.
Franklin Mfg. Co., Syracuse, N.Y.
Fisher Motor Co., Ltd., Orillia, Ont.
Tallman Brass & Metals Ltd., Hamilton, Ont.

CASTINGS, STEEL—ALL KINDS
Canada Electric Castings, Ltd., Orillia, Ont.
Dominion Foundries & Steel Ltd., Hamilton, Ont.
Electric Steel & Metals Co., Welland.
Meets Machine Co., Pittsburgh, Pa.

CASTINGS, ELECTRIC AND ALLOY STEEL
Can. Elec. Castings Co. Ltd., Orillia, Ont
Dominion Foundries & Steel Ltd., Hamilton, Ont.

CARRIERS COUPLING BOLTS
John Morrow Screw & Nut Co., Ingersoll
Alexander Fleck Ltd., Ottawa.
Tallman Brass & Metal Co., Hamilton.

CASTINGS, BENCH LEG.
Brown & Sharpe Mfg. Co., Providence, R.I.

CASTINGS, BRASS AND IRON
Algoma Steel Corp., Sault Ste. Marie.
International Machinery and Supply Co., Ltd., Montreal, Que.

CASTINGS, BUILDING
Katie Foundry, Galt. Ont.

CASTINGS, GRAY IRON
Bernard Industrial Co., A., Fortierville, Q.
Brown & Sharpe Mfg. Co., Providence, R.I.
Brown, Boggs Co., Ltd., Hamilton.
Can. Elec. Castings Co, Ltd., Orillia, Ont
Alexander Fleck, Ltd., Ottawa.
Gardner & Son, Robt., Montreal.
Hull Iron & Steel Foundries, Ltd., Hull
International Malleable Iron Co., Guelph
Kennedy & Sons, Ltd., Wm., Owen Sound.
Katie Foundry, Ltd., Galt, Ont.
Hamilton Co., Wm., Peterboro.
McFarlane Engineering Ltd., G. W., Paris, Ont.

CASTINGS, PLUMBERS'
Katie Foundry, Galt, Ont.

CASTINGS, NICHROME
Can. Driver-Harris Co., Ltd., Walkerville

CASTINGS, HARDWARE
Katie Foundry, Galt, Ont.

CASTINGS, STEEL CHROME AND MANGANESE STEEL
Thos. Davidson Mfg. Co., Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Hull Iron & Steel Foundries, Ltd., Hull.
Kennedy & Sons, Ltd, Owen Sound.

CASTINGS, MALLEABLE
International Malleable Iron Co., Guelph

CASTINGS, NICKEL STEEL
Hull Iron & Steel Foundries, Ltd., Hull.

CEMENT MACHINERY
Can. Fairbanks-Morse Co., Ltd., Montreal.
Gardner, Robt., & Son, Montreal.

CEMENT HANDLING MACHINERY
Can. Link-Belt Co., Toronto, Ont.

CEMENT TOOLS
Atkins & Co., E. C., Hamilton, Ont.

CENTERING MACHINES
Victoria Foundry Co., Ottawa, Ont.

CENTRE REAMERS
Bertram & Sons Co., John, Dundas.
Butterfield & Co., Inc., Rock Island, Que.
Gardner, Robt. & Son, Montreal.
Hurlburt, Rogers Mch. Co., South Sudbury, Mass.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co., of Canada, Galt, Ont.

CHAIN, WELDED COIL
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

CHAIN BLOCKS
Aikenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Ford Chain Block & Mfg. Co., Phila., Pa.
Garlock-Walker Machy. Co., Toronto.
Lyman Tube & Supply Co., Montreal, Que.
Morris Crane & HoistCo., Herbert, Niagara Falls, Ont.
Oliver Engineering Co., Montreal.
Rice Lewis & Son, Toronto, Ont.
Jones & Glassco, Montreal, Que.

CHAINS, AGRICULTURAL
Canadian Link-Belt Co., Ltd., Toronto, Ont.
Morse Chain Co., Ithaca, New York.
Renold of Canada Ltd., Montreal.

CHAINS, AUTOMOBILE ENGINE
Can. Link-Belt Co., Ltd., Toronto, Ont.
Morse Chain Co., Ithaca, New York.
Renold of Canada Ltd., Montreal.

CHAINS, BICYCLE, DRIVE AND BLOCK
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold of Canada Ltd., Montreal.

CHAINS, FOR ELEVATORS AND CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Petrie, Ltd., H. W., Toronto.
Renold of Canada Ltd., Montreal.
Williams Mchy Co., A. R., Toronto, Ont.

CHAIN, MALLEABLE, DETACHABLE AND RIVETED
Can. Link-Belt Co., Toronto, Ont.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

CHAINS, POWER TRANSMISSION
Canadian Link-Belt Co., Ltd., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, New York.
Glasgow, N.S.
Renold of Canada Ltd., Montreal.

CHAINS, SPROCKET WHEEL
Can. Link-Belt Co., Ltd., Toronto, Ont.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.

CHAIN DRIVES
Can. Link-Belt Co., Toronto, Ont.
Coventry Chain Co., Coventry, England.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold of Canada Ltd., Montreal.

CHASERS
National Acme Co., Cleveland, Ohio.
Taylor, J. A. M., 518 Stair Bldg., Toronto, Ont.

CHEMISTS
Toronto Testing Lab'tory, Ltd., Toronto

CHUCKS, AERO, AUTOMATIC
Garvin Machine Co., New York.

CHUCKS, CENTERING
Hoggson & Pettis Mfg. Co., New Haven, Conn.

CHUCKS, COLLET, AIR
Elliott & Whitehall Mach. & Tool Co. Galt, Ont.
Smalley-General Co., Inc., Bay City, Mich.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

CHUCKS, DRILL, LATHE AND UNIVERSAL
Aikenhead Hardware Co., Toronto, Ont.
Bertram & Sons Co., John, Dundas.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Ltd., Brantford.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Mach'y Co., Toronto.
Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Chicago, Ill.
Herbert Ltd., Alfred, Toronto, Ont.
Jacobs Mfg. Co., Hartford, Conn.
Ker & Goodwin Machine Co., Ltd.,
Knight Metal Products, Toronto.
Modern Tool Co., Erie, Pa.
Rice Lewis & Son, Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

CHUCKS, DRILL, AUTOMATIC AND KEYLESS
Aikenhead Hardware Co., Toronto, Ont
Can. Blower & Forge Co., Kitchener.
McCrosky Tool Corp., Meadville, Pa., U. S. A.

CHUCKS, FRICTION AND TAP
Victor Tool Co., Waynesboro, Pa.

CHUCKS, MAGNETIC
Heald Machine Co., Worcester, Mass.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co, Ltd., A. R., Montreal.

CHUCKS, RING WHEEL
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.

CHUCKS, WHEEL, CAR
Hoggson & Pettis Mfg. Co., New Haven, Conn.

CHUCKING MACHINES
Barber Mchy. Co., Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Garvin Machine Co., New York.
Gisholt Machine Co., Madison, Wis.
National Acme Co., Windsor, Vt.
Niles-Bement-Pond Co., New York.
Roslefson Machine & Tool Co., Toronto.
Warner & Swasey Co., Cleveland, O.
Wood Turret Mach. Co., Brazil, Ind.
Williams Mchy Co., A. R., Toronto, Ont.

CIRCULATING SYSTEMS FOR LUBRICATING OIL
Bowser Co., Ltd., S. F., Toronto, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

CLAY FIRE
Elk Fire Brick Co., Can., Ltd., Hamilton, Ont.

CLEANERS, METER, WASTE, GENERAL
Oakley Chemical Co., New York, N.Y.

CLEANING COMPOUND
Oakley Chemical Co., New York.

CLOCK SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

CLOCKS, WATCHMAN, PORTABLE
Gisholt Machine Co., Madison, Wis.

CLOSETS
Crane, Ltd., Montreal, Que.

CLUTCHES, CHAIN
Wright Mfg. Co., Lisbon, Ohio.

CLUTCHES, FRICTION AND PULLEY
Bernard Industrial Co., A., Fortierville, Q.
Can. Link-Belt Co., Toronto, Ont.
Carlyle Johnson Mach. Co., Manchester, Conn.
Positive Clutch & Pulley Wks., Aurora, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.

COAL CRUSHERS
Canadian Link-Belt Co., Ltd., Toronto, Ont.
Canadian Mead-Morrison Co., Limited, Montreal, Que.

COAL HANDLING MACHINERY
Brown Hoisting Machinery Co., Cleveland, Ohio.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Canadian Mead-Morrison Co., Limited, Montreal, Que.
Dominion Bridge Co., Montreal, Que.
MacGovern & Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont
Nova Scotia Steel & Coal Co., New

COLD ROLLED STRIP, ALL METAL
COLLARS, SHAFTING
Can. Driver-Harris Co., Ltd., Walkerville
Williams & Co., J. H., Brooklyn, N.Y.

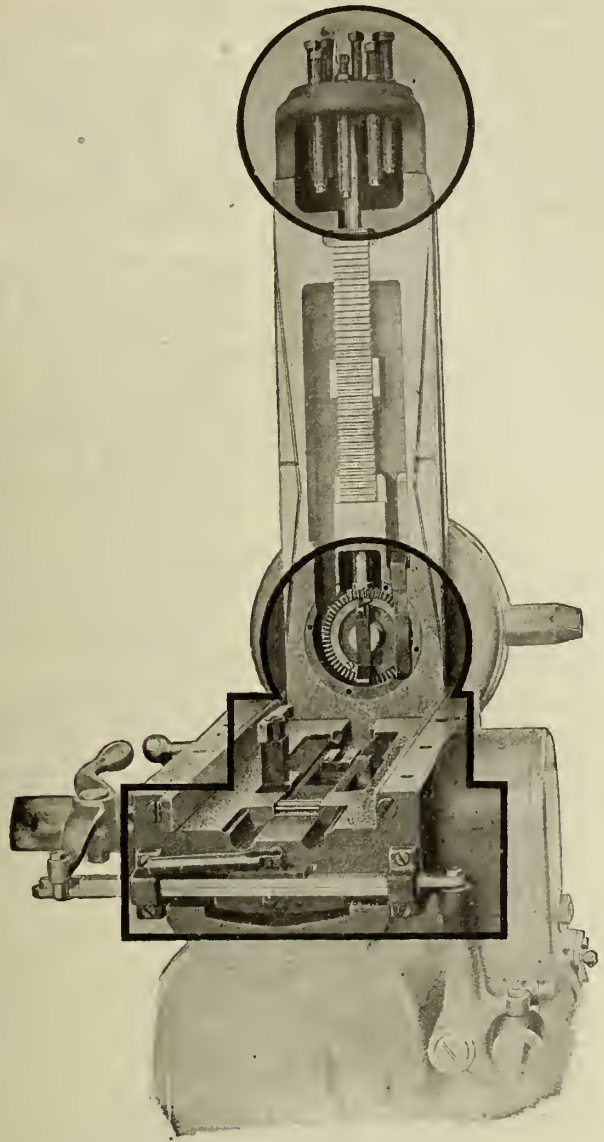
COLLECTORS, PNEUMATIC
Can. Blower & Forge Co., Kitchener.
Sturtevant Co., B. F., Galt, Ont.

COLLETS
Becker Milling Machine Co., Boston.

COMPOSITION INGOT
Canada Metal Co., Toronto, Ont.

COMPOUNDS, CUTTING AND GRINDING, DRAWING, STAMPING
Oakley Chemical Co., New York, N.Y.

COMPRESSORS, AIR
Atkins & Co., E. C., Hamilton, Ont.
Can. Ingersoll-Rand Co., Sherbrooke.
Cleveland Pneumatic Tool Co., Toronto.
Curtis Pneumatic Machy. Co., St. Louis
Elliott & Whitehall, Galt, Ont.
Garlock-Walker Machy. Co., Toronto.
Holden Co., Ltd., Montreal, Que.
MacGovern & Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto.



Time and labor-saving features are real production boosters and the points that speak for

Brown & Sharpe

Wire Feed Screw Machines

TURRET SLIDE FEATURES

Individual stop screws shown in circle, one for each turret position, obviate exact setting of each tool.

In addition to a positive lock by means of a taper pin which aligns the turret holes with the spindle, the larger machines are automatically clamped as the turret is moved forward, by a tapered bushing controlled by the rocker arm shown in the centre of the large bevel gear.

These features of rugged construction and practical design, combined with automatic feeding and chucking of stock and centralization of all levers—points vital to production, make these machines the choice of the discriminating manufacturer who must have high production and accuracy.

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PROVIDENCE, R.I., U.S.A.

Canadian Representative:--

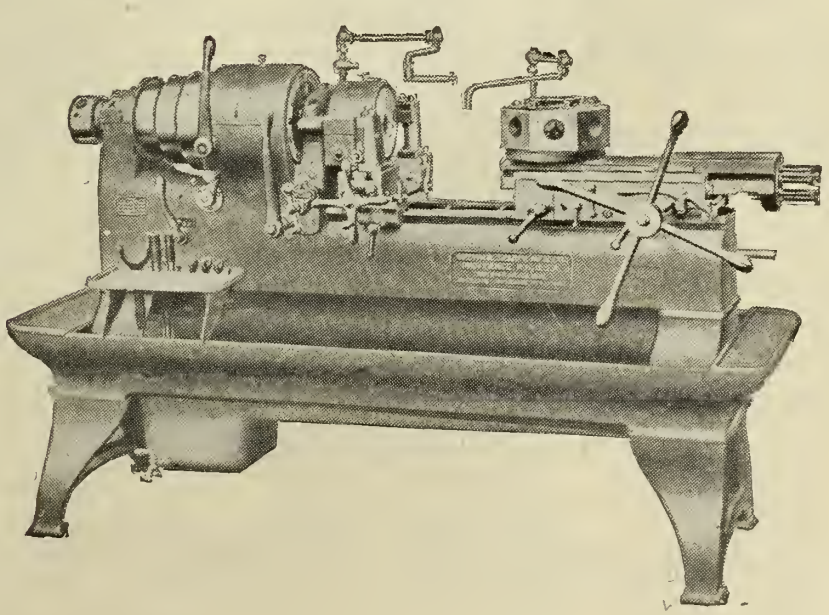
The Canadian Fairbanks-Morse Co., Limited

No. 6

Takes stock from ½-in. to 2-in. diameter—round, square or hexagonal.

This machine is the largest in our line of five, each of which is constructed with that same care and attention to detail for which Brown & Sharpe is known throughout the world.

Send for Catalog 22-G



If interested, tear out this page and keep with letters to be answered.

Superior Machinery Co., London, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

CONDENSERS

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
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Volta Mfg. Co., Welland, Ont.

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McCrosky Tool Corp., Meadville, Pa., U. S. A.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.

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Eclipse Counterbore Co., Ltd., Walkerville, Ont.

COUNTERBORES, INVERTED, INTERCHANGEABLE

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Brown & Sharpe Mfg. Co., Providence, R.I.
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Baird Machine Co., Bridgeport, Conn.
Ford-Smith Machine Co., Hamilton, Ont.
Foster Machine Co., Elkhart, Ind.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co, Ltd., A. R., Montreal
Williams Mchy Co., A. R., Toronto, Ont.

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Int. Machinery & Supply Co., Ltd., Montreal, Que.

COILING MACHINERY, WIRE AND SPRING

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COKE AND COAL

Hanna & Co., M. A., Cleveland, O.

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Gardner, Robt. & Son, Montreal.
Independent Pneumatic Tool Co., Chicago

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ELECTRIC

Volta Manufacturing Co., Welland, Ont.

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Can. Winkley Co., Ltd., Windsor, Ont.

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CRANE RUNWAYS

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Brown Hoisting Machinery Co., Cleveland, Ohio.

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Brown Hoisting Machinery Co., Cleveland, Ohio.
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MacKinnon Steel Co., Sherbrooke, Que.
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Niles-Bement-Pond Co., New York.
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Oliver Engineering Co., Montreal.

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Northern Crane Works, Walkerville.
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Graton & Knight Mfg. Co., Worcester, Mass.

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Oliver Machinery Co. Grand Rapids, Mich

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Garvin Machine Co., New York.
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Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Toronto, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Whitney Mfg. Co., Hartford, Conn.
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Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Foss Mchy & S'ply Co., Geo. F. Montreal
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hurlburt, Rogers Machy. Co., South Sudbury, Mass.
Kennedy & Sons, Wm., Owen Sound.
Lyman Tube & Supply Co., Montreal, Que.
Niles-Bement-Pond Co., New York, N.Y.
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Crescent Mche. Co., Ltd., Montreal, P.Q.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardner, Robt. & Son, Montreal.
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Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Acme Co., Cleveland, Ohio.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Rickert-Shafer Co., Erie, Pa.
Stoll Co., Inc., D. H., Buffalo, N.Y.
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Wells Brothers of Canada, Galt, Ont.
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DIES, DROP FORGE.

Kimber & Hillier Mfg., Co., St. Catharines, Ont.

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Pratt & Whitney Co., Dundas, Ont.
Walcott Lathe Co., Jackson, Mich

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Firth & Sons, Thos., Montreal, Que.
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Murchey Machine & Tool Co., Detroit.
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Strelinger, Chas. A. Co., Windsor, Ont.

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Stoll Co., D. H., Buffalo, N.Y.

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Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
National-Acme Co., Cleveland, Ohio.
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Pratt & Whitney Co., Dundas, Ont.
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Foss Mchy. & S'ply Co., G. F., Montreal
Garlock-Walker Mach. Co., Toronto.
Garvin Machine Co., New York.
Hoefer Mfg., Co., Freeport, Ill.
Henry & Wright Mfg. Co., Hartford, Conn
A. B. Jardine & Co., Hespeler, Ont.
Landis Tool Co., Waynesboro, Pa.
Nat. Automatic Tool Co., Richmond, Ind.
Niles-Bement-Pond Co., New York.
Rockford Drilling Mach Co., Rockford, Ill
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Garlock-Walker Machinery Co. Toronto.
Henry & Wright Mfg. Co., Hartford.
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Strelinger, Chas. A. Co., Windsor, Ont
Williams Mchy Co., A. R., Toronto, Ont.

STRELINGER'S

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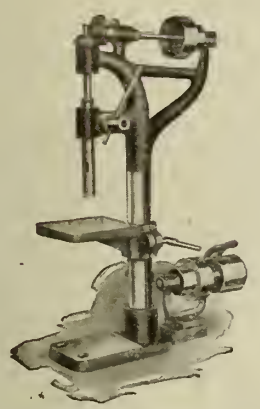

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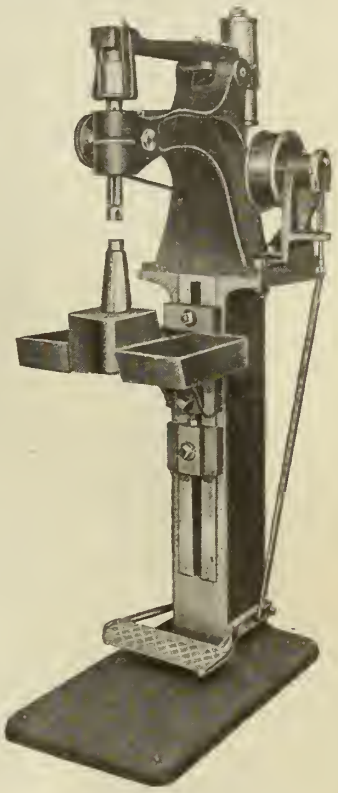
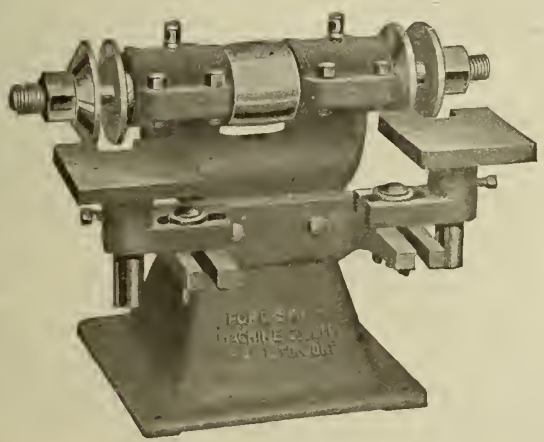
Deal with a firm which always does its best for you and which is capable of having a best worth while.

Get it at Strelinger's!



High Speed Hammer



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Ford-Smith Machine Co. Milling Machines;
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Edwin Harrington Sons Co. Drilling Machines;
Edwin Harrington Sons Co. Gap Lathes;
Foster Machine Co. Turret Lathes;
Foster Machine Co. Screw Machines;
Monarch Machine Tool Co. Lathes;
Porter Cable Machine Co. Production Lathes;
Standard Engineering Co. Hand Milling Machines;
Fisher Machine Co. Oil Groovers;
Atlas Press Co. Arbor Presses.

The Chas. A. Strelinger Co. of Canada, Ltd.

Windsor, Ontario

If interested tear out this page and place with letters to be answered.

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Canadian Fairbanks-Morse Co., Montreal.
Canadian Machinery Corp., Galt, Ont.
Geo. F. Foss Mch. & S'ply Co., Montreal
Garlock-Walker Mach. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
United States Mach. Tool Co., Cincinnati
Williams Mchy Co., A. R., Toronto, Ont.

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Garlock-Walker Mach. Co., Toronto, Ont
Can. Blower & Forge Co., Kitchener.
Canada Mach. Corp., Galt, Ont.
Garvin Machine Co., New York.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mach. Co., Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
A. B. Jardine & Co., Hespeler, Ont.
Knight Metal Products, Toronto.
Landis Tool Co., Waynesboro, Pa.
R. McDougall Co., Galt.
Nat. Automatic Tool Co., Richmond, Ind.
Rockford Drilling Mach. Co., Rockford, Ill
Niles-Bement-Pond Co., New York.
Silver Mfg. Co., Salem, Ohio.
Strelinger, Chas. A. Co., Windsor, Ont.
A. R. Williams Machinery Co., Toronto.

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Hoefer Mfg. Co., Freeport, Ill.

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Rice Lewis & Son, Toronto, Ont.
Silver Mfg. Co., Salem, Ohio.

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Can. Blower & Forge Co., Kitchener.
Can. Fairbanks-Morse Co., Montreal.
Geo. F. Foss Mch. & S'ply Co., Montreal
Garlock-Walker Machinery Co., Toronto.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
U.S. Electrical Tool Co., Cincinnati, O.

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Butterfield & Co., Inc., Rock Island, Que.
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Geo. F. Foss Mch. & S'ply Co., Montreal
A. B. Jardine & Co., Hespeler, Ont.
Morrow Screw & Nut Co., John, Ingersoll
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
Whitman & Barnes Mfg. Co., Akron, O.
Wilkinson & Kompass, Hamilton, Ont.
Wilt Twist Drill Co. of Can., Walkerville

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Cleveland Twist Drill Co., Cleveland.
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Morse Twist Drill & Machine Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto.
Rice Lewis & Son, Toronto, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
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Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
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Pratt & Whitney Co., Dundas, Ont.
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Standard Machy. & Supplies, Montreal.
Strelinger Co., Chas. A., Windsor, Ont.
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Wilt Twist Drill Co. of Can., Walkerville
Wilkinson & Kompass, Hamilton, Ont.
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Holden Co., Ltd., Montreal, Que.
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Canadian Fairbanks-Morse Co., Montreal.
Cincinnati Electrical Tool Co., Cincinnati.
Cleveland Twist Drill Co., Cleveland.
Garlock-Walker Mchy. Co., Toronto, Ont.
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Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Mch. Co., New Bedford Mass.
Pratt & Whitney Co., Dundas, Ont.
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Wells Bros. of Can., Galt, Ont.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

GRINDERS, DIE AND CHASER
Haskins & Co., R. C., Chicago, Ill.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
National-Acme Co., Cleveland, Ohio.

GRINDERS, DISK
Armstrong Bros. Tool Co., Chicago, Ill.
Atkins & Co., E. C., Hamilton, Ont.
Ford-Smith Mach. Co., Hamilton.
Gardner Machine Co., Beloit, Wis.
Heald Machine Co., Worcester, Mass.

GRINDERS, FLEXIBLE CASTING
Manhattan Machine & Tool Co., Grand Rapids, Mich.

GRINDERS, DRILL
Aikenhead Hardware Co., Toronto.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield,
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
United States Elec. Tool Co., Cincinnati.
Wells Bros. of Canada, Galt, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

GRINDERS, CYLINDER, INTERNAL
Barber Mchy. Co., Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I
Foss Mchy. & S'ply Co., G. F., Montreal.
Greenfield Machine Co., Greenfield, Mass.
Heald Machine Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Norton Co., Worcester, Mass.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

GRINDERS, PORTABLE, ELECTRIC HAND, TOOL POST, FLOOR AND BENCH
Baird Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Ford-Smith Mach. Co., Hamilton, Ont.
Haskins & Co., R. C., Chicago, Ill.
Grant Mfg. & Mach. Co., Bridgeport, Con
Garlock-Walker Machinery Co., Toronto.
Greenfield Machine Co., Greenfield, Mass.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool Co., Chicago
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
United States Elec. Tool Co., Cincinnati
Wisconsin Electric Co., Inc., Racine, Wis.
Williams Mchy Co., A. R., Toronto, Ont.
Wilkinson & Kompass, Hamilton, Ont.

GRINDERS, MANUFACTURING
Barber Mchy. Co., Ltd., Toronto, Ont.
Universal Grinding Mach. Co., Fitchburg, Mass.

GRINDERS, HOLE, HOLE AND AND DEEP HOLE
Barber Mchy. Co., Ltd., Toronto, Ont.
Bryant Chucking Grinder Co., Springfield, Vermont.
Heald Machine Co., Worcester, Mass.

GRINDERS, PLAIN CYLINDRICAL
Barber Mchy. Co., Ltd., Toronto, Ont.
Fitchburg Grinding Mach. Co., Fitchburg, Mass.

GRINDERS, PNEUMATIC
Can. Ingersoll-Rand Co., Montreal.
Cleveland Pneumatic Tool Co., Toronto.
Garlock-Walker Machinery Co., Toronto.
Heald Machine Co., Worcester, Mass.
Independent Pneumatic Tool Co., Chicago
MacGovern & Co., Montreal, Que.

GRINDERS, PROFILE
Cleveland Milling Machine Co., Cleveland.

GRINDERS, ROTARY SURFACE
Brown & Sharpe Mfg. Co., Providence, R.I
Bristol Machine Tool Co., Bristol, Conn.
Manhattan Machine & Tool Co., Grand Rapids, Mich.

GRINDERS, TOOL AND HOLDER
Armstrong Bros. Tool Co., Chicago.
W. F. & John Barnes Co., Rockford, Ill.
Blount & Co., J. G., Everet, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I
Ford-Smith Machine Co., Hamilton, Ont.
Greenfield Machine Co., Greenfield, Mass.
Greenfield Tap & Die Corp., Greenfield.
National-Acme Co., Cleveland, Ohio.
Tabor Mfg. Co., Philadelphia, Pa.
Wells Bros. of Canada, Galt, Ont.

GRINDERS, UNIVERSAL, PLAIN
Barber Mchy. Co., Ltd., Toronto, Ont.
Manhattan Machine & Tool Co., Grand Rapids, Mich.
Modern Tool Co., Erie, Pa.
Norton Co., Worcester, Mass.
Williams Mchy Co, Ltd., A. R., Montreal

GRINDERS, VERTICAL SURFACE
Brown & Sharpe Mfg. Co., Providence, R.I
Can. Fairbanks-Morse Co., Montreal.
Heald Machine Co., Worcester, Mass.
Petrie, Ltd., H. W., Toronto.
Pratt & Whitney Co., Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Norton Co., Worcester, Mass.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

GRINDING DISCS
Wausau Abrasives Co., Chicago, Ill.

GRINDING AND POLISHING MACHINES, PORTABLE, PNEUMATIC AND SPRING FRAME
Can. Fairbanks-Morse Co., Montreal.
Cincinnati Elec. Tool Co., Cincinnati, O.
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner & Son, Robt., Montreal.
Garvin Machine Co., New York.
Garlock-Walker Machy. Co., Toronto.
Greenfield Machine Co., Greenfield, Mass.
Haskins & Co., R. C., Chicago, Ill.
Herbert Ltd., Alfred, Toronto, Ont.
Niles-Bement-Pond Co., New York, N.Y.
Norton Co., Worcester, Mass.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
Wisconsin Electric Co., Racine, Wis.
Williams Mchy Co., A. R., Toronto, Ont.
Williams Tool Corp. of Can. Ltd., Brantford, Ont.

GRINDING MACHINES, CAR WHEEL, CUTTER, CYLINDRICAL, CRANKSHAFT
Barber Mchy. Co., Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I
Norton Co., Worcester, Mass.

GRINDING WHEELS
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., E. C., Hamilton, Ont.
Brantford Emery Wheel Co., Brantford.
Can. Fairbanks-Morse Co., Montreal.
Carborundum Co., Niagara Falls, N.Y.
Dominion Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Mchy. & S'ply Co. G. F., Montreal
Norton Co., Worcester, Mass.

GRINDING WHEEL DRESSER
Dominion Abrasive Wheel Co., Ltd., Mimico, Ont.

GUARDS, WINDOW AND MACHINE
Canada Machinery Corp., Galt, Ont.
Canada Wire & Iron Goods Co., Hamilton
Dennis Wire & Iron Works, London, Ont
B. Greening Wire Co., Hamilton, Ont.
Page Steel & Wire Co., Adrian, Mich.

GUTTERS AND SKYLIGHTS
H. H. Robertson, Ltd., Sarnia, Ont.

HACK SAW BLADES
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., E. C., Hamilton, Ont.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Can. Fairbanks-Morse Co., Montreal.
Diamond Saw & Stamping Wks., Buffalo.
Ford-Smith Machine Co., Hamilton, Ont.
Kayser-Ellison & Co., Ltd., Montreal.
Lyman Tube & Supply Co., Montreal, Que.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Rlewes, Ltd., Winnipeg, Man.
Pilot Steel & Tool Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto.
Racine Tool & Machine Co., Racine, Wis.
Rice Lewis & Son, Toronto, Ont.
Simonds Mfg. Co., Fitchburg, Mass.
L. S. Starrett Co., Athol, Mass.
Standard Machy. & Supplies, Montreal.
Strelinger, Chas. A. Co., Windsor, Ont.
Victor Saw Works, Ltd., Hamilton.
Wilkinson & Kompass, Hamilton.
Williams Mchy Co., A. R., Toronto, Ont.

HANDLES, BALANCE, CRANK AND MACHINE
Williams & Co., J. H., Brooklyn, N.Y.

HANGERS, SHAFT
Can. Link-Belt Co., Ltd., Toronto, Ont.

HACK SAW FRAMES
Aikenhead Hardware Co., Toronto.
Atkins & Co., E. C., Hamilton, Ont.
Can. Fairbanks-Morse Co., Montreal.
Ford-Smith Machine Co., Hamilton, Ont.
Garvin Machine Co., New York City.
Victor Saw Works, Hamilton, Ont.
Rice Lewis & Son, Toronto, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
Wilkinson & Kompass, Hamilton, Ont.

HACK SAWS, POWER
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., E. C., Hamilton, Ont.
Can. Fairbanks-Morse Co., Montreal.
Diamond Saw & Stamping Wks., Buffalo.
Foss Mchy. & S'ply Co., G. F., Montreal.
Ford-Smith Machine Co., Hamilton.
Perfect Machine Co., Galt, Ont.
Starrett Co., L. S., Athol, Mass.
Victor Saw Works, Hamilton, Ont.
Williams Machy. Co., A. R., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

HAMMERS, FORGING
Nazel Eng. & Mach. Wks., Philadelphia.

HAMMERS, ELECTRIC
Hoskins & Co., R. C., Chicago, Ill.

Morton Travelling Head Planer

Handles Large or Small Work With Equal Economy

With the Morton Travelling Head Planer you can tackle the most difficult jobs with the certainty of being able to complete them economically and expeditiously. It handles both large and small work with maximum economy.

The multiplicity of operations of the Morton Travelling Head Planer makes possible the complete machining of difficult jobs at one setting of the casting. This tool operates as a draw-cut planer but may be quickly converted to operate with a push cut. It bores, mills and drills at right angles to the ram, as well as in the same plane. Special attachments may be obtained for spherical boring.

Special Features

It may be used either as a portable or stationary machine as the bottom side of the bed is planed.

It is reversible and may be quickly converted into a large, horizontal, travelling head slotter.

All milling, boring and planing feeds and adjustments may be quickly changed to meet conditions.

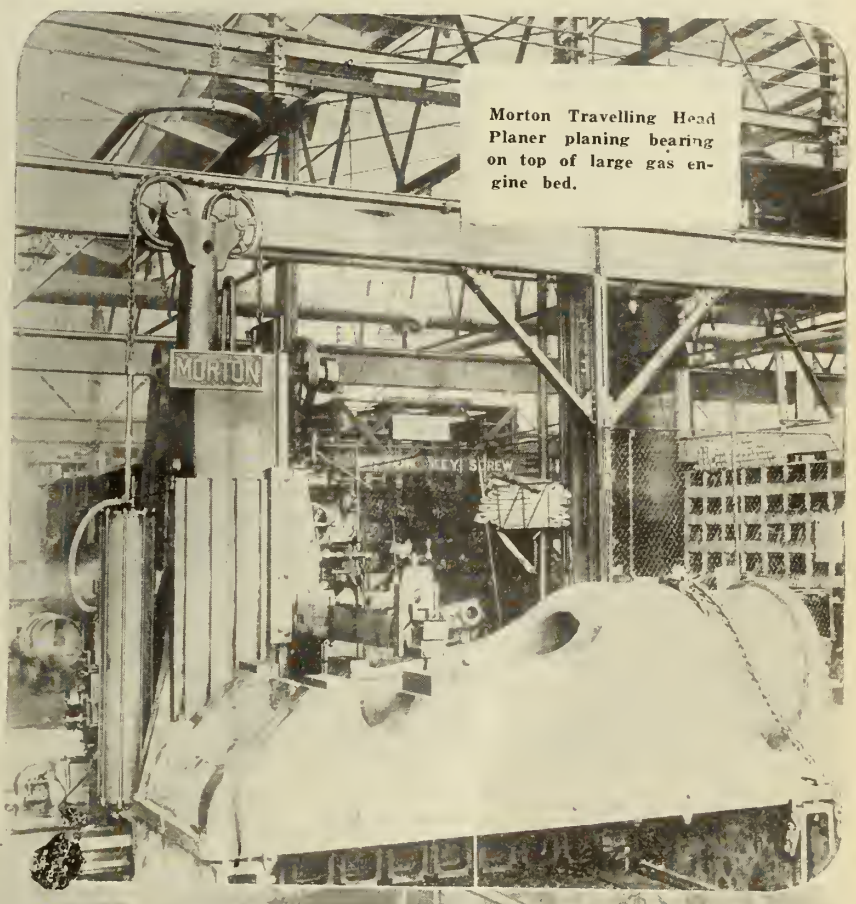
It will vertical mill and drill at right angles with the ram, at any 90-degree point of an arc.

Every operating lever is within easy reach of the operator.

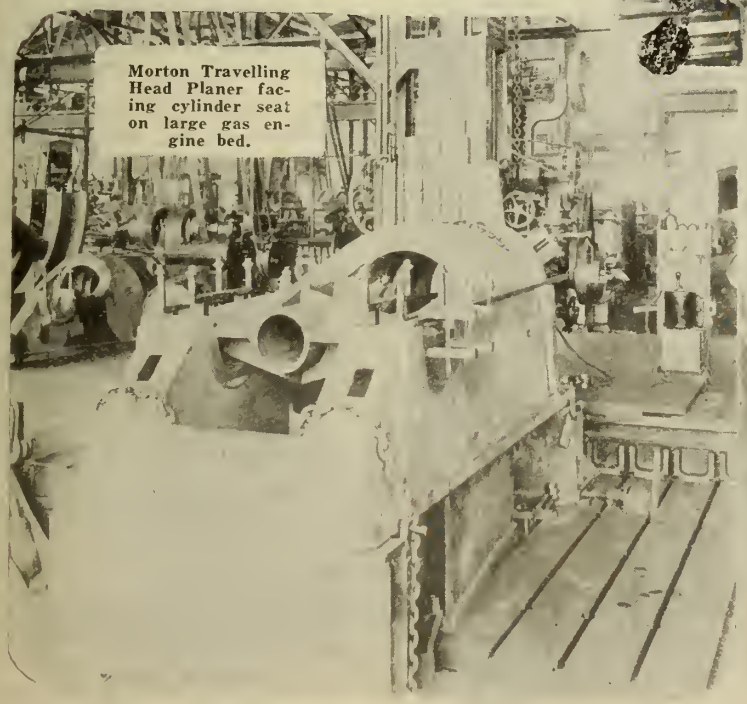
It requires one-half the floor space and one-fourth the power of a housed planer of equal capacity.

Complete Information in Bulletin No. 8A. Write for it to-day.

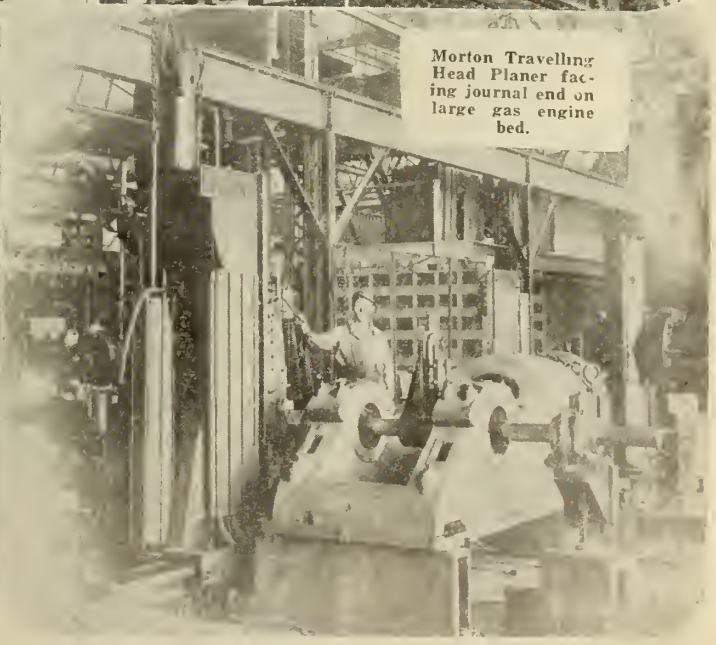
Morton Mfg. Co.
Muskegon Heights, Mich., U.S.A.



Morton Travelling Head Planer planing bearing on top of large gas engine bed.



Morton Travelling Head Planer facing cylinder seat on large gas engine bed.



Morton Travelling Head Planer facing journal end on large gas engine bed.

If interested tear out this page and place with letters to be answered.

HAMMERS (DROP), MOTOR AND BELT DRIVEN
Beaudry & Co., Boston, Mass.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton.
Can. Billings & Spencer, Ltd., Welland.
Canada Machinery Corp., Galt, Ont.
High Speed Hammer Co., Rochester, N.Y.
Jardine & Co., A. B., Hespeler, Ont.
Niles-Bement-Pond Co., New York, N.Y.
Petrie, Ltd., H. W., Toronto.
Toledo Machine & Tool Co., Toledo.
United Hammer Co., Boston, Mass.
Williams Mchy Co, Ltd., A. R., Montreal

HAMMERS, HELVE POWER
Canada Machinery Corp., Galt, Ont.
Petrie, Ltd., H. W., Toronto.
West Tire Setter Co., Rochester, N.Y.
Williams Mchy Co, Ltd., A. R., Montreal

HAMMERS, CHIPPING, CAULKING, PNEUMATIC
Can. Ingersoll-Rand Co., Montreal, Que.
Garlock-Walker Machinery Co., Toronto.
Independent Pneumatic Tool Co., Chicago.
Nazel Eng. & Mach. Wks., Philadelphia.

HAMMERS, MARKING
Matthews & Co., Jas. H., Pittsburgh, Pa.

HAMMERS, NAIL MACHINE
Rice Lewis & Son, Toronto, Ont.
United Hammer Co., Boston, Mass.

HAMMERS, POWER
Nazel Eng. & Mach. Wks., Philadelphia.

HAMMERS, STEAM
Canada Machinery Corp., Galt, Ont.
Niles-Bement-Pond Co., New York.

HAND PLANERS
Oliver Mchry. Co., Grand Rapids, Mich.

HAND PLANING AND JOINTING MACHINERY
Oliver Engineering Co., Montreal, P.Q.

HAND LEATHERS OR PADS
Graton & Knight Mfg. Co., Montreal.

HANDLES, FIBRE
Diamond State Fibre Co., Bridgeport, Pa.

HANGERS
Brown & Sharpe Mfg. Co., Providence, R.I.
Canadian Link-Belt Co., Ltd., Toronto, Ont.

HANGERS, SHAFT
Algoma Steel Corp., Sault Ste. Marie.
Chapman Double Ball Bearing Co., Toronto.
Gray Ball Bearing Co., Ltd., Toronto.
Baird Machine Co., Bridgeport, Conn.
Can. S K F Co., Toronto, Ont.
Gardner & Son, Robt., Montreal.
Jones & Glassco, Montreal.
Williams Mchy Co, Ltd., A. R., Montreal

HARDNESS TESTING INSTRUMENTS
Shore Instrument & Mfg. Co., New York.

HEAD, AUXILIARY
Hoefer Mfg. Co., Freeport, Ill.

HEATING AND VENTILATING ENGINEERS
Can. Blower & Forge Co., Kitchener, Ont.
Sturtevant Co., B. F., Galt, Ont.

HEAT GAUGES, HARDENING AND ANNEALING
Shore Instrument & Mfg. Co., New York

HEAT TREATING EQUIPMENT
Chicago Flexible Shaft Co., Chicago, Ill.

HELMETS, SANDBLAST, AMMONIA
Strong, Kennard & Nutt Co., Cleveland

HIGH SPEED STEEL
See Steel.

HINGE MACHINERY
Baird Machine Co., Bridgeport, Conn.

HINGES
Butterfield & Co., Inc., Rock Island, Que.
London Bolt & Hinge Wks., London, Ont.

HOBS
Greenfield Tap & Die Co., Greenfield, Mass.
Pratt & Whitney Co., Dundas, Ont.
Taylor, J. A. M., 318 Stair Bldg., Toronto
Wells Bros. of Canada, Galt, Ont.

HOISTING MACHINERY
Canadian Mead-Morrison Co., Limited, Montreal, Que.

HOISTS, AIR
Can. Ingersoll-Rand Co., Ltd., Sherbrooke
Holden Co., Ltd., Montreal, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

HOISTS, CHAIN AND PNEUMATIC
Can. Ingersoll-Rand Co., Montreal, Que.
Garlock-Walker Machinery Co., Toronto.
Ford Chain Block & Mfg., Philadelphia.
Independent Pneumatic Tool Co., Chicago
Lyman Tube & Supply Co., Montreal, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Wright Mfg. Co., Lisbon, Ohio.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co, Ltd., A. R., Montreal

HOISTS, ELEC., STATIONARY, MONO RAIL
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
A. Leatty & Sons, Ltd., Welland, Can.
Oliver Engineering Co., Montreal.
Volta Mfg. Co., Welland, Ont.

HOISTS, ELECTRICAL
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Montreal, Que.
Electric Steels & Metals Ltd., Welland.
Kennedy & Sons, Owen Sound, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co, Ltd., A. R., Montreal

HOLDERS, ADJUSTABLE LENGTH
Eclipse Counterbore Co., Ltd., Walkerville, Ont.

HOLDERS, STEEL DIE FOR MARKING
Matthews & Co., Jas. H., Pittsburgh, Pa.

HOLDERS, ELECTRIC
Electric Steels & Metals, Ltd., Welland

HOOKS, BELT LACING
Clipper Belt Lacer Co., Grand Rapids.

HOPPERS
MacKinnon Steel Co., Ltd., Sherbrooke.
Dominion Bridge Co., Montreal, Que.
William Hamilton Co., Peterboro, Ont.
Toronto Iron Works, Ltd., Toronto, Ont.

HOSE, FIRE PROTECTION
Quaker City Rubber Co, Philadelphia, Pa
International Mach. Sply, Ltd., Montreal

HOSE, PNEUMATIC
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto.
Gutta Percha & Rubber, Ltd., Toronto.
Independent Pneumatic Tool Co., Chicago.
Quaker City Rubber Co., Philadelphia, Pa.
Wells Bros. Co. of Canada, Galt, Ont.

HOSE, ALL KINDS
Goodyear Tire & Rubber Co., of Canada, Ltd., Toronto.
Gutta Percha & Rubber, Ltd., Toronto.
Quaker City Rubber Co, Philadelphia, Pa
International Mach. Sply, Ltd., Montreal
Dunlop Tire & Rubber Goods Co., Ltd., Toronto.

HOSE, SAND BLAST
Pangborn Corporation, Hagerstown, Md.
Goodyear Tire & Rubber Co. of Can., Ltd. Toronto
Quaker City Rubber Co., Philadelphia, Pa.
Intern'l. Machine Tool Co., Indianapolis.

HOSE, STEAM, SUCTION AND WATER
Gutta Percha & Rubber, Ltd., Toronto.
Quaker City Rubber Co, Philadelphia, Pa
International Mach. Sply, Ltd., Montreal
Dunlop Tire & Rubber Goods Co., Ltd., Toronto.

HUMIDIFIERS
Sturtevant Co., B. F., Galt, Ont.

HYDRAULIC ACCUMULATORS
Dom. Steel Products Co., Ltd., Brantford.

HYDRAULIC MACHINERY
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Dom. Steel Products Co., Ltd., Brantford.
Eastern Production Co., Detroit, Mich.
Garlock-Walker Machinery Co., Toronto.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Metalwood Mfg. Co., Detroit, Mich.
Niles-Bement-Pond Co., New York.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.
West Tire Setter Co., Rochester, N.Y.
Victoria Foundry Co., Ottawa.

HYDRAULIC TURBINES
Que.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,

HYDROMETERS, HYGROMETERS, HYGRODNIKS
Taylor Instrument Co., Rochester, N.Y.

INDICATORS, SPEED
Athenhead Hardware Co., Toronto, Ont.
Atkins & Co., E. C., Hamilton, Ont.
Brown & Sharpe Mfg. Co., Providence.
Starrett Co., L. S., Athol, Mass.

INDEX CENTRES
Brown & Sharpe Mfg. Co., Providence, R.I.
Dickow, Fred. C., Chicago, Ill.
Ford-Smith Machine Co., Hamilton, Ont.
Garvin Machine Co., New York.
Petrie, Ltd., H. W., Toronto.

INDICATING INSTRUMENTS
Taylor Instrument Co., Rochester, N.Y.

INDICATING SCALES
Can. Kron Scale Co., Montreal.

INDUSTRIAL SITES
City of St. Johns, Quebec.

INGOTS, BRASS, BRONZE, GUN METAL, PHOSPHOR
Thomas Moore & Son, Montreal.

INGOTS, FORGING AND ROLLING
Electric Steel & Metals Co., Welland.

INSULATING COMPOUNDS
Robertson Co., Ltd., H. H., Sarnia, Ont.

INSTRUMENTS, ENGINEERING
Consolidated Optical Co., Toronto.

IRON ORE
Hanna & Co., M. A. Cleveland, O.

IRON, WROUGHT, ROLLED, PIG
Swedish Steel & Impt. Co., Ltd., Montreal

JACKS
Athenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Globe Engineering Co.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Norton, A. O., Coaticook, Que.
Rice Lewis & Son, Toronto, Ont.
Petrie, Ltd., H. W., Toronto.

JACKS, PIT AND TRACK
Canadian Fairbanks-Morse Co., Montreal.
Lyman Tube & Supply Co., Montreal, Que.
Northern Crane Works, Walkerville.

JAWS, FACE PLATE
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Ltd., Brantford.
Skinner Chuck Co., New Britain, Conn.

JIGS, TOOLS, ETC.
Ackworthie Ltd., J., Birmingham, Eng.
Brown Engineering Corp., Toronto.
Crescent Mach. Co., Ltd., Montreal, P.Q.
Elliott & Whitehall Mach. & Tool Co., Galt.
Gisholt Machine Co., Madison, Wis.
Globe Engineering Co., Ltd., Hamilton.
Homer & Wilson, Hamilton, Ont.
Jones & Lamson, Springfield, Vt.
Toronto Tool Co., Toronto, Ont.

JOURNAL WEDGES
Canada Foundries & Forgings, Welland.
Dominion Foundries & Steel Ltd., Hamilton, Ont.

KEY SEATERS
Garlock-Walker Machy. Co., Toronto, Ont.
Garvin Machine Co., New York.
Morton Mfg. Co., Muskegon Heights, M.
Petrie, Ltd., H. W., Toronto.
Williams Machy. Co., A. R., Toronto.

KEYS, MACHINE
Whitney Mfg. Co., Hartford, Conn.
Williams & Co., J. H., Brooklyn, N.Y.

KILNS
Can. Blower & Forge Co., Kitchener, Ont.
General Combustion Co., Ltd., Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
Sturtevant Co., B. F., Galt, Ont.

KNIVES, MACHINE
Atkins & Co., E. C., Hamilton, Ont.

LABELS AND TAGS
Matthews & Co., Jas. H., Pittsburgh, Pa.

LABORATORIES, INSPECTION AND TESTING (see Chemists)

LADLES, FOUNDRY
Northern Crane Works, Walkerville.

LACING MACHINES
Clipper Belt Lacer Co., Grand Rapids, M.

LAG SCREW GIMLET POINTERS
National Machy. Co., Tiffin, Ohio.

LATH
Robertson, Ltd., H. H., Sarnia, Ont.

LATHES, CHUCKING
Acme Machine Tool Co., Cincinnati, Ohio.
Petrie, Ltd., H. W., Toronto.
Wood Turret Machine Co., Brazil, Ind.

LATHE CHUCKS (See Chucks)

LATHE DOGS AND ATTACHMENTS
Armstrong Bros. Tool Co., Chicago.
Handey Machine Co., Torrington, Conn.
Williams & Co., J. H., Brooklyn, N.Y.

LATHES, AUTOMATIC AND SEMI-AUTOMATIC
Gisholt Machine Co., Madison, Wis.
Wood Turret Machine Co., Brazil, Ind.

LATHES, AXLE
Barber Mchy. Co., Ltd., Toronto, Ont.
Betts Mach. Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.

LATHES, BORING
Barber Mchy. Co., Ltd., Toronto, Ont.
Bridgeford Mach. Tool Works, Rochester.
Canada Machinery Corp., Galt, Ont.
Ledge & Shipley, Cincinnati, O.
Petrie, Ltd., H. W., Toronto.

LATHES, PRECISION, BENCH
W. F. & John Barnes Co., Rockford.
J. G. Blount & Co., Everett, Mass.
Canadian Fairbanks-Morse Co., Montreal.
Geo. F. Foss Machy. & Supply Co., Montreal.
Garlock-Walker Machinery Co., Toronto.
Hardinge Bros., Chicago, Ill.
Petrie, Ltd., H. W., Toronto.
Pratt & Whitney Co., Dundas, Ont.
Seneca Falls Mfg Co., Seneca Falls, N.Y.
Strelinger Co., C. A., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

LATHES, BRASS
Ackworthie Ltd., J., Birmingham, Eng.
Acme Machine Tool Co., Cincinnati, Ohio.
Hardinge Bros., Chicago, Ill.
Wood Turret Machine Co., Brazil, Ind.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

LATHES, ENGINE
Acme Machine Tool Co., Cincinnati, O.
Barber Mchy. Co., Ltd., Toronto, Ont.
John Bertram & Sons, Co., Dundas.
Canada Machy. Corp., Galt, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cisco Machine Tool Co., Cincinnati, O.
G. F. Foss, Mchy. & S'ply Co., Montreal
Garlock-Walker Machinery Co. Toronto.
Garvin Machine Co., New York.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Kennedy & Sons, Wm., Owen Sound, Ont.
Lehman Mach. Co., St. Louis, Mo.
R. McDougall Co., Galt.
Niles-Bement-Pond Co., New York.
Perfect Machine Co., Galt, Ont.
Rae Mach. Tool Co., Hamilton.
Smalley-General Co., Inc., Bay City, Mich.
Standard Equipment & Tool Wks. Montreal, P.Q.
Seneca Falls Mfg. Co., Seneca Falls, N.Y.
Sidney Tool Co., Sidney, Ohio.
Strelinger Co., C. A., Windsor, Ont.
Wabcott Lathe Co., Jackson, Mich.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
Rae Mach. Tool Co., Hamilton.
Williams Mchy. Co., A. R., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

LATHES, FOOT POWER
Seneca Falls Mfg. Co., Seneca Falls, N.Y.

LATHES, HORIZONTAL
Intern'l. Mchy. Supplies Ltd., Montreal.
Wood Turret Machine Co., Brazil, Ind.

LATHES, JOURNAL TRUEING
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.

LATHE MANDRELS, HARDENED AND GROUND
Elliott & Whitehall, Galt, Ont.

LATHES, PATTERNMAKERS'
J. G. Blount Co., Everett, Mass.
Can. Machinery Corp., Galt.
Wood Turret Machine Co., Brazil, Ind.
G. F. Foss Mchy. & S'ply Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.

LATHES, POLISHING
Ackworthie Ltd., J., Birmingham, Eng.
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

LATHES, SCREW CUTTING
Barber Mchy. Co., Ltd., Toronto, Ont.
Bertram & Sons Co., John, Dundas, Ont.
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Cisco Machine Tool Co., Cincinnati, O.
Foss Mchy. & Sply Co., G. F., Montreal
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Hepburn Ltd., John T., Toronto, Ont.
Lehman Machine Co., St. Louis, Mo.
Niles-Bement-Pond Co, New York.
Rae Mach. Tool Co., Hamilton.
Seneca Falls Mfg. Co., Seneca Falls, N.Y.
Strelinger Co., C. A., Windsor, Ont.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
Williams Machy. Co., A. R., Toronto.
Wood Turret Machine Co., Brazil, Ind.

LATHES, SPINNING
Bliss Co., E. W., Brooklyn, N.Y.

LATHES, TOOL ROOM
Barber Mchy. Co., Ltd., Toronto, Ont.
Cisco Machine & Tool Co., Cincinnati, O.
Canada Machinery Corporation, Galt, Ont.
Knight Metal Products, Toronto.
Lehman Machine Co., St. Louis, Mo.
Rae Mach. Tool Co., Hamilton.
Seneca Falls Mfg. Co., Seneca Falls, N.Y.

LATHES, QUICK CHANGE
Lehman Machine Co., St. Louis, Mo.

LATHE SAWS
Atkins & Co., E. C., Hamilton, Ont.

LATHES, TURRET
Acme Machine Tool Co., Cincinnati, Ohio
Hardinge Bros., Chicago, Ill.
Herbert Ltd., Alfred, Toronto, Ont.

LEAD, PIG AND BAR
British Smelting & Refining Co., Ltd., Montreal, Que.

LEAD BURNING OUTFITS
Power Brass Works, Sycamore, Ill.

LEATHER STRAPPING
Graton & Knight Mfg. Co., Worcester, M.

LENSES FOR GOGGLES
Standard Optical Co. Geneva, N.Y.

LEVELS
Hughes, Owens Co., Ltd., Montreal, Que.

LIDS, SCREW TOP AND HINGE
Can. Whitney Co., Ltd., Windsor, Ont.

LINK BELTING
See Belting, Chain.

LIFT TRUCKS
Can. Kron Scale Co., Montreal.

LINOLEUM MILL MACHINERY
Bertrams, Ltd., Edinburgh, Scotland.

LOCKERS, STEEL WARDROBE AND STEEL MATERIAL
Canada Wire & Iron Gds. Co., Hamilton.
Dennis Wire & Iron Works, London, Ont.

LUBRICANTS
Cataract Refining & Mfg. Co., Toronto.
Swan & Finch, Inc., New York.

LUBRICANTS, CUTTING AND GRINDING, DRAWING, STAMPING
Oakley Chemical Co., New York, N.Y.

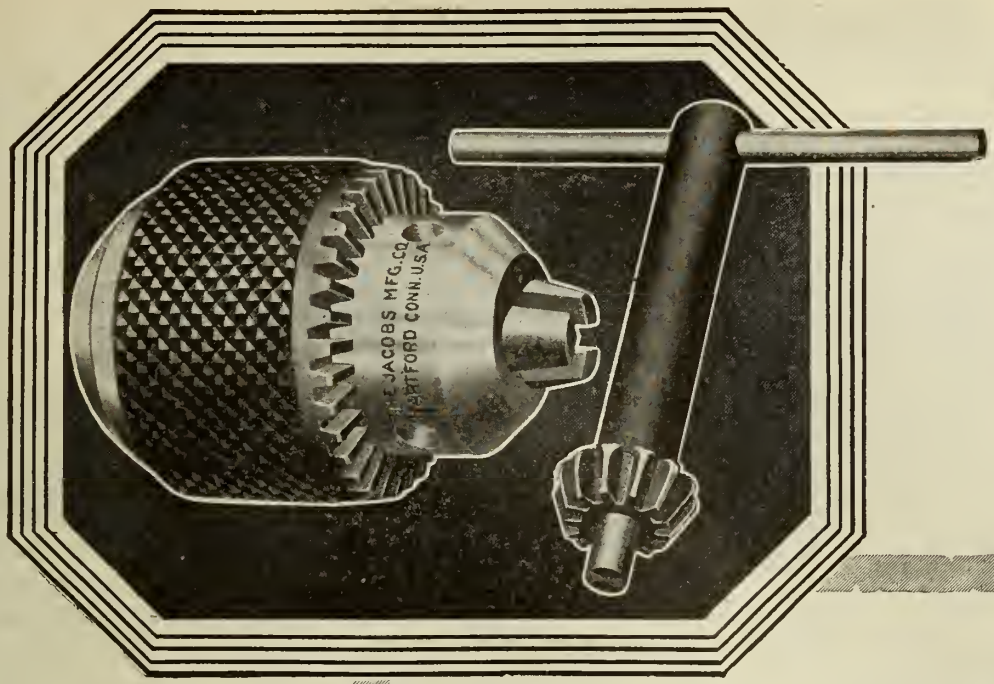
LUBRICATING, OIL FILTERING AND CIRCULATING SYSTEMS
Bower Co., Ltd., S. F., Toronto, Ont.

LUBRICATORS
Trabern Pump Co., Rockford, Ill.

LUMBERMEN'S TOOLS
Thos. Pink Co., Ltd., Pembroke, Ont.

MACHINE COUNTER WEIGHTS
Katie Foundry, Galt, Ont.

MACHINE TOOLS
Barber Mach. Co., F. F., Toronto, Ont.
Knight Metal Products, Toronto.



AN ACCESSORY? YES— — ——BUT

An accessory will sometimes through sheer intrinsic merit of its own assume the importance of a principal.

The exceptional performance of Jacobs Chucks resulting in greater efficiency, convenience, ease of handling, and economy in drilling operations is a case in point.

When you buy Jacobs Chucks for your plant, or drills equipped with Jacobs Chucks, you are buying better drilling. Henceforth you think of Jacobs Chucks as the principal in connection with better drilling.

THE JACOBS MFG. CO.

DEPT. C.M.

HARTFORD — CONN.

Jacobs Chucks

If interested tear out this page and place with letters to be answered.

MACHINERY DEALERS
Archibald & Co., Chas. P., Montreal.
Barber Mchy. Co., Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Elliott & Whitehall, Galt, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Machy. Co., A. R., Toronto.

MACHINERY GUARDS (See Guards)

MACHINERY SUPPLIES
Crescent Machine Co., Ltd., Montreal.
Globe Engineering Wks., Hamilton, Ont.
Knight Metal Products, Toronto.

MACHINERY, SPECIAL
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Crescent Machine Co., Ltd., Montreal, Que.
McClean Machine & Tool Co., Ltd., Hamilton, Ont.

MACHINISTS' TOOLS
Atkins & Co., E. C., Hamilton, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.

MAGNETIC BRAKES FOR ELECTRIC MOTORS
Volta Mfg. Co., Welland, Ont.

MANDRELS
Butterfield & Co., Inc., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Jardine & Co., A. B., Hespeler, Ont.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
McCrosky Tool Corp., Meadville, Pa., U. S. A.
Pratt & Whitney Co., Dundas, Ont.

MARKING DEVICES
Matthews & Co., Jas. H., Pittsburgh, Pa.

MARKING MACHINERY
Brown, Boggs Co., Hamilton, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Perrin, Wm. R., Toronto.
Petrie, Ltd., H. W., Toronto.

MATERIALS, HANDLING PLANTS
Canadian Mead-Morrison Co., Limited, Montreal, Que.

MATS, RUBBER MATTING
Quaker City Rubber Co., Philadelphia, Pa.
International Mchy. Sply., Ltd., Montreal

MEASURING MACHINES
Pratt & Whitney Co., Dundas, Ont.

MEASURES, REGISTERING
Bowser Co., Ltd., S. F., Toronto, Ont.

MEASURING TAPES AND RULES
Chesterman & Co., Jas., Sheffield, Eng.

MERCHANTS, IRON AND STEEL
Samuel Osborne (Can.), Ltd., Montreal.

METALLURGISTS
See Chemists.

METAL CLEANERS
Oakley Chemical Co., New York, N.Y.

METAL CUTTING MACHINES
Atkins & Co., E. C., Hamilton, Ont.
Lyman Tube & Supply Co., Montreal, Que.

METAL SAWS
See Saws.

METAL, ANTI-FRICTION
Thos. Moore & Son, Montreal.

METAL SAWS, POWER
E. C. Atkins & Co., Inc., Indianapolis.
Hoefer Mfg. Co., Freeport, Ill.
Lyman Tube & Supply Co., Montreal, Que.

METALS
British Smelting & Refining Co., Ltd., Montreal, Que.
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.
Canada Metal Co., Toronto, Ont.
Deloro Smelting & Refining Co., Ltd, Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.

METAL, STAMPINGS, SMALL
Can. Winkley Co., Ltd., Windsor, Ont.

METERS, OIL, GASOLINE, KEROSENE, ETC.
Bowser Co., Ltd., S. F., Toronto, Ont.
General Combustion Co., Ltd., Montreal, Que.

MICROMETERS
Taylor, J. A. M., 31f Stair Bldg., Toronto.
Petrie, Ltd., H. W., Toronto.

MILLS, BRACE AND TUBE
Elec. Steel & Metals, Welland, Ont.

MILL SPECIALTIES
Atkins & Co., E. C., Hamilton, Ont.

MILLS, SAND
Frost Mfg. Co., Chicago, Ill.

MILL MACHINERY
Alexander Fleck, Ltd., Ottawa.
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

MILLING ARBORS
Ackworthie Ltd., J., Birmingham, Eng.
Barber Mchy. Co., Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Kearney & Trecker Co., Milwaukee, Wis.
Strelinger, Chas. A. Co., Windsor, Ont.

MILLING ATTACHMENTS
Ackworthie Ltd., J., Birmingham, Eng.
Barber Mchy. Co., Ltd., Toronto, Ont.
Becker Milling Machine Co., Boston, Mass.
Bertram & Sons Co., John, Dundas, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Canada Machinery Corp., Galt, Ont.
Cincinnati Milling Machine Co., Cincinnati
Ford-Smith Mach. Co., Hamilton, Ont.
Foss Mchy. & S'ply Co. G. F., Montreal
Hastings Bros., Inc., Chicago, Ill.
Hendey Mach. Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Standard Equipment & Tool Wks., Montreal, P.Q.

MILLING CUTTERS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Milling Machine Co., Cleveland.
Delore Smelting & Refining Co., Ltd, Toronto, Ont.
Herbert, Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Marshall, Son & Bunney, Toronto.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

MILLING MACHINES, HAND
Bristol Machine Tool Co., Bristol, Conn.

MILLING MACHINES, THREAD
Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Inc., Chicago, Ill.
Gray Ball Bearing Co., Ltd., Toronto.
United States Mach. Tool Co., Cincinnati.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Smalley Gen. Co., Inc., Bay City, U.S.A.
Standard Equipment & Tool Wks., Montreal, P.Q.
Strelinger, Chas. A. Co., Windsor, Ont.

MILLING MACHINES, HORIZONTAL AND VERTICAL
Barber Mchy. Co., Ltd., Toronto, Ont.
Becker Milling Machine Co., Boston, Mass
Bristol Machine Tool Co., Bristol, Conn.
Brown & Sharpe Mfg. Co., Providence.
Bertram & Sons Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont
Cochrane-Bly Co., Rochester, N.Y., U.S.A.
Ford-Smith Mach. Co., Hamilton, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Knight Metal Products, Toronto.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Rockford Milling Mach. Co., Rockford, Ill
Strelinger, Chas. A. Co., Windsor, Ont.
United States Mach. Tool Co., Cincinnati.
Whitney Mfg. Co., Hartford, Conn.
Williams Machy. Co., A. R., Toronto.

MILLING MACHINES, PLAIN, BENCH AND UNIVERSAL
Barber Mchy. Co., Ltd., Toronto, Ont.
Becker Milling Machine Co, Boston, Mass.
Bilton Mach. Tool Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence.
Canada Machinery Corp., Galt, Ont.
Cleveland Milling Machine Co., Cleveland.
Cincinnati Milling Machine Co., Cincinnati
Ford-Smith Mach. Co., Hamilton, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal
Garlock-Walker Machy. Co., Toronto, Ont.
Garvin Machine Co., New York.
National Machy. Co., Tiffin, Ohio.
Gooley & Edlund, Inc., Cortland, N.Y.
Hardinge Bros., Inc., Chicago, Ill.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Knight Metal Products, Toronto.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Standard Equipment & Tool Wks., Montreal, P.Q.
Strelinger, Chas. A. Co., Windsor, Ont.

MILLING MACHINES, PROFILE
Barber Mchy. Co., Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont
Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
Williams Mchy Co., A. R. Toronto, Ont.

MILLING TOOLS
Aikenhead Hardware Co., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence.
Ford-Smith Mach. Co., Hamilton, Ont.
Geometric Tool Co., New Haven, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
Rice Lewis & Son, Toronto, Ont.
Pabor Mfg. Co., Philadelphia, Pa.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

MINE CARS
Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Dominion Bridge Co., Montreal, Que.
Elec. Steel & Metals, Welland, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.

MINING MACHINERY
Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Elec. Steel & Metals, Welland, Ont.
Holden Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto.
Williams Machy. Co., A. R., Toronto.
Williams Mchy Co., A. R., Toronto, Ont

MIXERS, SAND
Frost Mfg. Co., Chicago, Ill.

MORTISING CHAINS
Renold of Canada Ltd., Montreal.

MORTISING MACHINES
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.
Gray Ball Bearing Co., Ltd., Toronto.

MOTORS, ELECTRIC
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
Lincoln Electric Co. of Canada, Ltd., Toronto, Ont.
MacGovern & Co., Montreal, Que.
Northern Elec. Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Sturtevant Co., B. F., Galt, Ont.
U. S. Ordnance, Toronto, Ont.
Volta Mfg. Co., Welland, Ont.
Williams Mach'y Co., A. R., Toronto.

MOTOR SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

MOTORCYCLE FRAME AND FORK
The Dunbar Brothers Co., Bristol, Conn.

MOTORS, PNEUMATIC
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto.
Holden Co., Ltd., Montreal, Que.

MOULDS, RUBBER
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

MULTIPLE INDEX CENTRES
Garvin Machine Co., New York.
Graton & Knight Mfg. Co., Worcester, M.

MULTI-DRILLING, MULTI-BORING, MULTI-TAPPING MACHINERY,
Nat. Automatic Tool Co., Richmond, Ind.

MUNICIPALITIES
City of St. John, Quebec.

NAIL SETS
Morrow Screw & Nut Co., J., Ingersoll, Ont

NAME PLATES, BRONZE, ETCHED AND STAMPED
Matthews & Co., Jas. H., Pittsburgh, Pa.
Turner Brass Works, Sycamore, Ill.

NICHROME CASTINGS
Can. Driver-Harris Co., Ltd., Walkerville.

NICKEL
Pilot Steel & Tool Co., Montreal, Que.

NICKEL STEEL
See Steel.

NICKEL SILVER—SHEETS, ROLLS, PLATES and RODS
Brown's Copper and Brass Rolling Mills, New Toronto.

NIPPLE THREADING MACHINES
Landis Machine Co., Waynesboro, Pa.
Williams Tool Corp. of Can. Ltd., Brantford, Ont.

NITROGEN
Carter Welding Co., Toronto, Ont.

NUTS, STEEL, CASTELLATED AND COLD PRESSED
Galt Machine Screw Co., Ltd., Galt, Ont.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Williams & Co., J. H., Brooklyn, N.Y.

NUTS, SEMI-FINISH AND FINISHED
Galt Machine Screw Co., Galt, Ont.
National-Acme Co., Cleveland, Ohio.
Wilkinson & Kompass, Hamilton.

NUT LOCKS
Edw. W. Robinson Co., Ltd., Montreal.

NUT BURRING AND NUT MACHINES (HOT)
National Machy. Co., Tiffin, Ohio.

NUT FACING AND BOLT SHAVING MACHINES
Garvin Machine Co., New York.
National Machinery Co., Tiffin, Ohio.
Petrie, Ltd., H. W., Toronto.
Victor Tool Co., Waynesboro, Pa.

NUT TAPPERS
Bertram & Sons Co., John, Dundas, Ont
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
Jardine & Co., A. B., Hespeler.
Landis Machine Co., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Tool Corp of Can. Ltd., Brantford, Ont.

OILERS
All-Way Oiler Mfg. Co., Toronto, Ont.

OIL SEPARATORS
Can. Fairbanks-Morse Co., Montreal.

OIL STONES
Aikenhead Hardware Co., Toronto, Ont.
Carborundum Co., Niagara Falls, N.Y.
Norton Co., Worcester, Mass.
Rice Lewis & Son, Toronto, Ont.

OIL STONE GRINDERS
Oliver Machy. Co., Grand Rapids, Mich

OIL STORAGE SYSTEMS
Bowser Co., Ltd., S. F., Toronto, Ont.
St. Lawrence Welding Co., Ltd., Montreal.

OPENING DIE HEADS
Greenfield Tap & Die Corp, Greenfield
Wells Bros. of Canada, Galt, Ont.

OPTICAL SUPPLIES
Consolidated Optical Co., Toronto, Ont.

ORE HANDLING EQUIPMENT
Brown Hoisting Machinery Co., Cleveland, Ohio.
Canadian Link-Belt Co., Ltd., Toronto, Ont.
Canadian Mead-Morrison Co., Limited, Montreal, Que.

OSCILLATING VALVE GRINDERS (PNEUMATIC)
Cleveland Pneumatic Tool Co. of Canada Toronto

OVENS FOR BAKING, BLUING, DRYING, ENAMELING, JAPANNING AND LACQUERING
Brantford Oven & Rack Co., Brantford

OVEN TRUCKS, STEEL
Brantford Oven & Rack Co., Brantford.
MacKinnon Steel Co., Sherbrooke, Que.

OVENS FOR DRYING, TEMPER AND OXYGEN, ELECTROLYTIC CELLS UNDER TRUCKS
Welding & Supplies Co., Montreal, Que.
Brantford Oven & Rack Co., Brantford.

OXY-ACETYLENE WELDING AND CUTTING AND OUTFITS
Carter Welding Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
L'Air Liquide Society, Toronto, Ont.
Prest-o-Lite Co., Inc. Toronto, Ont.
Davis-Bournonville Co., Toronto, Ont.

OXYGEN
Carter Welding Co., Ltd., Toronto, Ont.
Dominion Oxygen Co., Ltd., Toronto, Ont.
Nat. Electro Products Ltd., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.

OXYGEN PLANTS (ELECTROLYTIC)
Davis-Bournonville Co., Toronto, Ont.

PACKINGS, ASBESTOS
Cleveland Wire Spring Co., Cleveland.

PACKING, ROD AND SHEET
Dunlop Tire & Rubber Goods Co., Ltd. Toronto.
Goodyear Tire & Rubber Co., Can., Ltd., Toronto
Gutta Percha & Rubber, Ltd., Toronto.
International Mach. Sply., Ltd., Montreal
Petrie, Ltd., H. W., Toronto.
Quaker City Rubber Co., Philadelphia, Pa

PANS, WET AND DRY
Frost Mfg. Co., Chicago, Ill.

PAPER MILL CONVEYORS AND DRIVES
Bertrams, Ltd., Edinburgh, Scotland.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Gutta Percha & Rubber, Ltd., Toronto.
MacKinnon Steel Co., Sherbrooke, Que.

PARTITIONS, WIRE
See Guards

PAPER MILL MACHINERY
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Machinery Co., Toronto.
Hamilton Co., Ltd., Wm., Peterbrough, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

PATTERN SHOP EQUIPMENT
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Oliver Machy. Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.

PATTERN MAKERS' LATHES
See Lathes.

PATENT SOLICITORS
Buchan, Hanbury A., Montreal.
Fetherstonhaugh & Co., Ottawa.
Marion & Marion, Montreal.
Ridout & Maybee, Toronto.

PECK CARRIERS FOR POWER PLANTS
Can. Link-Belt Co., Toronto, Ont.

PENSTOCKS
William Hamilton Co., Peterboro, Ont.

PERFORATED METALS AND ORNAMENTAL IRON GOODS
Canada Wire & Iron Goods Co., Hamilton

PHOSPHOR TIN, COPPER AND BRONZE
British Smelting & Refining Co., Ltd., Montreal, Que.

PHOTOSTATS
Commercial Camera Co., Providence, R.I.

PIG IRON
Hanna & Co., M. A., Cleveland, O.
Steel Co. of Canada, Ltd., Hamilton, Ont.

PINS, TAPER
Morrow Screw & Nut Co., J., Ingersoll, Ont

PINS, BELT-LACING
Clipper Belt Lacer Co., Grand Rapids.

PIPE, BLACK & GALVANIZED
Crane, Ltd., Montreal, Que.

PIPE FITTINGS, MALLEABLE AND CAST IRON
International Malleable Iron Co., Guelph.

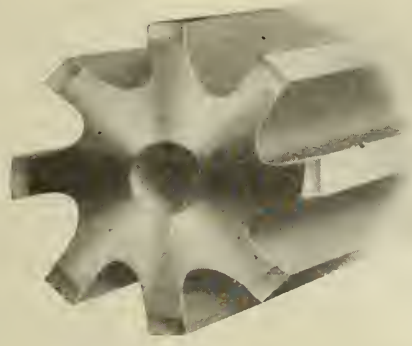
PIPE CUTTING AND THREADING MACHINES
Barber Mchy. Co., Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Curtis & Curtis Co., Bridgeport, Conn.
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
McDougall Co., R., Galt.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co. Windsor, Ont.
Wells Bros. Co. of Canada, Galt, Ont.
Williams Tool Co., Erie, Pa.
Williams Machy. Co., A. R., Toronto.
Williams Tool Corp. of Can. Ltd., Brantford, Ont.

PIPE, JOINT COMPOUNDS
Crane, Ltd., Montreal, Que.

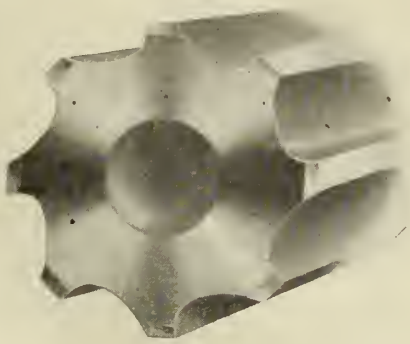
PIPE RIVETED STEEL
Toronto Iron Works, Ltd., Toronto.
William Hamilton Co., Peterboro, Ont.

PIERCING
Oliver Machy. Co., Grand Rapids, Mich.

PIPE CUTTERS, ROLLING
Curtis & Curtis Co., Bridgeport, Conn.
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. Co. of Canada, Galt, Ont.
Williams Tool Corp. of Can. Ltd., Brantford, Ont.



Imco Flute Depth



Average Flute Depth

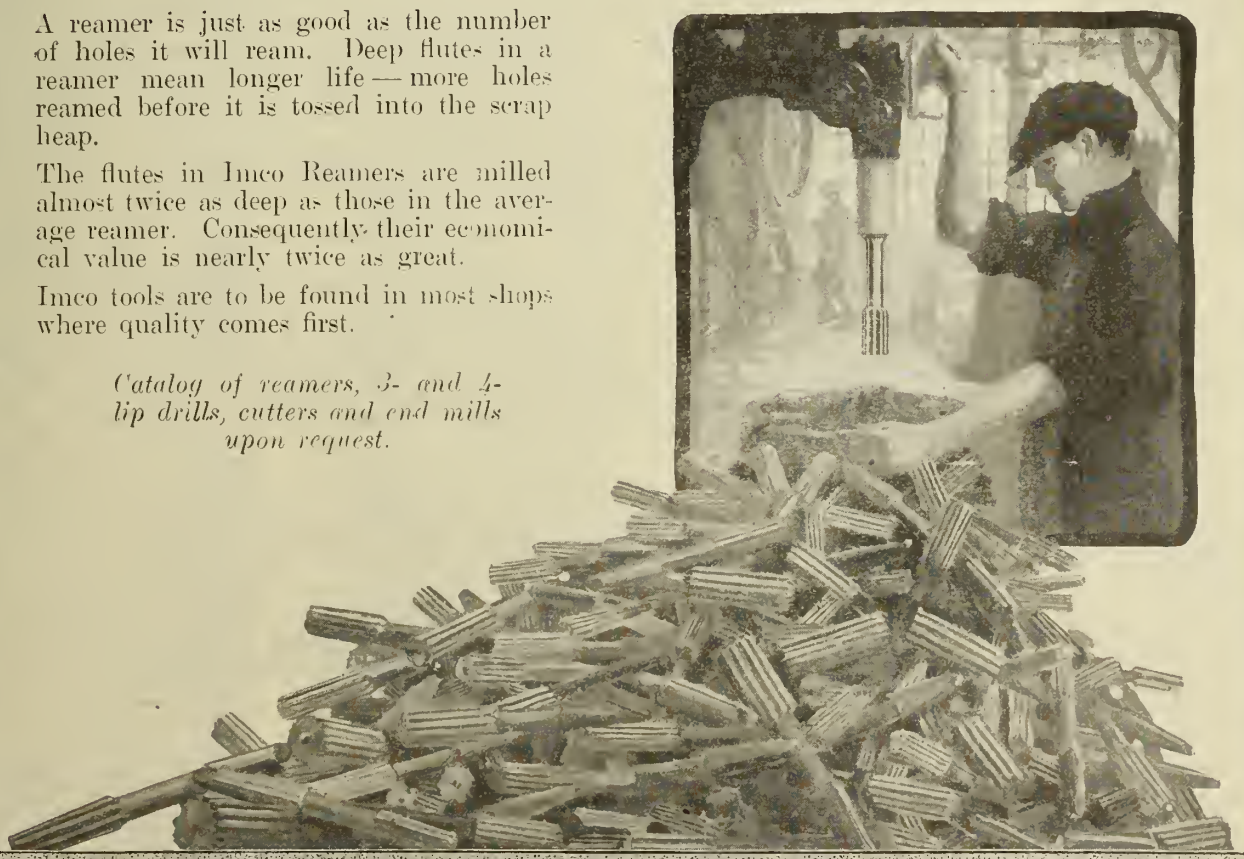
A Reamer's Value Is Its Length of Life

A reamer is just as good as the number of holes it will ream. Deep flutes in a reamer mean longer life — more holes reamed before it is tossed into the scrap heap.

The flutes in Imco Reamers are milled almost twice as deep as those in the average reamer. Consequently their economical value is nearly twice as great.

Imco tools are to be found in most shops where quality comes first.

Catalog of reamers, 3- and 4-lip drills, cutters and end mills upon request.



INGERSOLL MACHINE COMPANY
INGERSOLL, ONT.

CHAS. A. STRELINGER CO., LIMITED, Windsor, Ontario

If interested tear out this page and place with letters to be answered.

PIPE TOOLS AND DIES
Ackworthie Ltd., J., Birmingham, Eng.
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PIPE CUTTERS AND REAMERS
Greenfield Tap & Die Corp., Greenfield.
Strelinger, Chas. A. Co., Windsor, Ont.
Wells Bros. of Canada, Galt, Ont.

PIPE STOCKS AND THREADERS
Greenfield Tap & Die Corp., Greenfield.
Strelinger, Chas. A. Co., Windsor, Ont.
Wells Bros. of Canada, Galt, Ont.

PIPE TAPS AND VISES
Ackworthie Ltd., J., Birmingham, Eng.
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PISTON AND PISTON RING MACHINES
National Acme Co., Windsor, Vt.

PLANER BOLTS
Atkins & Co., E. C., Hamilton, Ont.
Carrow Screw & Nut Co., J., Ingersoll, Ont

PLANER JACKS
Armstrong Bros. Tool Co., Chicago.

PLANERS, STANDARD AND ROTARY
Betts Machine Co., Rochester, N.Y.
Barber Mchy. Co., Ltd., Toronto, Ont.
Bertram & Sons Co., John, Dundas.
Oliver Machy. Co., Grand Rapids, Mich.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardner & Son, Robt., Montreal.
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Herbert Ltd., Alfred, Toronto, Ont.
Morton Mfg. Co., Muskegon Heights, Mich
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
Standard Equipment & Tool Wks., Montreal.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.

PLANING AND SHAPING MACHINERY
Barber Mchy. Co., Ltd., Toronto, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Niles-Bement-Pond Co., New York.
Ohio Mach. Tool Co., Kenton, Ohio.
Perrin, Ltd., William, Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co. Ltd., A. R., Montreal

PLANER-SHAPER, COMBINED OPEN SIDE
Lund-Farquhar Co., Boston.
Petrie, Ltd., H. W., Toronto.

POWER HAMMERS
Quickwork Co., St. Marys, Ohio.

PLANING MILL EXHAUSTERS
Can. Blower & Forge Co., Kitchener, Ont.
MacGovern & Co., Montreal, Que.
Niles-Bement-Pond Co., New York.
Sturtevant Co., B. F., Galt, Ont.

PLATES, Q.M., SHEARED AND CHEQUERED
Peckovers, Ltd., Toronto, Ont.

PLATING, PLANTS & SUPPLIES
Can. Hanson Van Winkle Co., Ltd., Toronto, Ont.

PLIERS
Aikenhead Hardware Co., Toronto.
Can. Billings & Spencer, Ltd., Welland.
Rice Lewis & Son, Toronto, Ont.

PNEUMATIC CYLINDERS
Holden Co., Ltd., Montreal, Que.

PNEUMATIC EQUIPMENT
Strelinger Co., C. A., Windsor, Ont.

PNEUMATIC TOOLS
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland P'matic Tool Co., Can., Toronto.
Curtis Pneumatic Machy. Co., St. Louis.
Garlock-Walker Machy. Co., Toronto.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool Co., Chicago.
Int. Mach. & Supply Co., Ltd., Montreal.
Strelinger, Chas. A. Co., Windsor, Ont.

POWER CRANES, HAND
MacKinnon Steel Co., Sherbrooke, Que.

POLISHING MACHINES
Ackworthie Ltd., J., Birmingham, Eng.
Brown & Sharpe Mfg. Co., Providence, R.I.
Ford-Smith Machine Co., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto.

POLISHING PLATES
Greenfield Tap & Die Corp., Greenfield.
Petrie, Ltd., H. W., Toronto.
Wells Bros. of Canada, Galt, Ont.

POLISHING PAPER
H. H. Barton & Son Co., Philadelphia.

POTS AND KETTLES, CAST STEEL
Elec. Steel & Metals, Welland, Ont.

POWER HOUSE CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

PORTABLE MACHINERY
Hastine & Co., R. C., Chicago, Ill.

POWER TRANSMISSION MCHY.
Canadian Link-Belt Co., Ltd., Toronto, Hamilton Co., Ltd., Wm., Peterborough, Ont.
Petrie, Ltd., H. W., Toronto.

PRECISION MACHINES
Herbert Ltd., Alfred, Toronto, Ont.

PRESSED STEEL PARTS
Ackworthie Ltd., J., Birmingham, Eng.
Gray Ball Bearing Co., Ltd., Toronto.

PRESSERS, ARBOR
Atlas Press Co., Kalamazoo, Mich.
Metalwood Mfg. Co., Detroit, Mich.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
Lourie Manufacturing Co., Springfield, Ill.

PRESSES, BROACHING, FORGING AND FLANGING
Atlas Press Co., Kalamazoo, Mich.
Bliss Co., E. W., Brooklyn, N.Y.
Dom. Steel Products Co., Ltd., Brantford.
Eastern Production Co., Detroit, Mich.
Metalwood Mfg. Co., Detroit, Mich
Petrie, Ltd., H. W., Toronto.
Toledo Machine & Tool Co., Toledo.
Stoll Co., D. H., Buffalo, N.Y.
Williams Mchy Co., Ltd., A. R., Montreal

PRESSES, CAM, TOGGLE, EYELET
Baird Machine Co., Bridgeport, Conn.
Bliss Co., E. W., Brooklyn N.Y.
Toledo Machine & Tool Co., Toledo.
Stoll Co., D. H., Buffalo, N.Y.

PRESSES, FILTER
Perrin, Ltd., William R., Toronto.
Smalley-General Co., Inc., Bay City, Mich.

PRESSES, PNEUMATIC
Dom. Steel Products Co., Ltd., Brantford.
Eastern Production Co., Detroit, Mich.
Metalwood Mfg. Co., Detroit, Mich.
Toledo Machine & Tool Co., Toledo.

PRESSES, DROP AND FORGING
Barber Mchy. Co., Ltd., Toronto, Ont.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs Co, Ltd., Hamilton.
Can. Fairbanks-Morse Co., Montreal.
Niles-Bement-Pond Co., New York.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co, Toledo.

PRESSES, HYDRAULIC
Barber Mchy. Co., Ltd., Toronto, Ont.
Bertram & Sons Co., John, Dundas.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke.
Dom. Steel Products Co., Ltd., Brantford.
Eastern Production Co., Detroit, Mich.
Lourie Manufacturing Co., Springfield, Ill.
Metalwood Mfg. Co., Detroit, Mich.
Niles-Bement-Pond Co., New York.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.
Toledo Machine & Tool Co, Toledo.
Stoll Co., Inc., D. H., Buffalo, N.Y.
Williams Machy. Co., A. R., Toronto.

PRESSES, HYDRAULIC, HORIZONTAL
Eastern Production Co., Detroit, Mich.

PRESSES, HYDRAULIC, VERTICAL
Eastern Production Co., Detroit, Mich.

PRESSES, HYDRO-PNEUMATIC
Eastern Production Co., Detroit, Mich.

PRESSES, BALING
Perrin, Ltd., William R., Toronto.

PRESSES, POWER
Baird Machine Co., Bridgeport, Conn.
Barber Mchy. Co., Ltd., Toronto, Ont.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machinery Co., Toronto.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Machy. Co., A. R., Toronto.

PRESSES, SPRING FOOT
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Ont.
Toledo Machine & Tool Co., Toledo.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., Ltd., A. R., Montreal

PRESSES, SCREW
Barnes & Co., W. F. & Jno., Rockford, Ill
Bliss Co., E. W., Brooklyn, N.Y.
Manhattan Machine & Tool Co., Grand Rapids, Mich.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.

PRESSES, TIRE
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,

PRESSES, TRIMMING
Bliss Co., E. W., Brooklyn, N.Y.
Canada Machinery Corp., Galt, Ont.
Petrie, Ltd., H. W., Toronto.
Stoll Co., D. H., Buffalo, N.Y.

PROFILING MACHINES
Herbert Ltd., Alfred, Toronto, Ont.

PROJECTORS, FLOOD LIGHTING
Holden Co., Ltd., Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que

PROPELLERS
Kennedy & Sons, Wm., Owen Sound.

PROTECTIVE COATINGS
H. H. Robertson, Ltd., Sarnia, Ont.

PSYCROMETERS, SLING
Taylor Instrument Co., Rochester, N.Y.

PULLEYS
Algoma Steel Corp., Sault Ste. Marie, Ont
American Pulley Co., Philadelphia.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., Fortierville, Que.
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Diamond State Fibre Co., Bridgeport, Pa.
Ford-Smith Machine Co., Hamilton, Ont.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Kennedy & Sons, Ltd., W., Owen Sound.
Positive Clutch & Pulley Works Ltd., Toronto.
Petrie, Ltd., H. W., Toronto.

PULLEYS, STEEL SASH, STEEL BELT
American Pulley Co., Philadelphia, Pa.

PULLEYS, FRICTION, CLUTCH
American Pulley Co., Philadelphia, Pa.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., A., Fortierville, Q.
Can. Link-Belt Co., Toronto, Ont.
Carlyle Johnson Mch. Co., Manchester, Ct.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Jones & Glasco, Montreal.
Positive Clutch & Pulley Works, Toronto.
Petrie, Ltd., H. W., Toronto.

PULP MILL MACHINERY
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Hamilton Co., Ltd., Wm., Peterborough, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

PUMPS, AIR LIFT
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Holden Co., Ltd., Montreal, Que.

PUMPS, BOILER FEED
Can. Ingersoll-Rand Co., Ltd. Sherbrooke,

PUMPS, CENTRIFUGAL
Bowser Co., Ltd., S. F., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Ingersoll-Rand Co., Montreal, Que.
Darling Bros., Ltd., Montreal, Que.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

PUMPS, FUEL OIL
Bowser Co., Ltd., S. F., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Darling Bros., Ltd., Montreal, Que.
Trabern Pump Co., Rockford, Ill.

PUMPS, GEARED
Darling Bros., Ltd., Montreal, Que.
Globe Engineering Co., Hamilton, Ont.

PUMPS, HIGH PRESSURE
Perrin, Ltd., William R., Toronto.

PUMPS, HYDRAULIC
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Clarke & Co., Furniss, Montreal, Que.
Garlock-Walker Machinery Co., Toronto.
Darling Bros., Ltd., Montreal, Que.
Elec. Steel & Metals, Welland, Ont.
Metalwood Mfg. Co., Detroit, Mich.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

PUMPS, LUBRICATING, OIL STORAGE
Bowser Co., Ltd., S. F., Toronto, Ont.

PUMPS, RETURN AIR
Can. Ingersoll-Rand Co. Ltd., Sherbrooke,

PUMPS, SPECIAL
Elec. Steel & Metals, Welland, Ont.

PUMPS, RUBBER CEMENT
Bowser Co., Ltd., S. F., Toronto, Ont.

PUMPS, KEROSENE, OIL, SELF-MEASURING
Bowser Co., Ltd., S. F., Toronto, Ont.

PUMPS, LUBRICANT, OIL, WATER
Darling Bros., Ltd., Montreal, Que.
Trabern Pump Co., Rockford, Ill.

PUMPS — ROTARY
General Combustion Co., Ltd., Montreal, Que.

PUMP LEATHERS
Graton & Knight Mfg. Co., Worcester.

PUNCHES AND DIES
Atkins & Co., Ltd., Wm., Sheffield, Eng.
E. W. Bliss Co, Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Can.
Can. Blower & Forge Co., Kitchener, Ont.
Crescent Mach. Co., Ltd., Montreal, P.Q.
Can. Fairbanks-Morse Co., Montreal.
Elliott & Whitehall Machine and Tool Co., Galt, Ont.
Gardner & Son Robert Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Marshall, Son & Blumney, Toronto.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, O.
Williams Mchy Co., A. R., Toronto, Ont.

PUNCHES, POWER
John Bertram & Sons Co., Dundas, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd, Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machinery Co., Toronto.
A. B. Jardine & Co., Hespeler, Ont.
Long & Allstatter, Hamilton, Ohio.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
D. H. Stoll Co., Buffalo, N.Y.
Williams Mchy Co., A. R., Toronto, Ont.

PUNCHING MACHINES, HORIZONTAL
Bertrams, Ltd., Edinburgh, Scotland.
Bertrams & Sons, John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co, Ltd., Hamilton, Ont.
Garlock-Walker Mach'y. Co., Toronto.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

PUNCHES, HAND
Niles-Bement-Pond Co., New York.

PYROMETERS
Bristol Co., Waterbury, Conn.
Share Instrument & Mfg. Co., New York.
Taylor Instrument Co., Rochester, N.Y.

QUARTERING MACHINES
Bertram & Sons, John, Dundas, Ont.
Canadian Mead-Morrison Co., Limited, Montreal, Que.
Niles-Bement-Pond Co., New York.

QUARRY HOISTS
Canadian Mead-Morrison Co., Limited, Montreal, Que.

RAIL BENDERS
Algoma Steel Corp., Sault Ste. Marie, Ont.

RAILROAD TOOLS
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machinery Co., Toronto.
Holden Co., Ltd., Montreal, Que.
Niles-Bement-Pond Co., New York.
Petrie Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

RASPS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall, Son & Bunney, Toronto.

RAWHIDE PINIONS (See Gears)

REAMERS
Butterfield & Co., Inc., Rock Island, Que.

REAMERS, ADJUSTABLE
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Elliott & Whitehall Machine and Tool Co., Galt, Ont.
Greenfield Tap & Die Corp., Greenfield.
Ingersoll Machy. Co., Ingersoll, Ont.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
McCrosky Tool Corp., Meadville, Pa., U. S. A.
Plewes, Ltd., Winnipeg, Man.
Pratt & Whitney Co., Dundas, Ont.
The Kelly Reamer Co., Cleveland, O.
J. A. M. Taylor, 35 Stair Bldg., Toronto.
Wells Bros. of Can., Galt, Ont

REAMERS, BRIDGE, EXPANDING AND HIGH SPEED
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Aikenhead Hardware Co., Toronto.
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Elliott & Whitehall Machine and Tool Co., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Lyman Tube & Supply Co., Montreal, Que
Marshall, Son & Bunney, Toronto.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Morse Twist Drill & Mch. Co., New Bedford, Mass.
McCrosky Tool Corp., Meadville, Pa., U. S. A.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Samuel Osborne, Ltd., Montreal, P.Q.
Strelinger, Chas. A. Co., Windsor, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

REAMERS, STEEL TAPER AND SELF-FEEDING
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

REAMERS, CHUCKING
Ackworthie Ltd., J., Birmingham, Eng.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Elliott & Whitehall Machine and Tool Co., Galt, Ont.
Greenfield Tap & Die Corp., Greenfield.
Ingersoll Machy. Co., Ingersoll, Ont.
Marshall, Son & Bunney, Toronto.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
Wells Bros. of Canada, Galt, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

REAMERS, HAND
Ackworthie Ltd., J., Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Elliott & Whitehall, Galt, Ont.
Greenfield Tap & Die Corp., Greenfield.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wells Bros. of Can., Galt, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

REAMERS, PIN
Ackworthie Ltd., J., Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield.
Morrow Screw & Nut Co., John, Ingersoll.
Wells Bros. of Can., Galt, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

REAMER FLUTING MACHINES
Garvin Machine Co., New York.

REAMING MACHINES, PNEUMATIC
Cleveland Pneumatic Co. of Can., Toronto
Garlock-Walker Machinery Co., Toronto.
Holden Co., Ltd., Montreal, Que.

RECORDING INSTRUMENTS
Bristol Co., Waterbury, Conn.
Gisholt Machine Co., Madison, Wis.
Taylor Instrument Co., Rochester, N.Y.

REELS, WIRE AND TEXTILE MFG.
American Pulley Co., Philadelphia, Pa.

REGULATORS, AUTOMATIC
Electric Steels & Metals, Ltd., Welland.

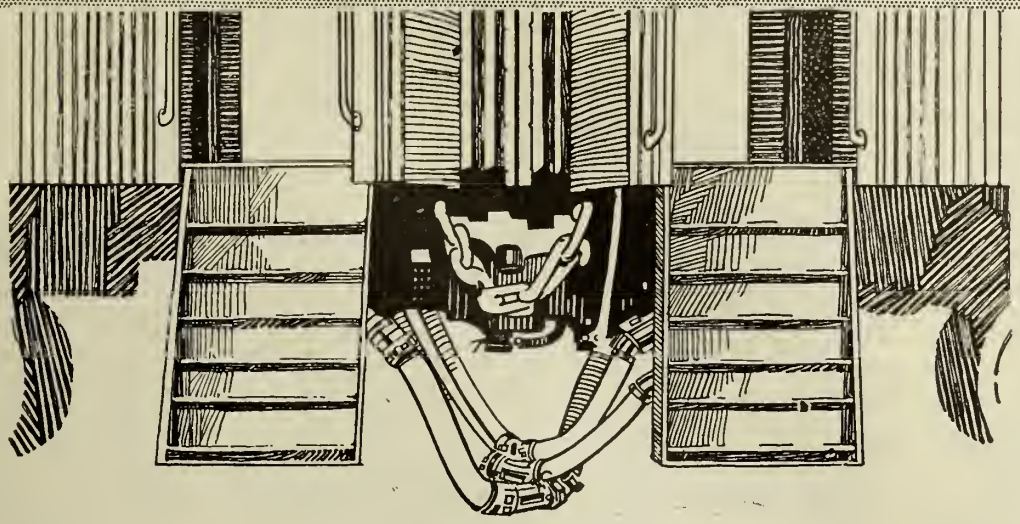
REGULATORS, PRESSURE, TEMPERATURE
Can. Fairbanks-Morse Co., Montreal.
Taylor Instrument Co., Rochester, N.Y.

REPAIR WORK — SAWS
Atkins & Co., E. C., Hamilton, Ont.

REPAIR WORK, ALL KINDS
Elec. Steel & Metals, Welland, Ont.

RIVETS
Aikenhead Hardware Co., Toronto, Ont.
Parmenter & Bulloch Co., Gananoque.
Rice, Lewis & Son, Toronto.
Steel Co. of Canada, Ltd., Hamilton.

RIVET HEATERS
Chicago Flexible Shaft Co., Chicago, Ill.



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Breaking away from accepted but antiquated methods of hose building created Goodyear Industrial Hose —a hose that gives longer, more satisfactory service under present-day industrial conditions, and costs less in the end.

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Goodyear has made wire-winding on steam hose unnecessary, by developing a hose fabric strong enough to resist high pressure without the addition of wire. Compounded an inner tube capable of withstanding the effects of high-pressure steam. Fitted the hose with a tough, durable cover. Created a steam hose that will meet the severe conditions under which it is used—at a very low final cost.

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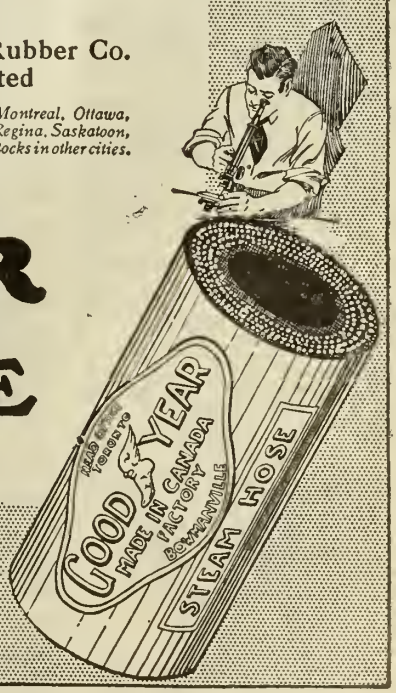
Branches: Halifax, St. John, Quebec, Montreal, Ottawa, Toronto, Hamilton, London, Winnipeg, Regina, Saskatoon, Calgary, Edmonton, Vancouver. Service stocks in other cities.



GOODYEAR
MADE IN CANADA
INDUSTRIAL HOSE

If interested, tear out this page and keep with letters to be answered.

RIVETERS, PNEUMATIC, HYDRAULIC, HAMMER, COMPRESSION
Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Montreal.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.

RIVETING MACHINES, ELASTIC, ROTARY BLOW
Grant Mfg. & Machine Co., Bridgeport
High-Speed Hammer Co., Rochester.
Petrie, Ltd., H. W., Toronto.
F. B. Shuster Co., New Haven, Conn.
Strelinger Co., C. A., Windsor, Ont.

ROAD BUILDING EQUIPMENT
Can. Ingersoll-Rand Co., Ltd., Sherbrooke.
Holden Co., Ltd., Montreal, Que.

ROAD-MAKING MACHINERY
G. F. Foss Mchy & Sply. Co., Montreal.

RODS, ROPE AND SPRING
Page Steel & Wire Co., Adrian, Mich.

RODS, PURE NICKEL, MONEL METAL, NICHROME
Can. Driver-Harris Co., Ltd., Walkerville.

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Can. Link-Belt Co., Toronto.
Jones & Glasco, Montreal.
Lyman Tube & Supply Co., Montreal, Que
Renold of Canada Ltd., Montreal.

ROLLS, BENDING, STRAIGHTENING
John Bertram & Sons Co., Dundas.
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Can. Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machinery Co., Toronto
Niles-Bement-Pond Co., New York.
Petrie Ltd., H. W., Toronto.
Toledo Machine & Tool Co., Toledo, O.

ROLLS CRUSHING
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

ROLLS AND TABLES
Dominion Foundries & Steel Ltd., Hamilton, Ont.
Elec. Steel & Metals, Welland, Ont.

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ROPE, GALX, MONEL METAL, BRONZE, TILLER AND SASH CORD
Can. Driver-Harris Co., Ltd., Walkerville.

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ROLLING MACHINES, SHEET METAL
Manhattan Machine & Tool Co., Grand Rapids, Mich.

ROLLING MILL MACHINERY
Dom. Steel Products Co., Ltd., Brantford
Mesta Machine Co., Pittsburgh, Pa.

ROLL LATHES
Mesta Machine Co., Pittsburgh, Pa.

ROLLS, BENDING, STRAIGHTENING
Manhattan Machine & Tool Co., Grand Rapids, Mich.

ROLLS, CRUSHING
Can. Link-Belt Co., Toronto.

ROOF COOLERS
Electric Steels & Metals, Ltd., Welland

RUBBER MOULDS AND CORES
Elliott & Whitehall, Galt, Ont.

RUBBER MILL DRIVES
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Dom. Steel Products Co., Ltd., Brantford
Can. Link-Belt Co., Toronto.

RUBBER MILL MACHINERY
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Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Dom. Steel Products Co., Ltd., Brantford

RUBBER MOULDS & CORES
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

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RUBBING BRICKS
Dominion Abrasive Co., Mimico, Ont.

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Brown & Sharpe Mfg. Co., Providence.
James Chesterman & Co., Ltd., Sheffield
Rice, Lewis & Son, Toronto.
L. S. Starrett Co., Athol, Mass.

RULES, STEEL, STRAIGHT, AND FOLDING
Lufkin Rule Co. of Can., Windsor.

RULES, BOXWOOD, FOLDING
Lufkin Rule Co. of Can., Windsor.

RULES, BOARD AND LONG
Lufkin Rule Co. of Can., Windsor.

RUST PREVENTATIVES
Oakley Chemical Co., New York, N.Y.

SAW MILL CONVEYORS
Can. Link-Belt Co., Toronto.
Petrie, Ltd., H. W., Toronto.

SAND MILLS
Frost Mfg. Co., Chicago, Ill.

SAND-BLAST EQUIPMENT
SAND BLAST SUPPLIES AND ACCESSORIES
Pangborn Corporation, Hagerstown, Md

SAND BLAST ABRASIVES
Pangborn Corporation, Hagerstown, Md

SAND MIXING MACHINERY
Frost Mfg. Co., Chicago, Ill.

SANITARY DRINKING FOUNTAINS
Pure Sanitary Drinking Fountain Co. Haydenville.

SANDING MACHINES
Canada Machinery Corp., Galt.

SAW MILL MACHINERY
Can. Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt.
Robert Gardner & Son, Montreal.
Curtis Pneumatic Machy Co., St. Louis
Hamilton Co., Ltd., Wm., Peterborough, Ont.
A. R. Williams Machy. Co., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

SASH SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

SAWS FOR EVERY USE
Atkins & Co., E. C., Hamilton, Ont.

SAWS, CIRCULAR METAL
Atkins & Co., E. C., Hamilton, Ont.
Cochrane-Bly Co., Rochester, N.Y., U.S.A.
Wm. Atkins & Co., Ltd., Sheffield, Eng.
Marshal, Son & Bunney, Toronto.
Plewes Ltd., Winnipeg, Man.
Simonds Mfg. Co., Fitchburgh, Mass.
Tabor Mfg. Co., Philadelphia, Pa.

SAWS, HACK (See Hack Saws)

SAW GUARDS
Ackworthie Ltd., J., Birmingham, Eng.
Atkins & Co. E. C. Hamilton, Ont.

SAWING MACHINES, CIRCULAR, FOR COLD METAL
Cochrane-Bly Co., Rochester, N.Y., U.S.A.

SAWS, METAL, HACK AND BAND
Atkins & Co., E. C., Hamilton, Ont.

SAWS, SILVER STEEL
E. C. Atkins & Co., Inc., Indianapolis

SAW SHARPENERS
Cochrane-Bly Co., Rochester, N.Y., U.S.A.
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Can., Galt, Ont.

SAWS, SLITTING
J. A. M. Taylor, Stair Bldg., Toronto.
Atkins & Co., E. C., Hamilton, Ont.
Elliott & Whitehall Machine and Tool Co., Galt, Ont.

SAWS — HIGH-SPEED FRICTION
Atkins & Co., E. C., Hamilton, Ont

SAWS — PATTERN SHOP
Atkins & Co. E. C., Hamilton, Ont

SAWS — SWING
Atkins & Co., E. C., Hamilton, Ont

SCALES
Can. Kron Scale Co., Montreal, P.Q.

SCALES, MECHANICS'
Lufkin Rule Co. of Can., Windsor.

SCLEROSCOPES
Shore Instrument & Mfg. Co., New York.

SCREENING MACHINERY
Can. Link-Belt Co., Toronto.

SCREW EXTRACTORS
Cleveland Twist Drill Co., Cleveland.

SCREW MACHINES, HAND, AUTOMATIC
Barber Mchy. Co., Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Ltd., Toronto
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield.
A. B. Jardine & Co., Hespeler.
National Acme Co. Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto.
Pratt & Whitney Co., Dundas Ont
Strelinger, Chas. A. Co., Windsor, Ont.
Warner & Swasey Co., Cleveland, O.
Wells Bros. of Can., Galt, Ont.
Wood Turret Mach. Co., Burfl, Ind.

SCREWS, MACHINE, SET, CAP AND SPECIAL
Galt Machine Screw Co., Galt.
John Morrow Screw & Nut Co., Ingersoll.
National Acme Co. Montreal.
Rice Lewis & Son, Toronto.
Steel Co. of Canada, Ltd., Hamilton.
Wilkinson & Kompass, Hamilton.

SCREW COLLARS
Galt Machine Screw Co., Ltd., Galt, Ont.
John Morrow Screw & Nut Co., Ingersoll.

SCREW MACHINES, PLAIN WIRE FEED
Barber Mchy. Co., Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.

SCREW PLATES
Ackworthie Ltd., J., Birmingham, Eng.
Butterfield & Co., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield.
A. B. Jardine & Co., Hespeler.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto.
J. A. M. Taylor, Stair Bldg., Toronto.
Wells Bros. of Can., Galt.
Wilkinson & Kompass, Hamilton.

SCREWS, SAFETY SET
Galt Machine Screw Co., Ltd., Galt, Ont.

SCREW SLOTTERS
Butterfield & Co., Inc., Rock Island, Que.
Garvin Machine Co., New York.
National Acme Co., Cleveland, O.
Pratt & Whitney Co., Dundas, Ont
Strelinger, Chas. A. Co., Windsor, Ont.

SEPARATORS, MOISTENERS AND OIL FOR COMPRESSED AIR
Pangborn Corporation, Hagerstown, Md

SELF-OPENING DIES
See Dies.

SEPARATORS, SAND
Pangborn Corporation, Hagerstown, Md

SET SCREWS SAFETY
Aikenhead Hardware Co., Toronto.
Bristol Co., Waterbury, Conn.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wilkinson & Kompass Hamilton

SHANKS, STRAIGHT AND TAPER
Jacobs Mfg. Co., Hartford, Conn.

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Barber Mchy. Co., Ltd., Toronto, Ont.
John Bertram & Sons Co., Dundas.
Can. Fairbanks-Morse Co., Montreal.
Canadian Machinery Corp., Galt.
Cochrane-Bly Co., Rochester, N.Y., U.S.A.
Geo. F. Foss Mchy. & Sply. Co., Montreal
Robt. Gardner & Son, Montreal.
Garlock-Walker Mach'y. Co., Toronto.
Herbert, Ltd., Alfred, Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Milwaukee Shaper Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto.
Rae Mach. Tool Co., Hamilton.
Strelinger Co., C. A., Windsor, Ont.
Standard Equipment & Tool Wks., Montreal.
Walcott Lathe Co., Jackson, Mich.
Williams Mchy Co., A. R., Toronto, Ont.

SHAPERS, GEAR
Fellows Gear & Shaper Co., Springfield, V.
Knigh Metal Products, Toronto.

SHAFTING
Algoma Steel Corp., Sault Ste. Marie, O.
Can. Fairbanks-Morse Co., Montreal.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machy. Co., Ltd., Toronto
Jones & Glasco, Montreal.
Niles-Bement-Pond Co., New York.
Can. Drawn Steel Co., Hamilton.
Peekovers, Ltd., Toronto, Ont.
Petrie, Ltd., H. W., Toronto.
Pratt & Whitney Co., Dundas.
Rice Lewis & Son Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
A. R. Williams Machy. Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

SHARPENING STONES
Norton Co, Worcester, Mass.
Rice, Lewis & Son, Toronto.

SHEARING MACHINES, ANGLE IRON, BAR AND GATE
John Bertram & Sons Co., Dundas.
Bertrams Ltd., Edinburgh, Scotland.
Canada Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machy. Co., Ltd., Toronto
A. B. Jardine & Co., Hespeler, Ont.
Long & Allstatter Co., Hamilton, Ohio
Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co. Toledo, O

SHEARS, POWER
John Bertram & Sons Co., Dundas.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co. Ltd., Hamilton.
Can Blower & Forge Co, Kitchener
Canada Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford
Garlock-Walker Machy. Co., Ltd., Toronto
Long & Allstatter, Hamilton, Ohio
A. B. Jardine & Co., Hespeler, Ont.
National Machy. Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
H. D. Stoll Co., Inc., Buffalo, N.Y.
Strelinger, Chas. A. Co., Windsor, Ont.
Toledo Machine & Tool Co., Toledo, O
Williams, White & Co., Moline, Ill.
Williams Mchy Co., A. R., Toronto, Ont.

SHEARS, ROTARY
The Quickwork Co., St. Mary's, Ohio.

SHEARS, PNEUMATIC
Toledo Machine & Tool Co., Toledo, Ohio

SHEARS, PLATE CUTTING, SLITTING
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Quickwork Co., St. Mary's, Ohio.

SHEARS, SPLITTING
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SHEARS, IRREGULAR AND CIRCLE CUTTING
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SHEARS, SERPENTINE
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SHEARS, SQUARING
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Barber Mchy. Co., Ltd. Toronto, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs & Co. Hamilton.
Peck, Stow & Wilcox Co., Southington, O.
Petrie, Ltd., H. W., Toronto.
D. H. Stoll Co., Inc. Buffalo, N.Y.
Strelinger, Chas. A. Co., Windsor, Ont.

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British Smelting & Refining Co., Ltd., Montreal, Que.
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SHEETS, BLACK AUTO AND GALVANIZED
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Dennis Wire & Iron Works, London.

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Jones & Glasco, Montreal
Renold of Canada Ltd., Montreal.

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Aikenhead Hardware Co., Toronto, Ont
Rice Lewis & Son, Toronto, Ont.
Wilkinson & Kompass, Hamilton, Ont

SLEDGES, CAST IRON
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SLICING CLAMPS
Peck, Stow & Wilcox Co., Southington, Conn.

SLINGS, CHAINS
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Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
Herbert, Ltd., Alfred, Toronto, Ont.
National-Acme Co., Cleveland, Ohio.
Niles-Bement-Pond Co., New York.

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Butterfield & Co., Inc., Rock Island, Que.
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Keystone Mfg. Co., Buffalo, N.Y.
Modern Tool Co., Erie, Pa.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.

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Katie Foundry, Galt, Ont.

SOLDERING IRONS
Aikenhead Hardware Co., Toronto, Ont.
Brown, Boggs & Co., Hamilton, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.

SOLDER
British Smelting & Refining Co., Ltd., Montreal, Que.
Aikenhead Hardware Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.
Tallman Brass & Metal Co., Hamilton.

SPELTER
British Smelting & Refining Co., Ltd., Montreal, Que.

SPEED REDUCING GEARS
Can. Link-Belt Co., Toronto, Ont.
Jones & Glasco, Montreal.

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Barnes, Wallace Co., Bristol, Conn.
Can. Steel Foundries, Ltd., Montreal
Cleveland Wire Spring Co., Cleveland.
Dunbar Bros. Co., Bristol, Conn.
Garlock-Walker Machinery Co., Toronto.

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Baird Machine Co., Bridgeport, Conn.
Barber Mchy. Co., Ltd., Toronto, Ont.
Bertram, John, & Sons Co., Dundas.
Bliss, E. W. Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada.
Brown Engineering Corp., Toronto, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Hahn Engineering Co. Ltd., Hamilton.
Hamilton Co., Ltd., Wm., Peterborough,
A. B. Jardine & Co., Hespeler, Ont.
Katie Foundry, Galt, Ont.
Ker & Goodwin Machine Co., Ltd., Brantford Ont.
McCrosky Tool Corp., Meadville, Pa., U. S. A.
National-Acme Co., Cleveland, Ohio.
Mesta Machine Co., Pittsburgh, Pa.
Rae Mach. Tool Co., Hamilton.
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Baird Machine Co., Bridgeport, Conn.
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Morse Chain Co., Ithaca, New York.

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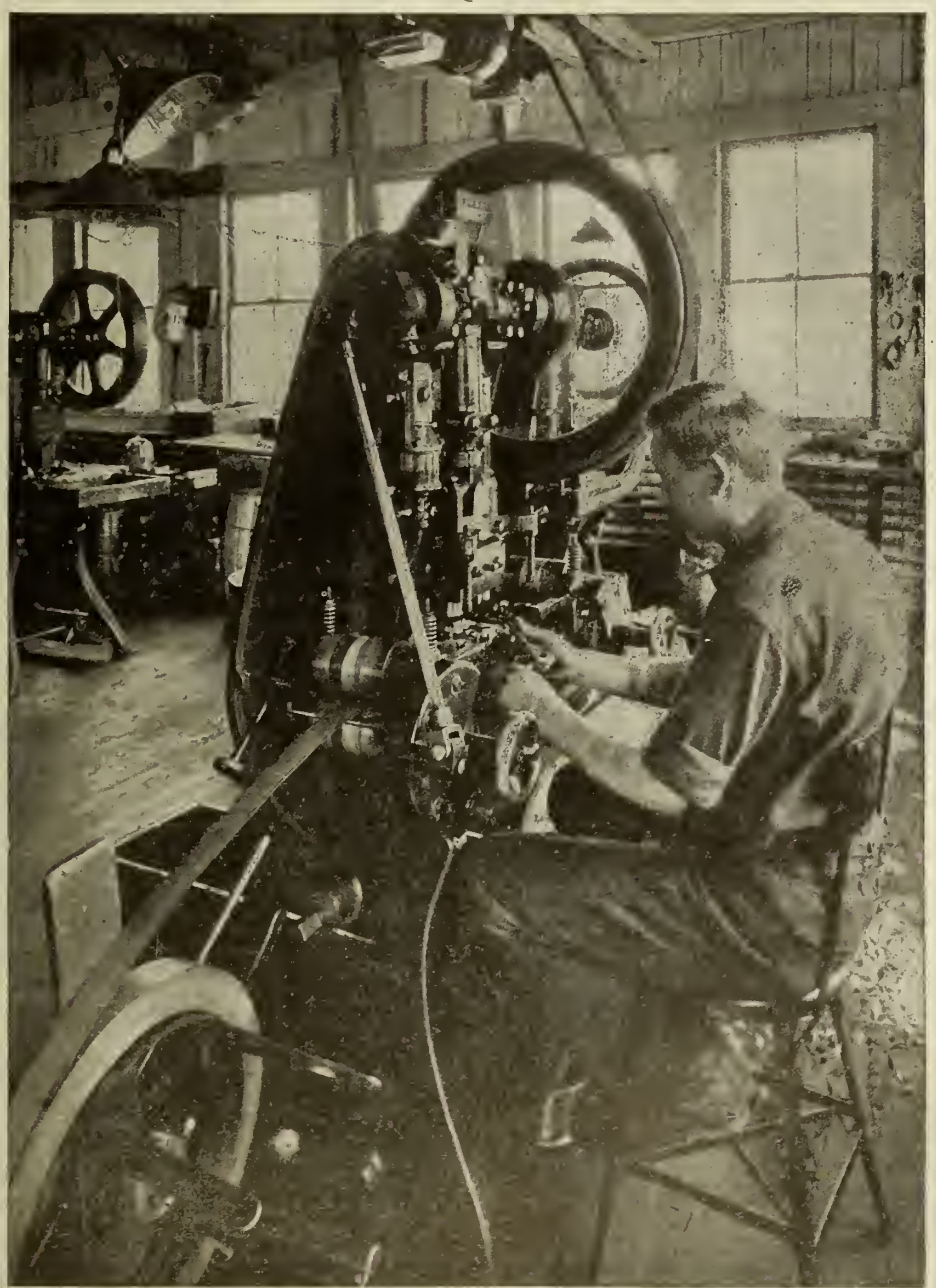

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If interested tear out this page and place with letters to be answered.

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Oliver Mach. Co., Grand Rapids, Mich.

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Oliver Mach. Co., Grand Rapids, Mich.

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Dom. Forge & Stamping Co., Walkerville
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Horner & Wilson, Hamilton, Ont.

STAMPING MACHINERY
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Canadian Mead-Morrison Co., Limited, Montreal, Que.

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STEEL BALLS
See Balls Steel.

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Kayser-Ellison & Co., Ltd., Montreal.
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Lincoln Electric Co. of Canada, Ltd., Toronto, Ont.
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Peckovers, Ltd., Toronto, Ont.
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United Alloy Steel Corp., Canton, Ohio.

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Joliette Steel Co., Montreal, Que.
Kennedy & Sons, Wm., Owen Sound.
Electric Steel & Metals Co., Welland.
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United Alloy Steel Corp., Canton, Ohio.

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Atkins & Co., Ltd., Wm., Sheffield, Eng.
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Kayser-Ellison & Co., Ltd., Montreal.
Rice Lewis & Son, Toronto, Ont.
Swedish Steel & Importing Co. Ltd., Montreal.
Union Drawn Steel Co., Hamilton, Ont.

STEEL, ELECTRIC FURNACE
United Alloy Steel Corp., Canton, Ohio.

STEEL FJAB
Lincoln Electric Co., of Canada, Ltd., Toronto, Ont.

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Atkins & Co., Ltd., Wm., Sheffield, Eng.
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Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.
United Alloy Steel Corp., Canton, Ohio.

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Baines & David, Toronto.
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Deloro Smelting & Refining Co., Ltd. Toronto, Ont.
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Firth & Sons, Thos., Montreal, Que.
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Kayser Ellison & Co., Sheffield, Eng.
Latrobe Electric Steel Co., Latrobe, Pa.
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Plewes, Ltd, Winnipeg, Man.
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Ralph B. Norton, Montreal, Que.
Rice Lewis & Son, Toronto, Ont.
Swedish Steel & Importing Co., Ltd., Montreal.
Vanadium-Alloys Steel Co., Pittsburgh.

STEEL, CHROME, MANGANESE
Joliette Steel Co., Montreal, Que.

STEEL, OPEN HEARTH
Illingworth Steel Co., John, New York
United Alloy Steel Corp., Canton, Ohio.

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Dominion Foundries & Steel Ltd., Hamilton, Ont.

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Lincoln Electric Co. of Canada, Ltd., Toronto, Ont.

STEEL, SPECIAL ANALYSIS
United Alloy Steel Corp., Canton, Ohio.

STEEL, SPRING AND REINFORCING
Peckovers, Ltd., Toronto, Ont.
United Alloy Steel Corp., Canton, Ohio.

STEEL, STRUCTURAL
Algoma Steel Corp., Sault Ste. Marie
Dom. Iron & Steel Co., Sydney, N.S.
MacKinnon Steel Co., Sherbrooke, Que.
Peckovers, Ltd., Toronto, Ont.

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Atkins & Co., Wm., Sheffield, Eng.
Baines & David, Toronto.
Can. Fairbanks-Morse Co., Montreal.
Drury Co., H. A., Montreal, Que.
Deloro Smelting & Refining Co., Ltd, Toronto, Ont.
Firth & Sons, Thos., Montreal, Que.
Hawkridge Bros. Co., Boston, Mass.
Kayser-Ellison & Co., Ltd., Montreal.
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Lyman Tube & Supply Co., Ltd., Montreal
Marshall, Son & Bunney, Toronto, Ont.
Latrobe Electric Steel Co., Latrobe, Pa.
Pilot Steel & Tool Co., Montreal, Que.
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Tube Co. of Canada, Ltd., Toronto, Ont.

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Wm. Atkins & Co., Ltd., Sheffield, Eng.
Armstrong, Whitworth of Can., Montreal.
Dominion Foundries & Steel Ltd., Hamilton, Ont.
Drury, H. A., Co., Montreal, Que.
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Rice Lewis & Son, Toronto, Ont.
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William Hamilton Co., Peterboro, Ont.

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Keuffel & Esser Co., New York.
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TABLES, SAND-BLAST
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Toronto Iron Works, Ltd., Toronto.

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Lincoln Electric Co. of Canada, Ltd., Toronto, Ont.

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MacKinnon Steel Co., Sherbrooke, Que.
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The Geometric Tool Co., New Haven.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Niles-Bement-Pond Co., New York.
Rickert-Shafer Co., Erie, Pa.
National-Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto.
L. S. Starrett Co., Athol, Mass.
Strelinger, Chas. A. Co., Windsor, Ont.
Whitney Mfg. Co., Hartford, Conn.
Williams Tool Corp. of Can. Ltd., Brantford, Ont.

TAPS, ADJUSTABLE
Butterfield & Co., Rock Island, Que.
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Ingersoll Mach. Co., Ingersoll, Ont.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Pilot Steel & Tool Co., Montreal, Que.
Victor Tool Co., Waynesboro, Pa.

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Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

TAPS, MACHINE RELIEVED
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

TAPS, MACHINE SCREW
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

TAPS, PIPE
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield.
Ingersoll Mach. Co., Ingersoll, Ont.
Marshall, Son & Bunney, Toronto.
Wells Bros. of Can., Galt, Ont.

TAPS, SPECIAL
Elliott & Whitehall, Galt, Ont.

TAPS, STAYBOLT, TAPPER
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

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Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Pratt & Whitney Co., Hartford, Conn.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Rice Lewis & Son, Toronto, Ont.
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THERMOMETERS, INDUSTRIAL ENGRAVED TEMPERATURE AND PRESSURE
Taylor Instrument Co., Rochester, N.Y.

THERMOMETERS, RECORDING AND INDEX
Bristol Co., Waterbury, Conn., U.S.A.
Taylor Instrument Co., Rochester, N.Y.

TESTING INSTRUMENTS, METALLURGICAL
Shore Instrument & Mfg. Co., New York.

TENOVERS
Oliver Machy. Co., Grand Rapids, Mich.

TESTING LABORATORIES
Toronto Testing Laboratory, Toronto.

THREAD-CUTTING MACHINES
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Mach. Co., Ltd., Toronto.
Geometric Tool Co., New Haven.
Jardine & Co., Ltd., A. B., Hespeler.
Landis Machine Co., Waynesboro, Pa.
National-Acme Co., Cleveland, Ohio.
National Machy. Co., Tiffin, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Wells Bros. Co. of Canada, Galt, Ont.

THREADING TOOLS
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield.
Landis Machine Co., Waynesboro, Pa.
Pratt & Whitney Co., Dundas, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
Wells Bros. of Canada, Galt, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

THREADING MACHINES FOR BOLTS, NUTS AND PIPES
Greenfield Tap & Die Corp., Greenfield.
Petrie, Ltd., H. W., Toronto.
Wells Bros. Co. of Canada, Galt, Ont.

THREAD MILLING MACHINES
Taft-Pierce Mfg. Co., New York, N.Y.
Smalley-General Co., Bay City, Mich.

THUMB SCREWS AND NUTS
See Screws.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

TIN—PIG AND BAR
British Smelting & Refining Co., Ltd., Montreal, Que.

TINSMITHS' TOOLS
Brown, Boggs & Co., Hamilton, Can.
Petrie, Ltd., H. W., Toronto.

TIRE BENDERS
Jardine & Co., Ltd., A. B., Hespeler.

TIRE SETTING MACHINES, HYDRAULIC
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Perrin, Ltd., William R., Toronto.
West Tire Setter Co., Rochester, N.Y.

TOOL CASES
Rice Lewis & Son, Toronto, Ont.

TOOL HOLDERS
Aikenhead Hardware Co., Toronto, Ont.
Armstrong Bros. Tool Co., Chicago.
Cleveland Twist Drill Co., Cleveland.
Deloro Smelting & Refining Co., Ltd. Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

TOOL MAKERS
Samuel Osborne (Can.), Ltd., Montreal.

TOOL POSTS, LATHE
Armstrong Bros. Tool Co., Chicago.
Williams & Co., J. H., Brooklyn, N.Y.

TOOL ROOM EQUIPMENT
Herbert Ltd., Alfred, Toronto, Ont.

TOOL ROOM PARTITIONS
Canada Wire & Iron Goods Co., Hamilton.

TOOLS, BLACKSMITHS'
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Rice Lewis & Son Toronto, Ont.

TOOLS, ADJUSTABLE BORING
Kelly Reamer Co., Cleveland, O.
Petrie, Ltd., H. W., Toronto.

TOOLS, ELECTRIC
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool Co., Chicago.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Machy. Co., A. R., Toronto.
U. S. Electrical Tool Co., Cincinnati, O.

TOOLS, FORMING
Davidson Tool Mfg. Co., New York, N.Y.
Deloro Smelting & Refining Co., Ltd. Toronto, Ont.

TOOLS, LUMBERING
Thos. Pink & Co., Pembroke, Ont.

TOOLS, LATHE, PLANER, SLOTTER
Armstrong Bros. Tool Co., Chicago.
Gisholt Machine Co., Madison, Wis.
Williams & Co., J. H., Brooklyn, N.Y.

TOOLS, SCREW MACHINE
Foster Machine Tool Co., Hubbard, Ind.

TOOLS, SHOP
Strelinger Co., C. A., Windsor, Ont.
Landis Machine Co., Waynesboro, Pa.
Morse Twist Drill & Mchy. Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Rice Lewis & Son, Toronto, Ont.
Starrett Co., L. S., Athol, Mass.
Strelinger, Chas. A. Co., Windsor, Ont.
Taylor, J. A. M., 318 Stair Bldg., Toronto.
Wells Bros. of Canada, Galt, Ont.

TAP EXTRACTORS
Walton Co., The, Hartford, Conn.

THERMOMETERS, INDUSTRIAL ENGRAVED TEMPERATURE AND PRESSURE
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Geometric Tool Co., New Haven.
Jardine & Co., Ltd., A. B., Hespeler.
Landis Machine Co., Waynesboro, Pa.
National-Acme Co., Cleveland, Ohio.
National Machy. Co., Tiffin, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Wells Bros. Co. of Canada, Galt, Ont.

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Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield.
Landis Machine Co., Waynesboro, Pa.
Pratt & Whitney Co., Dundas, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
Wells Bros. of Canada, Galt, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

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Greenfield Tap & Die Corp., Greenfield.
Petrie, Ltd., H. W., Toronto.
Wells Bros. Co. of Canada, Galt, Ont.

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Taft-Pierce Mfg. Co., New York, N.Y.
Smalley-General Co., Bay City, Mich.

THUMB SCREWS AND NUTS
See Screws.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

TIN—PIG AND BAR
British Smelting & Refining Co., Ltd., Montreal, Que.

TINSMITHS' TOOLS
Brown, Boggs & Co., Hamilton, Can.
Petrie, Ltd., H. W., Toronto.

TIRE BENDERS
Jardine & Co., Ltd., A. B., Hespeler.

TIRE SETTING MACHINES, HYDRAULIC
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Perrin, Ltd., William R., Toronto.
West Tire Setter Co., Rochester, N.Y.

TOOL CASES
Rice Lewis & Son, Toronto, Ont.

TOOL HOLDERS
Aikenhead Hardware Co., Toronto, Ont.
Armstrong Bros. Tool Co., Chicago.
Cleveland Twist Drill Co., Cleveland.
Deloro Smelting & Refining Co., Ltd. Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

TOOL MAKERS
Samuel Osborne (Can.), Ltd., Montreal.

TOOL POSTS, LATHE
Armstrong Bros. Tool Co., Chicago.
Williams & Co., J. H., Brooklyn, N.Y.

TOOL ROOM EQUIPMENT
Herbert Ltd., Alfred, Toronto, Ont.

TOOL ROOM PARTITIONS
Canada Wire & Iron Goods Co., Hamilton.

TOOLS, BLACKSMITHS'
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Rice Lewis & Son Toronto, Ont.

TOOLS, ADJUSTABLE BORING
Kelly Reamer Co., Cleveland, O.
Petrie, Ltd., H. W., Toronto.

TOOLS, ELECTRIC
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool Co., Chicago.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Machy. Co., A. R., Toronto.
U. S. Electrical Tool Co., Cincinnati, O.

TOOLS, FORMING
Davidson Tool Mfg. Co., New York, N.Y.
Deloro Smelting & Refining Co., Ltd. Toronto, Ont.

TOOLS, LUMBERING
Thos. Pink & Co., Pembroke, Ont.

TOOLS, LATHE, PLANER, SLOTTER
Armstrong Bros. Tool Co., Chicago.
Gisholt Machine Co., Madison, Wis.
Williams & Co., J. H., Brooklyn, N.Y.

TOOLS, SCREW MACHINE
Foster Machine Tool Co., Hubbard, Ind.

TOOLS, SHOP
Strelinger Co., C. A., Windsor, Ont.

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Special Marine and Naval Bronzes, Muntz and Yellow Sheets and Rods. Beaver Brand Metals are recognized in Canada as the standard for consistent quality and reliability.

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If interested tear out this page and place with letters to be answered.

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Crescent Machine Co., Ltd., Montreal, Que.
McClean Machine & Tool Co., Ltd., Hamilton, Ont.
McCrosky Tool Corp., Meadville, Pa., U. S. A.

TORCHES, BLOW
Int. Mach. & Supply Co., Ltd., Montreal.

TORCHES, GASOLINE, KEROSENE AND ALCOHOL
Turner Brass Works, Sycamore, Ill.

TORCHES, STEEL
Armstrong, Whitworth of Can., Montreal.
Prest-O-Lite Co., Inc., Toronto, Ont.

TRACK SYSTEMS
Brown Hoisting Machinery Co., Cleveland, Ohio.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.

TRAM RAIL SYSTEMS (Overhead)
Brown Hoisting Machinery Co., Cleveland, Ohio.

TRAMWAYS, BRIDGE
Brown Hoisting Machinery Co., Cleveland, Ohio.

TRANSFORMERS
Can. General Electric Co., Toronto, Ont
MacGovern & Co., Montreal, Que.
Northern Electric Co., Ltd., Montreal.

TRANSITS
Hughes, Owens Co., Ltd., Montreal, Que.

TRANSMISSION CHAIN
Lyman Tube & Supply Co., Ltd., Montreal
Morris Chain Co., Ithaca, New York.
Renold of Canada Ltd., Montreal.

TRANSMISSION MACHINERY
American Pulley Co., Philadelphia, Pa.
Can. Link-Belt Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Coventry Chain Co., Coventry, England.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Hamilton Gear & Machine Co., Toronto.
Jones & Glassco, Montreal.
Kennedy & Sons, Wm., Owen Sound, Ont.
Morse Chain Co., Ithaca, N.Y.
Petrie, Ltd., H. W., Toronto.
Renold of Canada Ltd., Montreal.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Machinery Co., A. R., Toronto.

TRANSMISSION ROPE
Jones & Glassco, Montreal, Que.
MacKinnon Steel Co., Ltd., Sherbrooke.

TRANSMISSION TOWERS
Curtis Pneumatic Machy. Co., St. Louis.
Dominion Bridge Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Northern Crane Works, Walkerville.
Tallman Brass & Metal Co., Hamilton.

TROLLEYS
Brown Hoisting Machinery Co., Cleveland, Ohio.
Lyman Tube & Supply Co., Ltd., Montreal
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

TRUCKS, FACTORY, FREIGHT, ETC
Canada Machinery Corp., Galt, Ont.
Chapman Double Ball Bearing, Toronto.
Cowan Truck Co., Holyoke, Mass.
Holyoke Truck Co., Holyoke, Mass.
MacKinnon Steel Co., Sherbrooke, Que.
Rice Lewis & Son, Toronto, Ont.

TRUCKS, ELECTRIC
Cowan Truck Co., Holyoke, Mass.
Good Engineering Co., Toronto, Ont.

TRUCKS, FLOOR
Cowan Truck Co., Holyoke, Mass.
Holyoke Truck Co., Holyoke, Mass.

TRUCKS, HAND
Can. Kron Scale Co., Montreal, P.Q.
Cowan Truck Co., Holyoke, Mass.

TRUCKS, LUMBER AND KILN
Holyoke Truck Co., Holyoke, Mass.
Swedish Steel & Importing Co., Montreal.
Northern Crane Works, Walkerville.

TRUCKS, LIFT, ELEVATING & TRANSFER
Cowan Truck Co., Holyoke, Mass.
Holyoke Truck Co., Holyoke, Mass.

TUBES, BOILER
Lyman Tube & Supply Co., Montreal, Que.

TUBING ELECTRIC WELDED OR OXYACETYLENE WELDED
Tube Co. of Can., Ltd., Toronto, Ont.

TUBE PROUCTS
Tube Co. of Can., Ltd., Toronto, Ont.

TUBING, SEAMLESS, BRASS AND COPPER
Lyman Tube & Supply Co., Montreal, Que.
Standard Tube & Fence Co., Woodstock.
Tallman Brass & Metal Co., Hamilton.

TUBING, FLEXIBLE METALLIC
Lyman Tube & Supply Co., Montreal, Que.

TUBING, SEAMLESS STEEL
Tube Co. of Can., Ltd., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.

TUBING, WELDED STEEL
Lyman Tube & Supply Co., Montreal Que.
Tube Co. of Can., Ltd., Toronto, Ont.

TURRET MACHINES, LATHES
Acme Mach. Tool Co., Cincinnati, Ohio
Brown & Sharpe Mfg. Co., Providence.
Garlock-Walker Machinery Co., Toronto.
Greenfield Tap & Die Corp., Greenfield
Hardinge Bros., Chicago, Ill.
Oliver Mchy. Co., Grand Rapids, Mich
Pratt & Whitney, Hartford, Conn.
Petrie, Ltd., H. W., Toronto.
Steinle Turret Mach. Co., Madison, Wis.
Strelinger, Chas. A. Co., Windsor, Ont.
Warner & Swasey Co., The, Cleveland, O

TURBO GENERATOR UNITS
Garvin Machine Co., New York.
Holden Co., Ltd., Montreal, Que.
MacGovern & Co., Montreal, Que.
Warner & Swasey, Cleveland, O.

TURNBUCKLES
Canada Fdrs. & Forg. Ltd., Welland.
Morrow Screw & Nut Co., Ingersoll, Ont.
Rice Lewis & Son, Toronto, Ont.

TURNTABLES
Can. Link-Belt Co., Toronto, Ont.
Dom. Bridge Co., Ltd., Montreal, P.Q
Elec. Steel & Metals, Welland, Ont.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

TWIST DRILLS
Butterfield & Co., Inc., Rock Island, Que

UPSETTING AND BENDING MACHINERY
Bertram & Sons Co., John, Dundas.
Brown, Boggs Co., Ltd., Hamilton, Can.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Machinery Co., Toronto.
Jardine & Co., A. B., Hespeler, Ont.
National Machy. Co., Tiffin, O.
Canada Machinery Corp., Galt, Ont.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Williams Machy. Co., A. R., Toronto.

VACUUM PUMPS
Holden Co., Ltd., Montreal, Que.

VALVE LEATHERS
Graton & Knight Mfg. Co., Montreal.

VALVES, MIXING
Crane, Ltd., Montreal, Que.

VALVES (IRON) STANDARD AND EXTRA HEAVY
Crane, Ltd., Montreal, Que.

VALVE GRINDERS (PNEUMATIC)
Cleveland Pneumatic Tool Co., Toronto.

VALVES, HYDRAULIC
Metalwood Mfg. Co., Detroit, Mich.

VALVES, RUBBER PUMP
International Mach. Spls., Ltd., Montreal
Quaker City Rubber Co., Philadelphia

VENTILATORS
H. H. Robertson, Lt., Sarnia, Ont.

VENTILATING APPARATUS
Brantford Oven & Rack Co., Brantford.
Can. Blower & Forge Co., Kitchener, Ont
Petrie, Ltd., H. W., Toronto.
Sturtevant Co., B. F., Galt, Ont.
Williams Machy. Co., A. R., Toronto.

VISE STANDS, PORTABLE
Williams & Co., J. H., Brooklyn, N.Y

VISES, BENCH
Aikenhead Hardware Co., Toronto, Ont.
Becker Milling Machine Co., Boston, Mass.
Foss Machy. & Spty. Co., G. F., Montreal.
Petrie, Ltd., H. W., Toronto.
Chicago Flexible Shaft Co., Chicago, Ill.
Strelinger, Chas. A. Co., Windsor, Ont
Superior Machinery Co., London, Ont.

VISES, DRILL
Superior Machinery Co., London, Ont.

VISES, PIPE
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Rock Island, Que.
Marshall, Son & Bunnev, Toronto.
Petrie, Ltd., H. W., Toronto.
Wells Bros. Co. of Canada, Galt, Ont.
Williams & Co., J. H., Brooklyn, N.Y.
Strelinger, Chas. A. Co., Windsor, Ont.

VISES, MILLING MACHINE
Brown & Sharpe Mfg. Co., Providence, R.I.
Superior Machinery Co., London, Ont.

VISES, PLANER AND SHAPER
Aikenhead Hardware Co., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Petrie, Ltd., H. W., Toronto.
Superior Machinery Co., London, Ont.

VOLMETERS & AMMETERS
Northern Electric Co., Ltd., Montreal Que

WASHER MACHINES
National Machy. Co., Tiffin, Ohio.

WASHERS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Barnes, Wallace, Co., Bristol, Conn.
Graton & Knight Mfg. Co., Worcester.
Kayser-Ellison & Co., Ltd., Montreal.
London Bolt & Hinge Wks., London, Ont.
Marshall, Son & Bunnev, Toronto.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Norton, Ralph B., Agent, Montreal.
Steel Co. of Canada, Ltd., Hamilton, Ont.

WASTE
Wilkinson & Kompass, Hamilton, Ont.
Wood Turret Machine Co., Brazil, Ind.

WASTE CLEANER AND OIL RECLAIMER
Oakley Chemical Co., New York, N.Y.

WATER-INTAKE SCREENS
Can. Link-Belt Co., Toronto, Ont.

WATER TOWERS
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Toronto Iron Works, Ltd., Toronto.

WATER WHEELS
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Hamilton Co., Ltd., Wm., Peterborough,

WELDED TANKS
Can. John Wood Co., Toronto, Ont.
Lincoln Electric Co. of Canada, Ltd., Toronto, Ont.

WELDERS, ELECTRIC, SPOT AND BUTT
Knight Metal Products, Toronto.

WELDERS, ELECTRIC ARC
Lincoln Electric Co. of Canada, Ltd., Toronto, Ont.

WELDING, ELECTRIC, SPOT, BUTT, ETC.
McClean Machine & Tool Co., Ltd., Hamilton, Ont.
Tabor Mfg. Co., Philadelphia, Pa.

WELDING MASKS
Carter Welding Co., Ltd., Toronto, Ont.
Davis-Bournonville Co., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.

WELDING GOGGLES
Carter Welding Co., Ltd., Toronto, Ont.
Davis-Bournonville Co., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.
Willson Goggles Inc., Reading, Pa.

WELDING RODS AND WIRE
Carter Welding Co., Ltd., Toronto, Ont.
Davis-Bournonville Co., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.
Lincoln Electric Co. of Canada, Ltd., Toronto, Ont.
Page Steel & Wire Co., Adrian, Mich.

WELDING SUPPLIES
Carter Welding Co., Ltd., Toronto, Ont.
Davis-Bournonville Co., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.
Lincoln Electric Co. of Canada, Limited, Toronto, Ont.
Nat. Electro Products Ltd., Toronto, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
Union Carbide Co. of Can. Ltd., Welland Ont.

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Carter Welding Co., Ltd., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
L'Air Liquide Society, Toronto, Ont.

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Furniss, Clarke & Co., Montreal, Que.

WHEELS, BALL BEARING
Lyman Tube & Supply Co., Montreal, Que

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Dominion Foundries & Steel Ltd., Hamilton, Ont.
Elec. Steel & Metals, Welland, Ont.

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Petrie, Ltd., H. W., Toronto.

WHEELS, TURBINE, WATER
Elec. Steel & Metals, Welland, Ont.

WHEELS, PRESSED STEEL
American Pulley Co., Philadelphia, Pa.

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Petrie, Ltd., H. W., Toronto.
Wheel Trueing Tool Co., Windsor, Ont.

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Canadian Mead-Morrison Co., Limited, Montreal, Que.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Kennedy & Son, Wm., Owen Sound, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Williams Tool Corp. of Can. Ltd., Brantford, Ont.

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WINCHES, POWER DRIVEN
Canadian Mead-Morrison Co., Limited, Montreal, Que.
Hamilton Co., Ltd., Wm., Peterborough, Ont.

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Shuster Co., he F. B., New Haven, Conn

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Quickwork Co., St. Marys, Ohio

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Page Steel & Wire Co., New York, N.Y.

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WIRE, COPPER, CLAD STEEL
WIRE, LINK FABRIC
Page Steel & Wire Co., Adrian, Mich.

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Brown, Boggs Co., Ltd., Hamilton, Can.

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WIRE NAILS
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Parmenter & Bulloch Co., Gananoque.
Steel Co. of Canada, Ltd., Hamilton, Ont.

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Can. ...re & Iron Goods Co., Hamilton, Ont.
Samuel Osborne, Ltd., Montreal, P.Q.

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National Machy. Co., Tiffin, Ohio.
Page Steel & Wire Co., New York, N.Y.

WIRE, SPARK PLUG, MANGANESE NICKEL, COPPER NICKEL, MONEL METAL
Can. Driver-Harris Co., Ltd., Walkerville.

WIRE SPRING
Page Steel & Wire Co., Adrian, Mich.

WIRE STEEL, BRASS, COPPER
Page Steel & Wire Co., New York.
Steel Co. of Canada, Ltd., Hamilton, On.

WIRE, TELEPHONE, TELEGRAPH, GALVANIZED AND ELECTRICAL
Page Steel & Wire Co., Adrian, Mich.

WIRE, WEAVING, MONEL METAL, BRASS, COPPER, GOLDEN BRONZE, HIGH BRASS, LOW BRASS, NICKEL
Can. Driver-Harris Co., Ltd., Walkerville.

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Canada Machinery Corp., Galt, Ont.
Cowan Truck Co., of Galt, Galt, Ont.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., Ltd., A. R., Montreal

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Baird Machine Co., Bridgeport, Conn.
Brown, Boggs Co., Ltd., Hamilton, Can.
Strelinger Co., C. A., Windsor, Ont.
Shuster Co., F. B., New Haven, Conn.

WOOD BORING MACHINES
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Holden Co., Ltd., Montreal, Que.

WOODWORKING MACHINERY
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Cowan Truck Co., of Galt, Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Oliver Machy. Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto.
Standard Equipment & Tool Wks., Montreal.
Silver Mfg. Co., Salem, Ohio.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Machy. Co., A. R., Toronto.

WOOD MILLING MACHINES AND SHAPERS
Oliver Machy. Co., Grand Rapids, Mich.

WRENCHES
Williams & Co., J. H., Brooklyn, N.Y.
Armstrong Bros. Tool Co., Chicago, Ill.
Butterfield & Co., Rock Island, Que.
Canada Fdrs. & Forg. Ltd., Welland
Keystone Mfg. Co., Buffalo, N.Y.
Wells Bros. of Canada, Galt, Ont.

WOVEN STEEL PARTITIONS
Can. Wire & Iron Goods Co., Hamilton, Ont.
Page Steel & Wire Co., Adrian, Mich

WRENCHES, AUTOMOBILE, NARROW JAW, MONKEY, SCREW
Morrow Screw & Nut Co., Ingersoll, Ont

WRENCHES, PIPE, MONKEY, TAP AND POWER
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Aikenhead Hardware Co., Toronto, Ont.
Marshall, Son & Bunnev, Toronto.
Peck, Stow & Wilcox Co., Southington
Rice Lewis & Son, Toronto, Ont.
Keystone Mfg. Co., Buffalo, N.Y.
Petrie, Ltd., H. W., Toronto.
Wells Bros. of Canada, Galt, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

WRENCHES, SOCKET
Petrie Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Machy. Co., A. R., Toronto.
Williams & Co., J. H., Brooklyn, N.Y.

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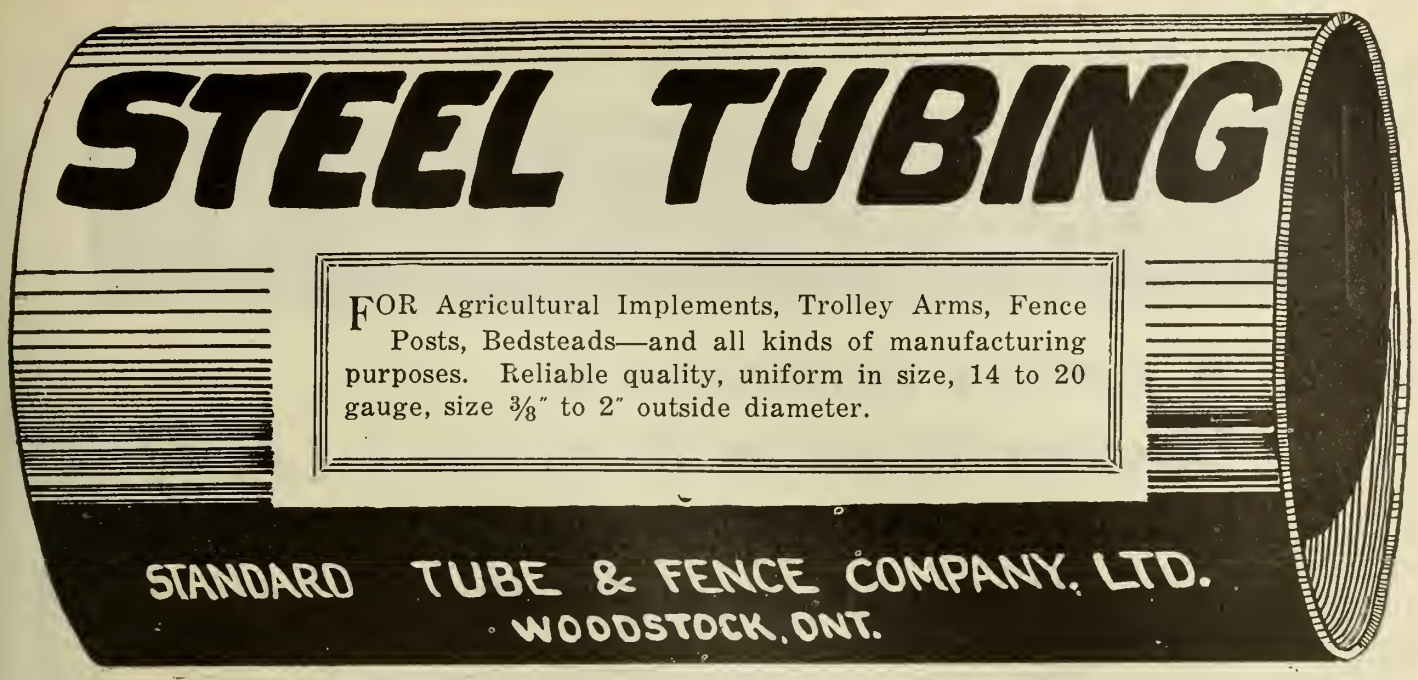
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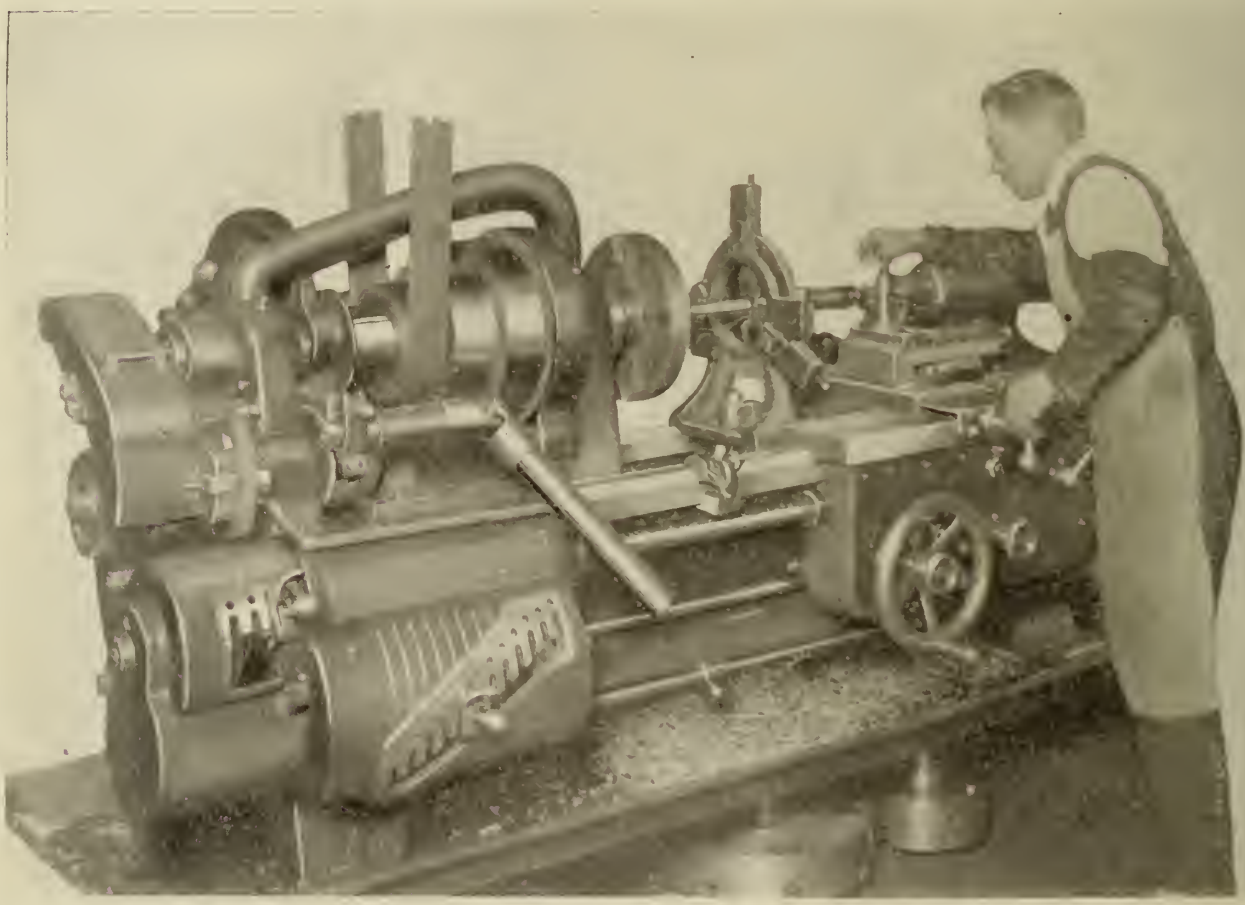

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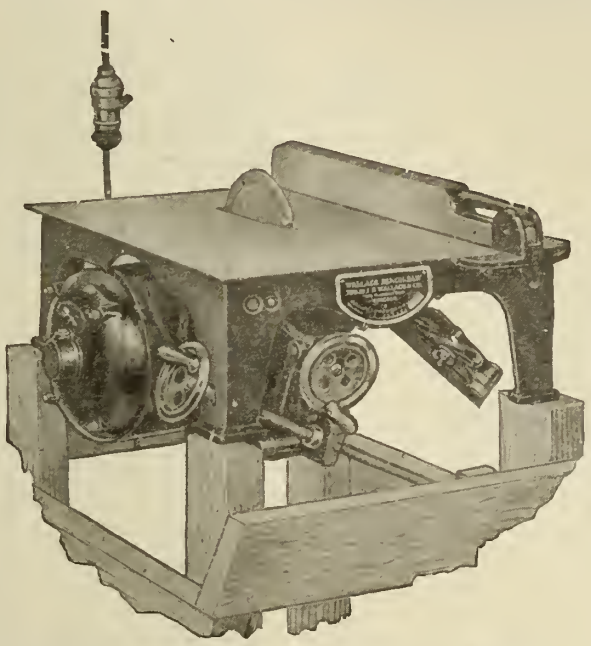

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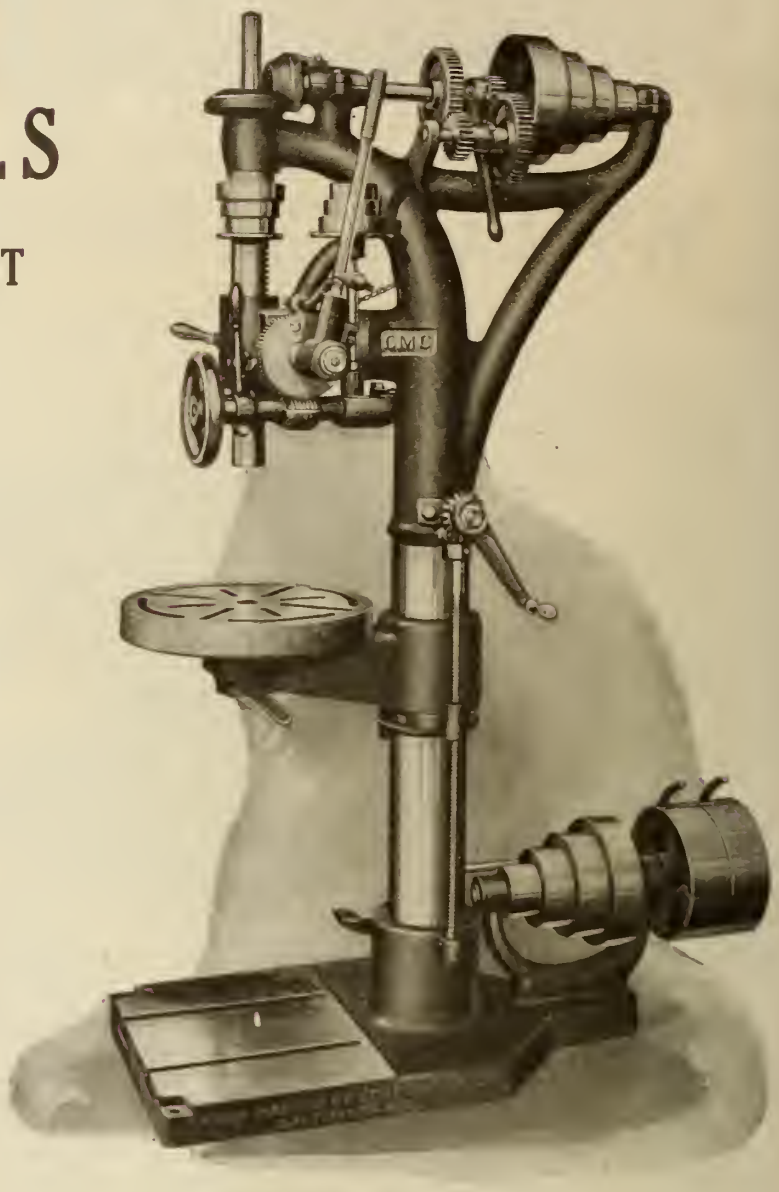

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Vol. XXIV., No. 7 Published by the MacLean Publishing Company, Limited, Toronto August 12, 1920 $4.00 a Year Subscription Price

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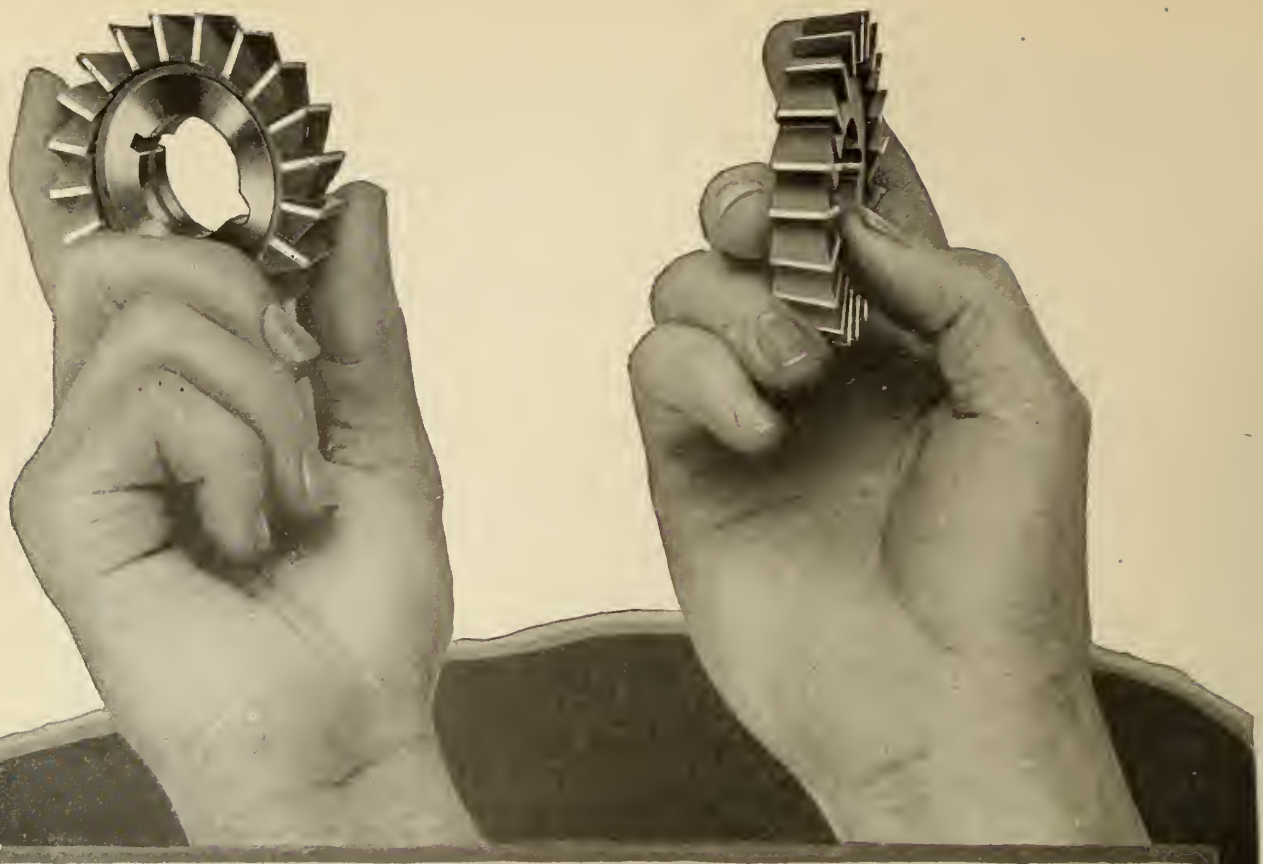

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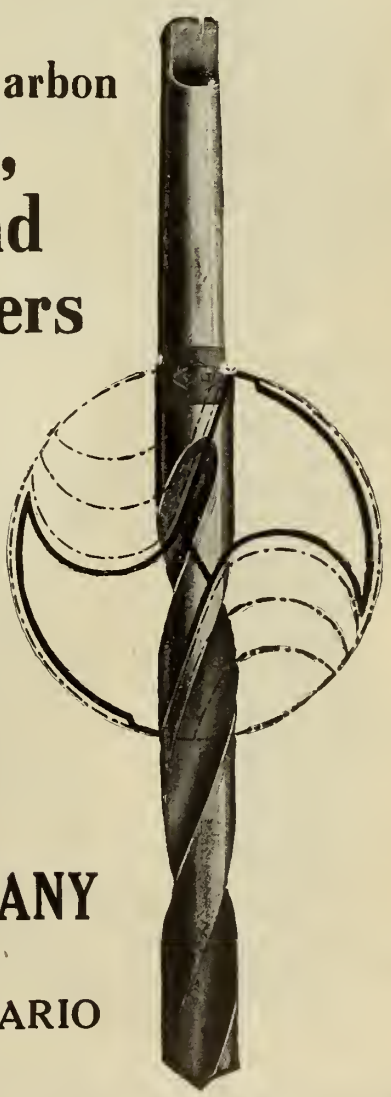

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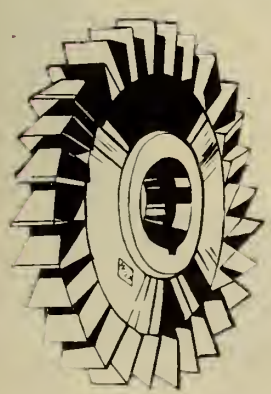

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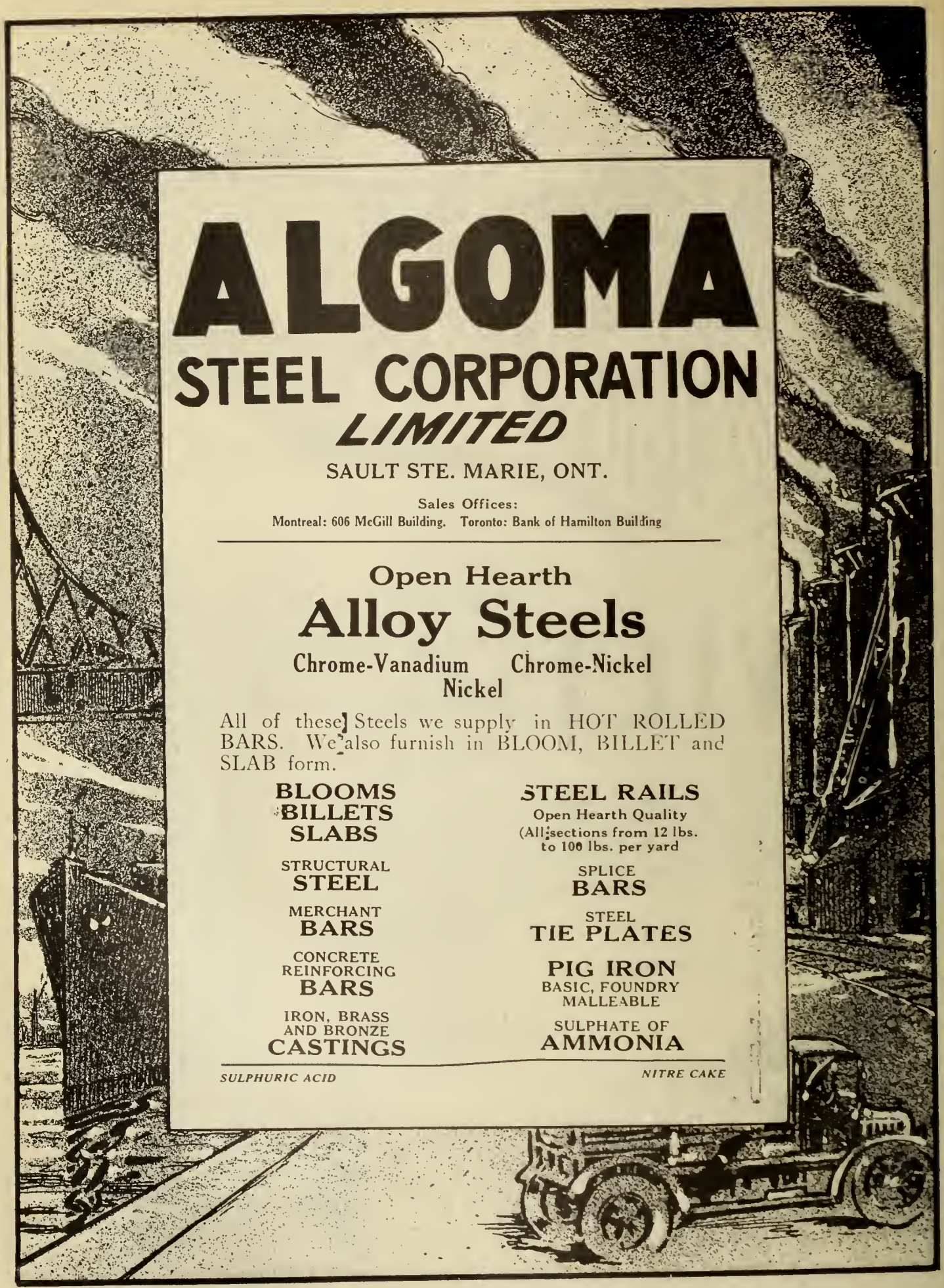

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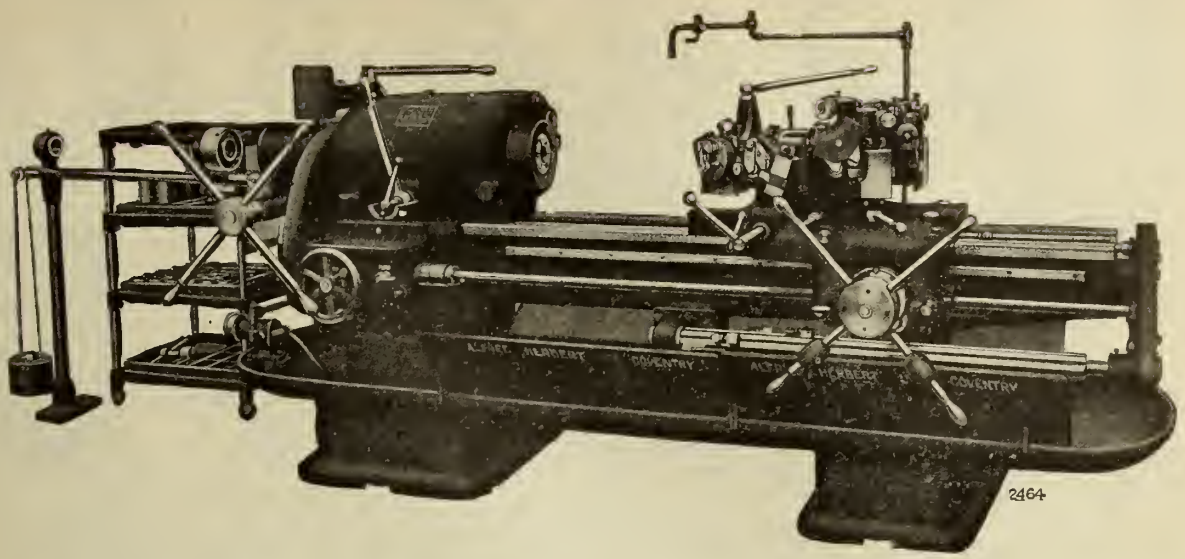

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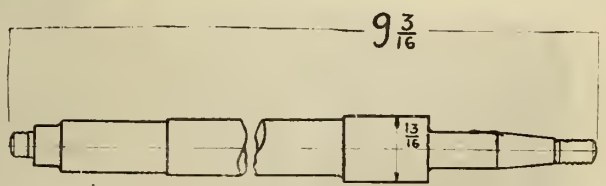

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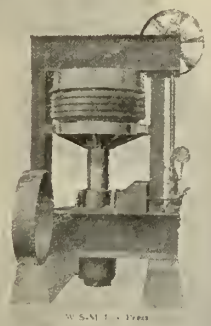

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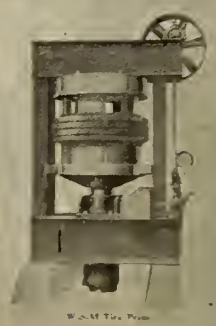

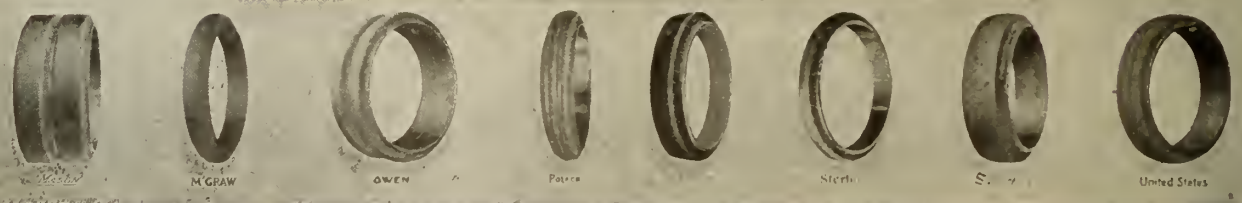

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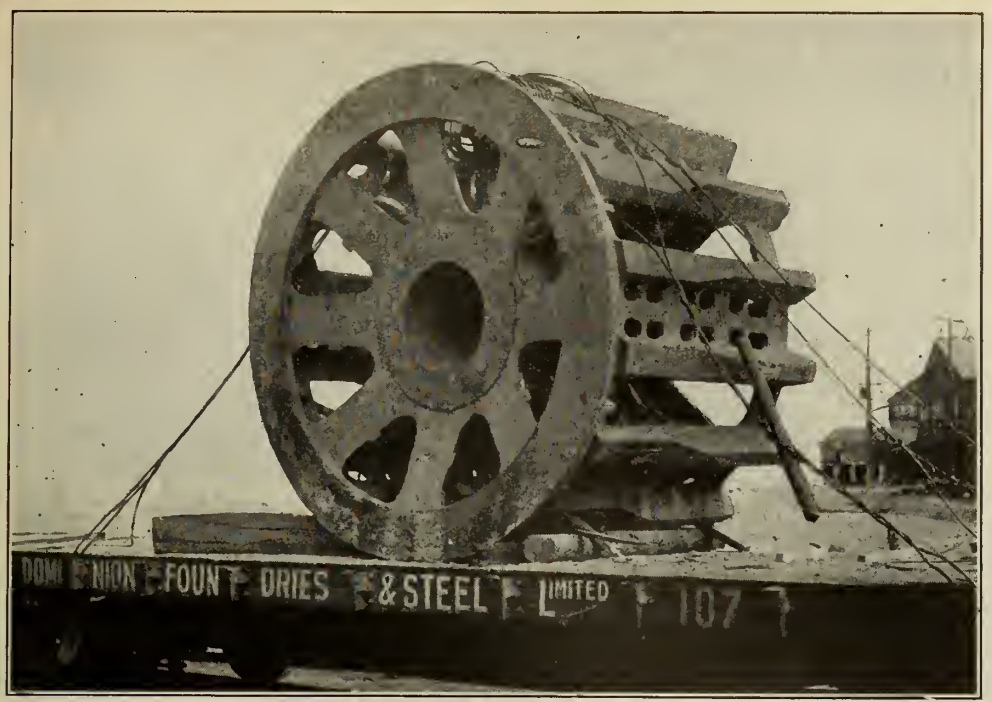

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There's a *Tycos* or *Taylor* Thermometer for Every Purpose

CC9

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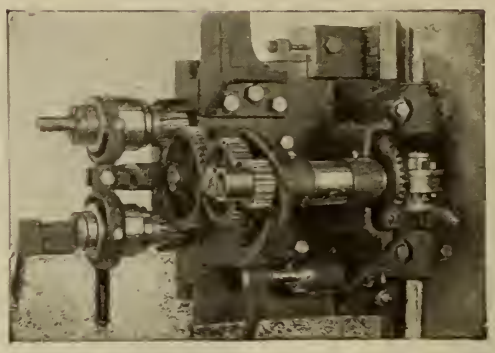
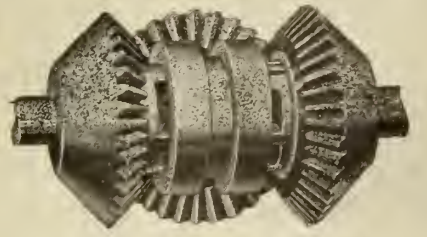
THE JOHNSON FRICTION CLUTCH

Look Over This Practical Johnson Clutch Assembly

Here is a typical Johnson installation—the Colburn Boring Mill with three Johnson Clutches shown, and three more on the other end of the cross rail. For neatness and simplicity this arrangement is worthy of notice, but its real value appears in the smooth and convenient control of operations that it gives.





Double Clutch Between Bevel Gears

Builders of all types of machinery are placing their confidence in Johnson clutches and are finding them capable of the highest quality of service under any conditions.

Our booklet, "Clutches as Applied to Machine Building," shows many examples of successful clutch engineering. Let us send you a copy.

Write for our Yellow Catalog

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WILLIAMS & WILSON, LIMITED, 84 Inspector Street, Montreal
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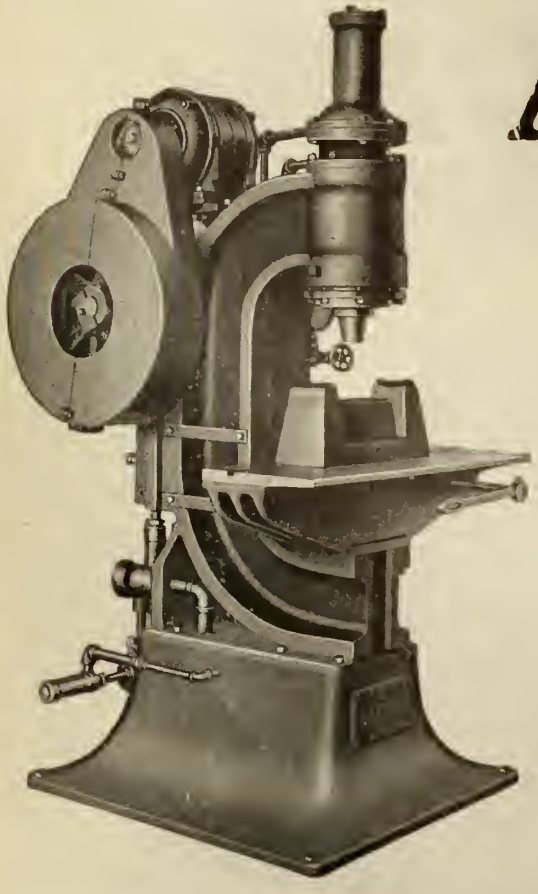
THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.



A SELF-CONTAINED HYDRAULIC UNIT

EASTERN UNIVERSAL HYDRAULIC PRESS. Supplied in 20-35 and 50 ton capacities, full hydraulic depending on no springs or weight for return of ram delivering pressure instantly at a speed of 1½" per second, return of ram 3" per second.

Length of Ram Travel	**6 in.**
Depth of Throat	**10 in.**
Length of Table	**8 ft.**
Width of Table	**10 in.**
Table to Ram	**10 to 14 in.**

EASTERN UNIVERSAL PRESSES are tested before leaving our plant at 33 1/3% overload. They are furnished with rolling centers and are unexcelled for straightening of motor crankshafts, heavy wheel shafts, broaching splines in drive plate, differential gears, and others. Straightening front axles and spindles.

Write for details.

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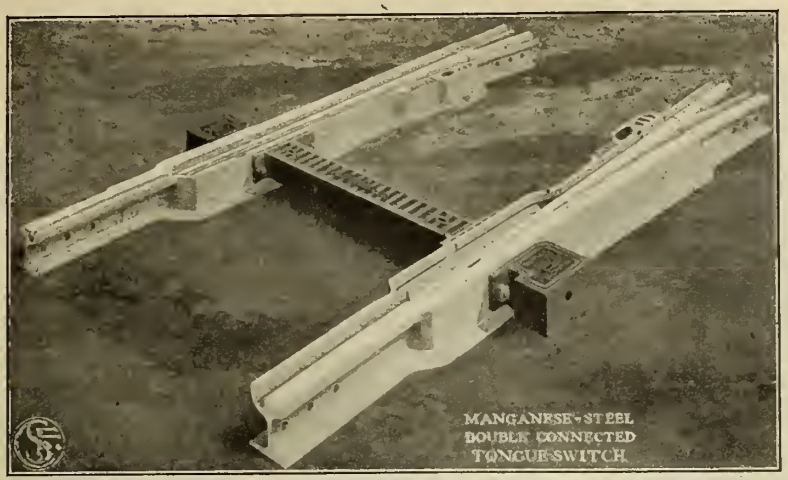

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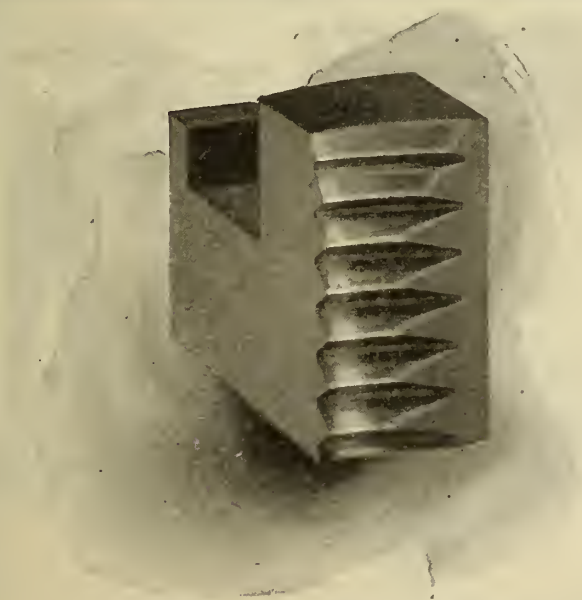

Don't Scrap the other Chasers

If one in a set breaks

Put in a New Chaser

Grinding set to uniformity.

This *Is* Practicable *If* You Use

HARTNESS AUTOMATIC DIES

Jones & Lamson Machine Company

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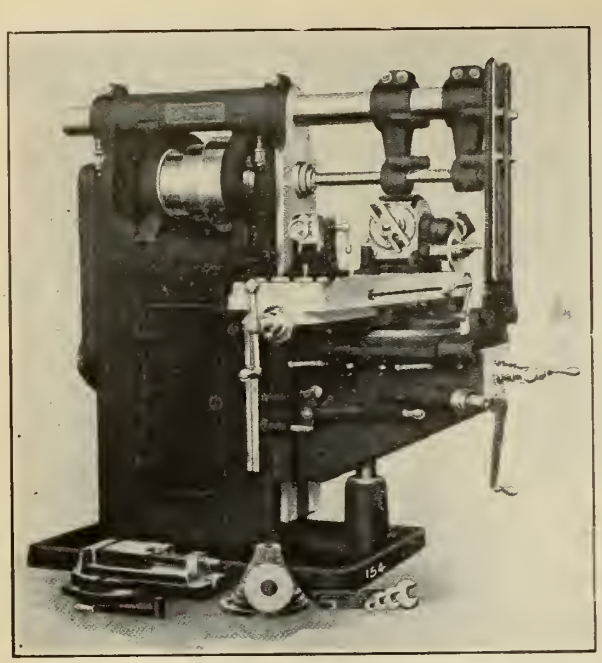

Ford-Smith Millers are built in plain and universal types in a suitable range of capacity for almost every type of milling.

Full particulars will be found in the Ford-Smith catalog. Shall we send you a copy?

FORD-SMITH

Quality Machine Tools

Ford-Smith Millers are high-grade machines, modern in every particular, designed for **quality** as well as **quantity** production.

Every miller is rigidly tested before leaving the factory. The machine you receive is guaranteed to be dependable in every way.

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NOTED FOR ITS BLOW AND CONTROL

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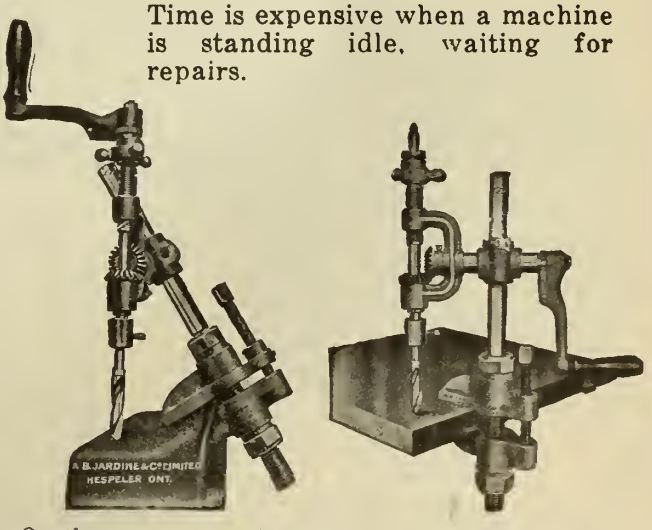
Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.



On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, $26.50 net.

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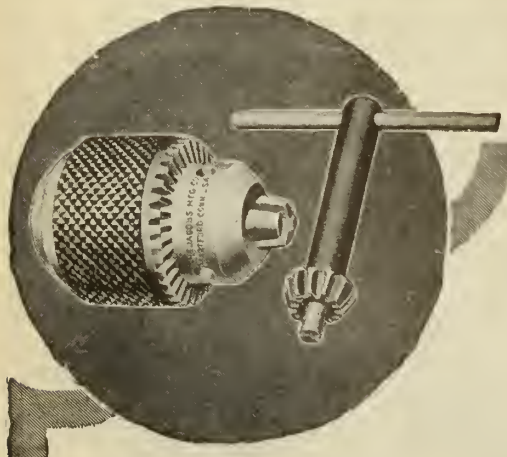

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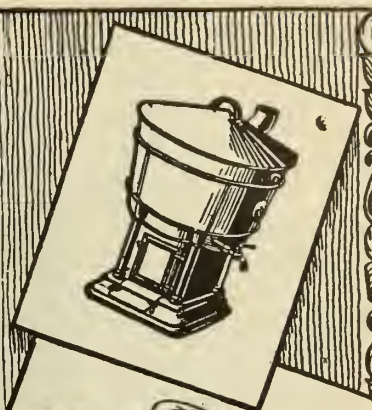
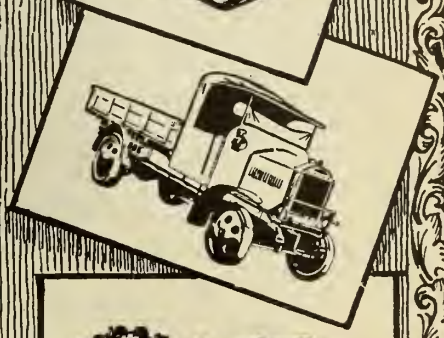
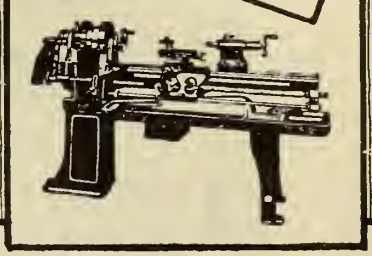
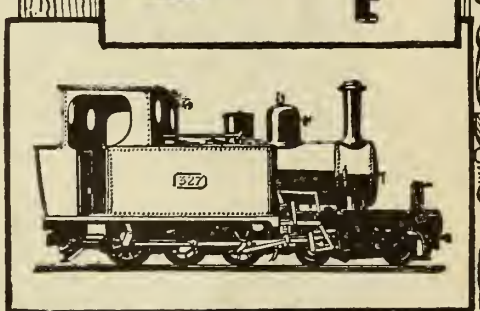
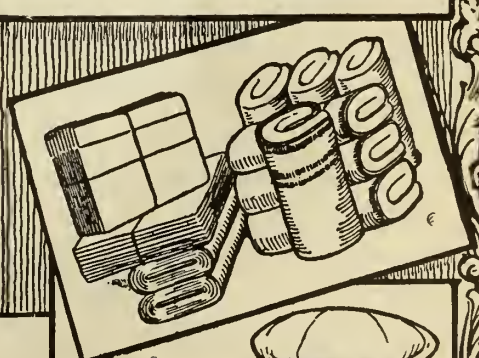

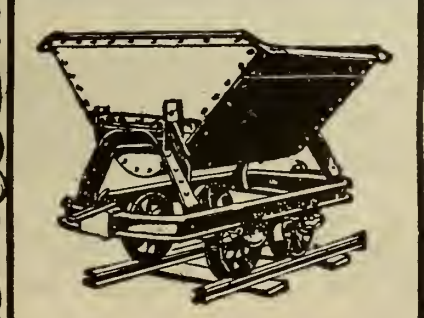
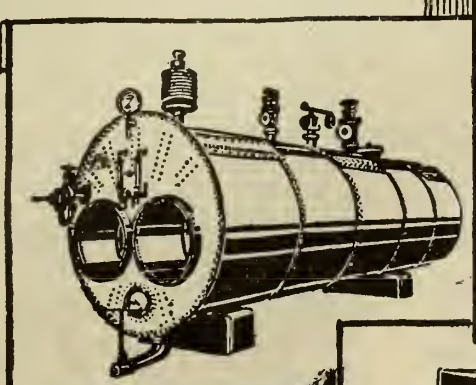

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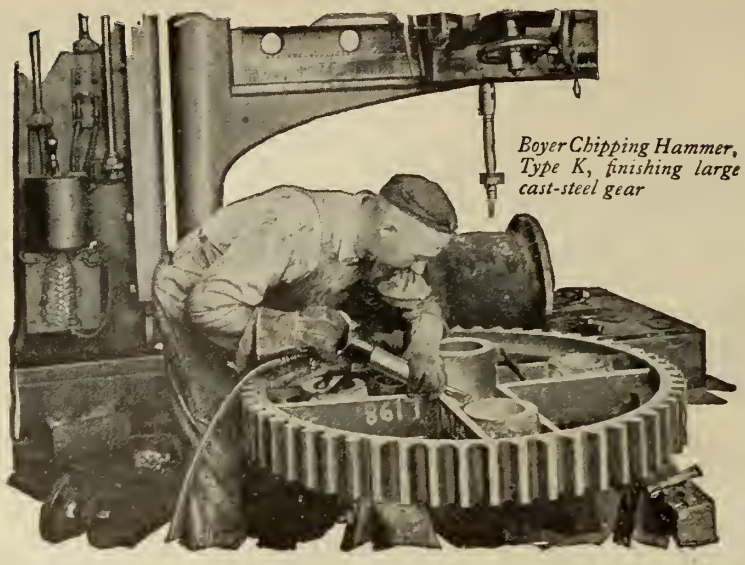

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Boyer Chipping Hammers have the same built-in qualities as the famous Boyer Riveting Hammer itself; fast-hitting power, freedom from wasteful vibration, accurately fitted air-tight parts made from finest materials carefully heat treated, and day-in-day-out dependability that spells *low upkeep.*

Boyer Chipping Hammers are made in a wide variety of types and sizes for every conceivable chipping, calking, beading, scaling or light riveting job. And *stock delivery* is procurable from any Company Branch.

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P-82-H

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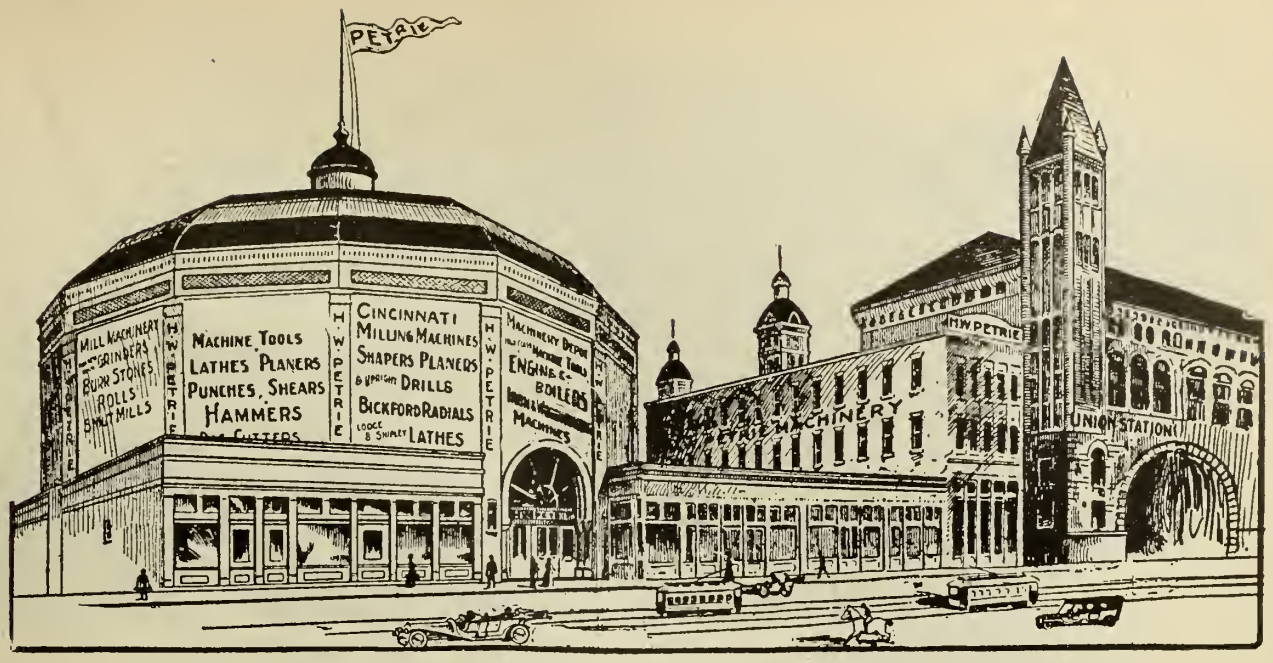
The world's standard *wherever rivets are driven*



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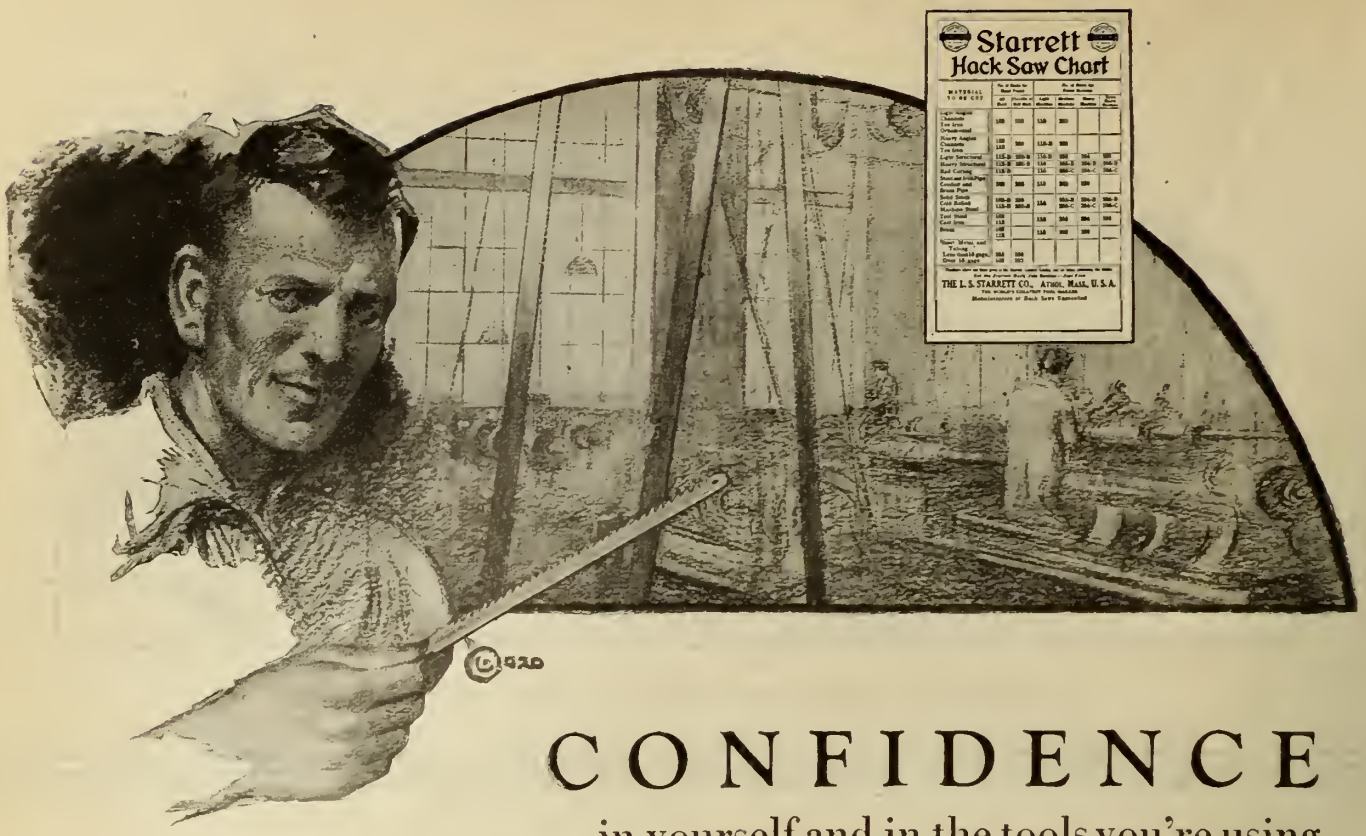

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Mechanics who use Starrett Hack Saws according to the Starrett Hack Saw Chart, are sure of their results. Starrett Saws are sold upon the *confidence* mechanics have in them.

A saw for each kind of material to be cut—each blade made of the finest grade of hack saw steel. And behind them the Starrett Service, helping hack saw users to get every bit of value out of Starrett Blades that we put into them. That's why they "cut quicker and last longer."

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The finished work is never returned under the cutter, thus avoiding all marks or scratches on the milled surface.

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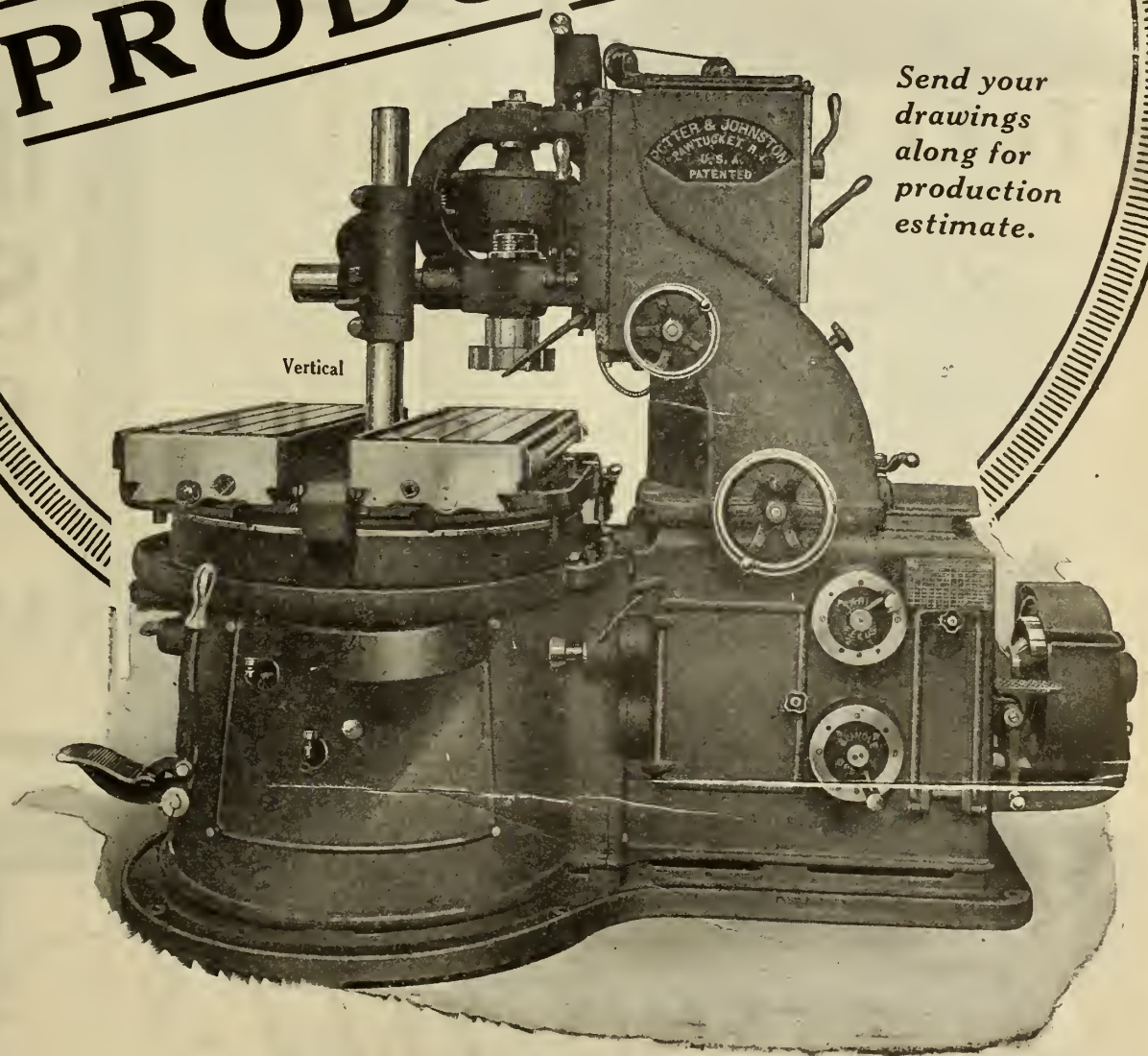

Vertical

Send your drawings along for production estimate.

Bulletin 40

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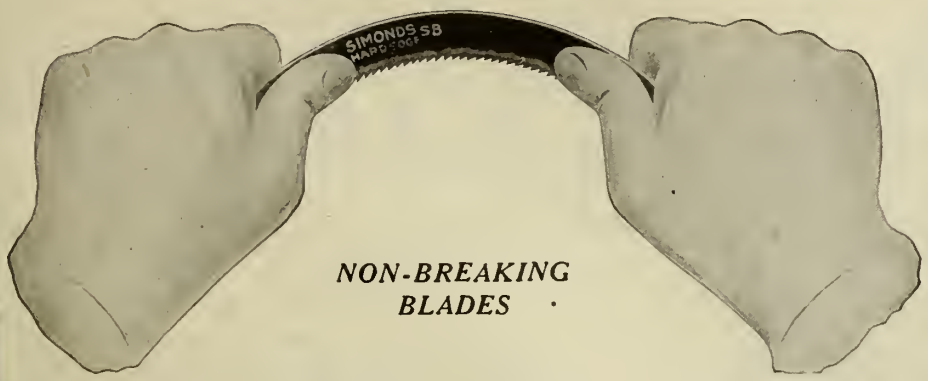

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Estimates from blue prints submitted promptly.

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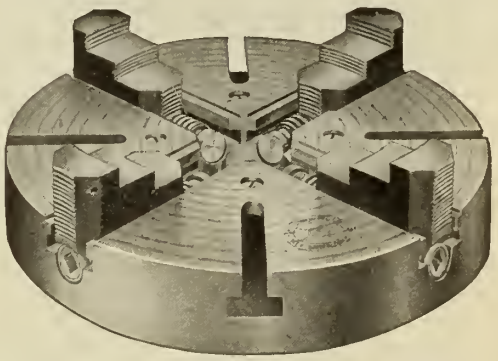
are not an experiment—they have come to stay. They are a necessity with the modern machinery and high-speed steel cutting tools.



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are well designed and have all the elements of strength and durability for which they are designed. We make other types in steel also, including the Geared Scroll Chucks and the Geared Scroll Combination—all designed for heavy work and hard usage.

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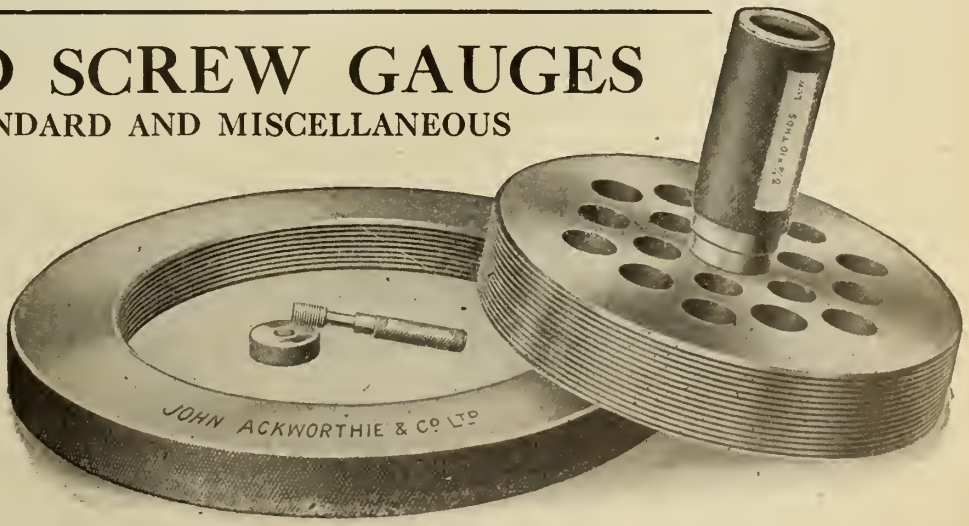
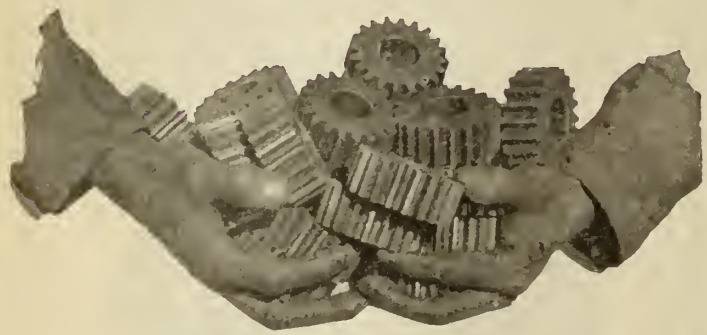


CUT GEARS

Generated Spur Gears



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We have been making springs of all kinds for 70 years. Let us advise you when in difficulty.

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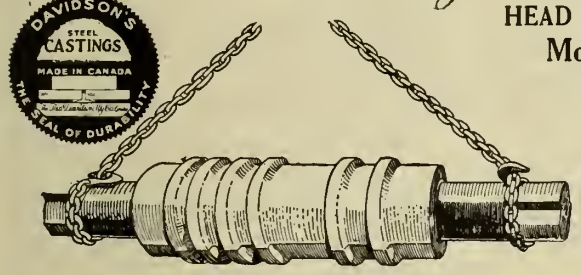
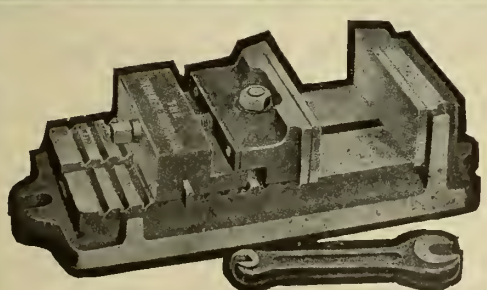


DAVIDSON

SKINNER DRILL PRESS VISES



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It is truly **THE HANDY TOOL.**

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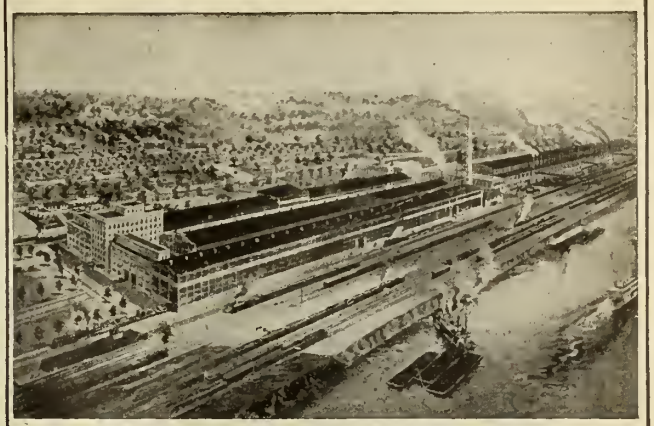

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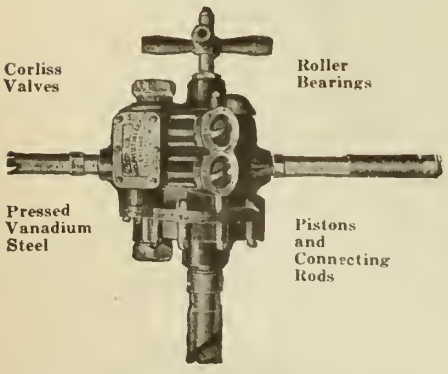

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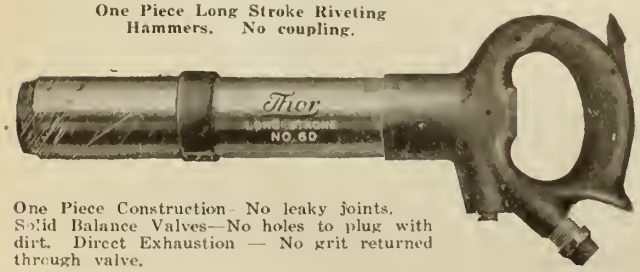

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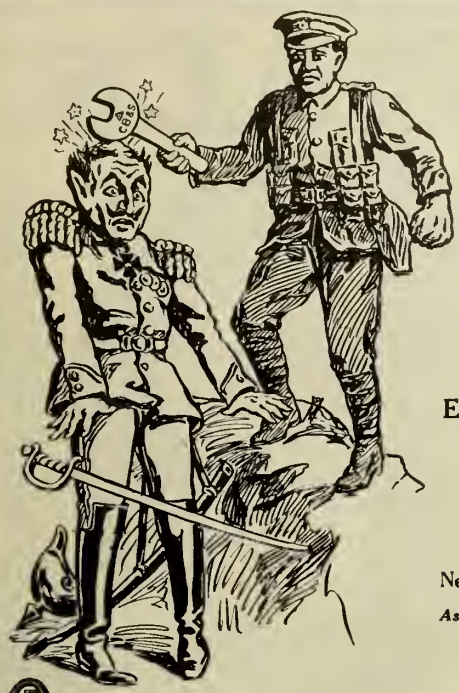

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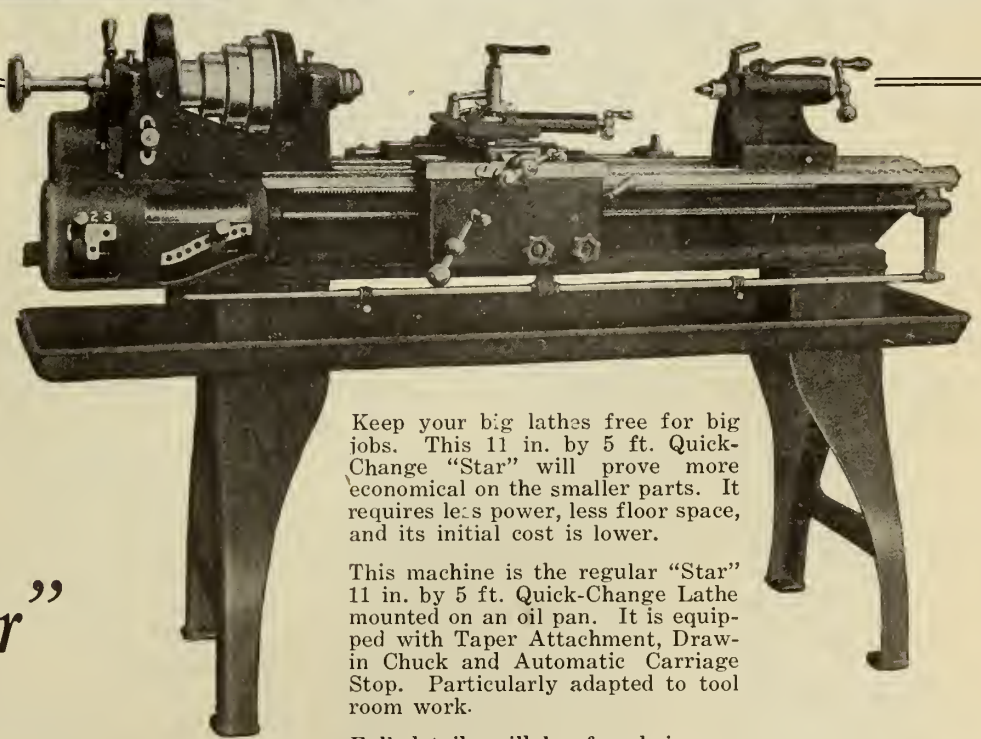

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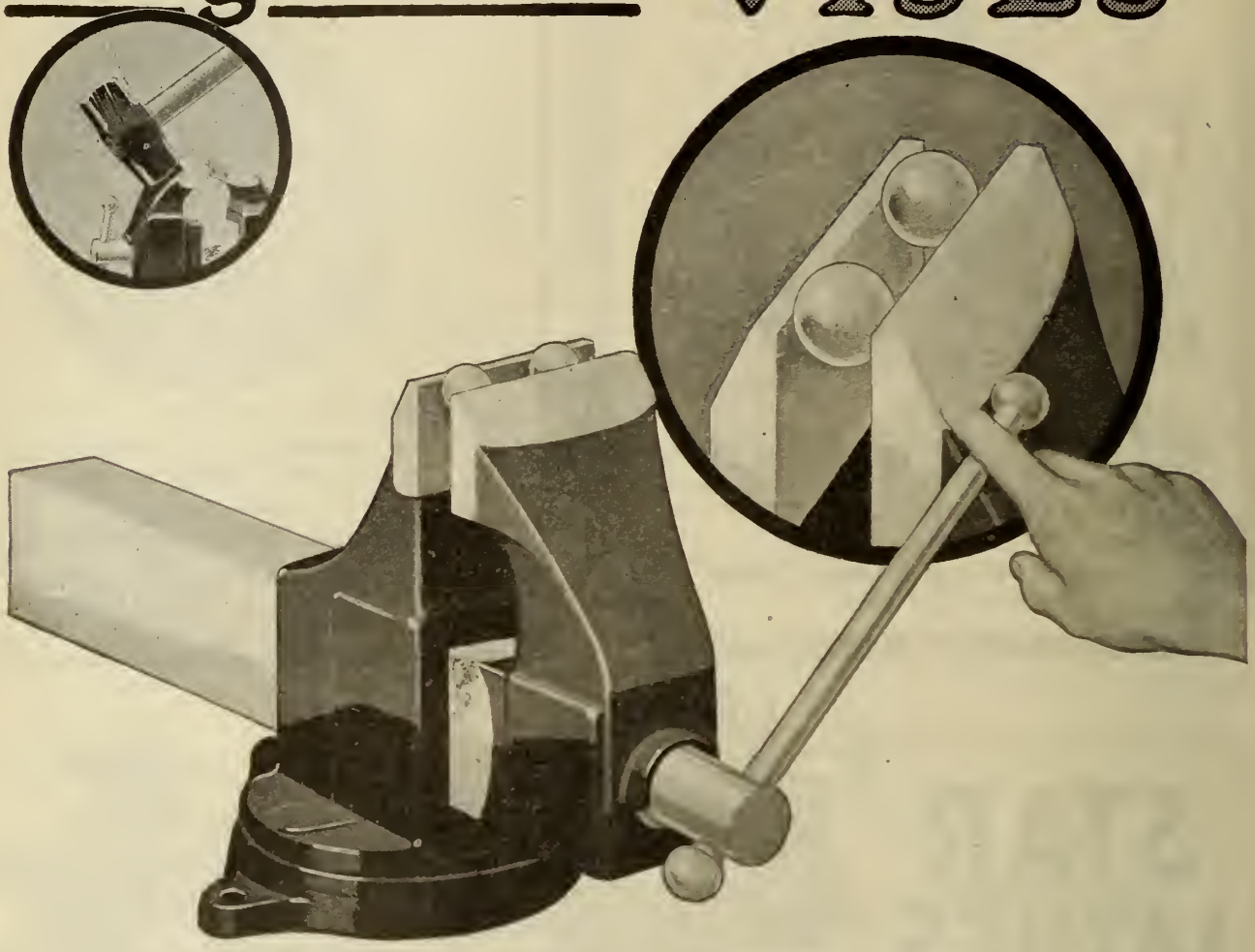

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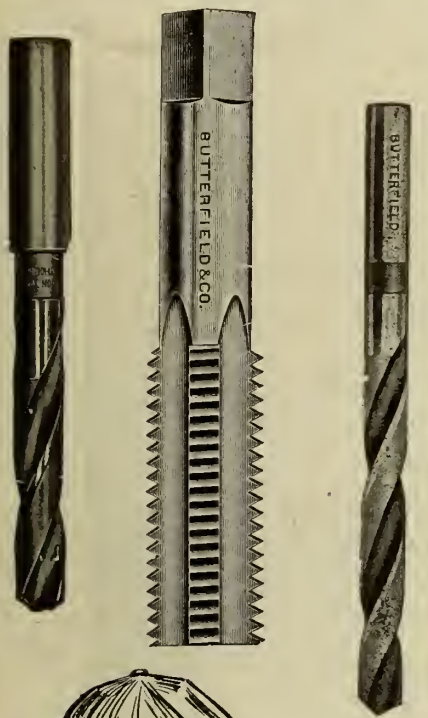

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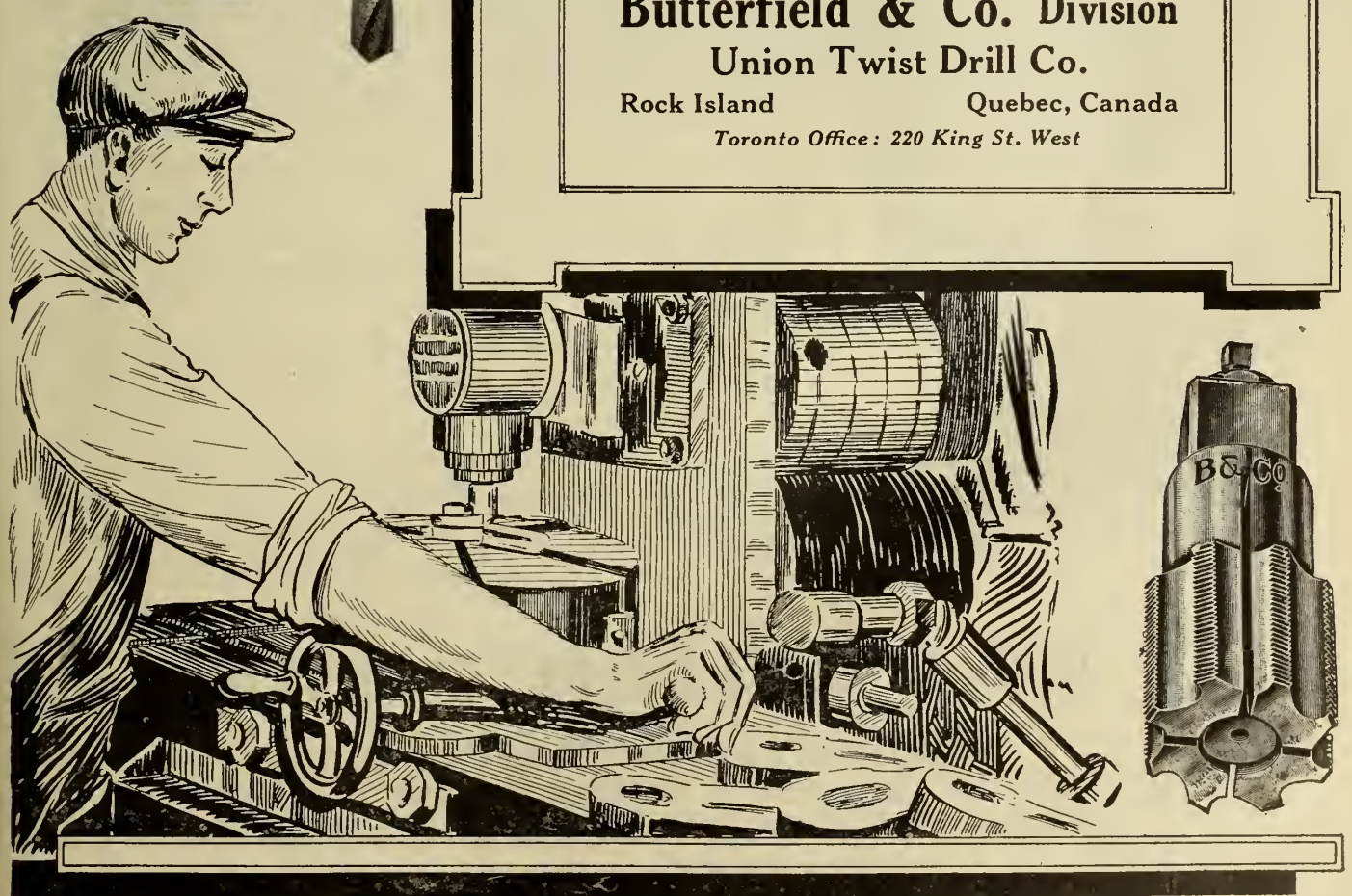

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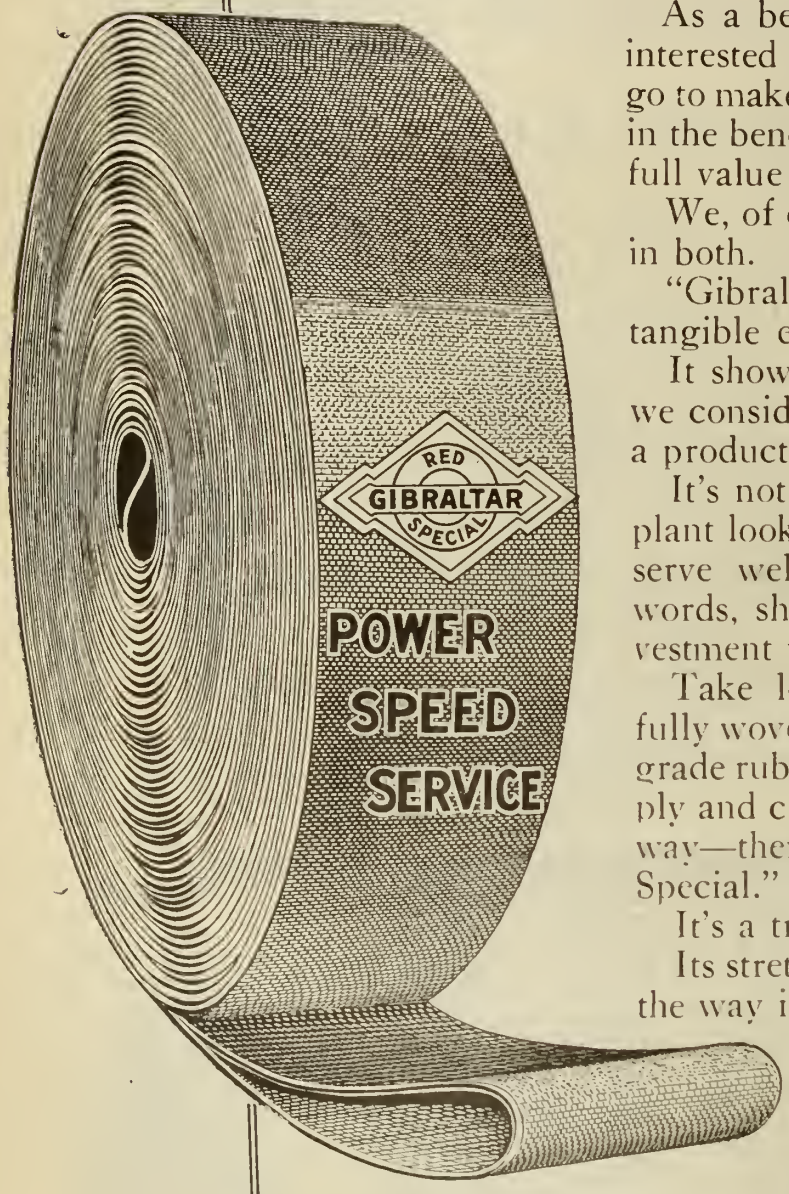

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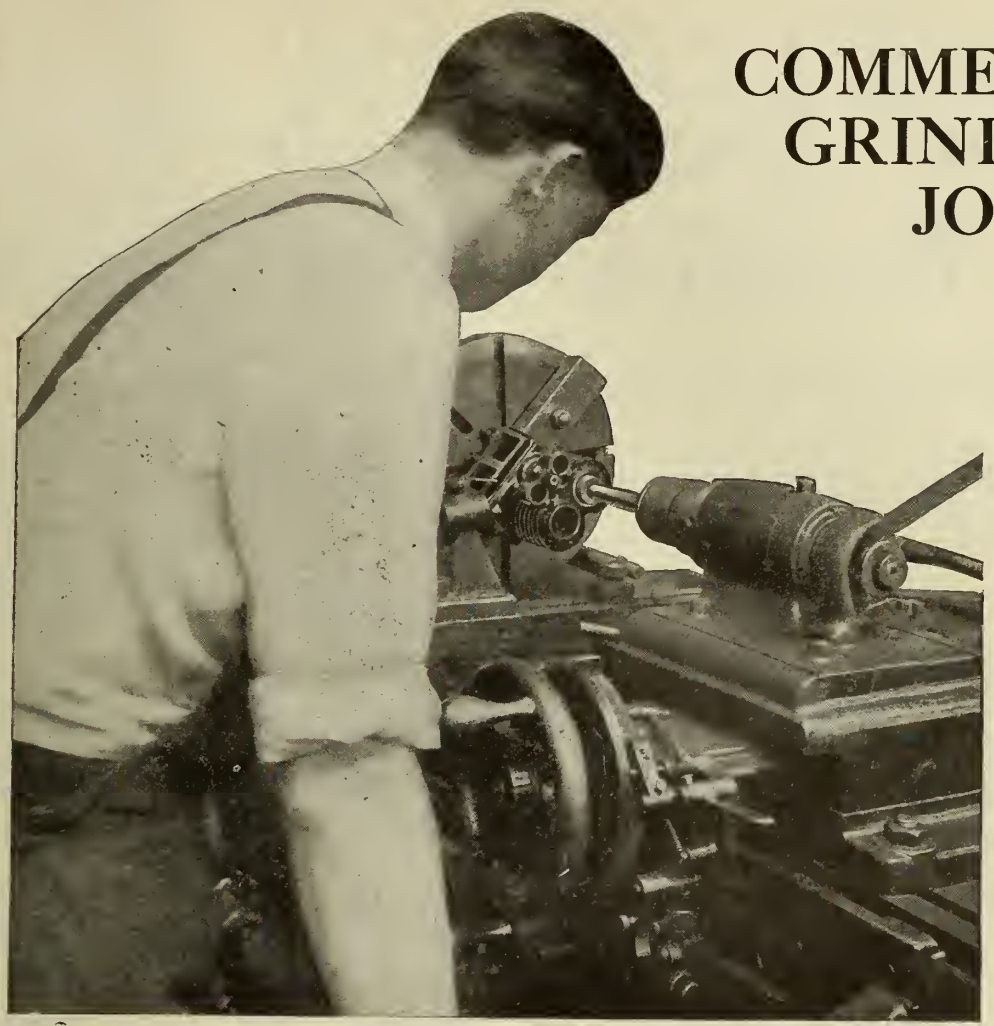

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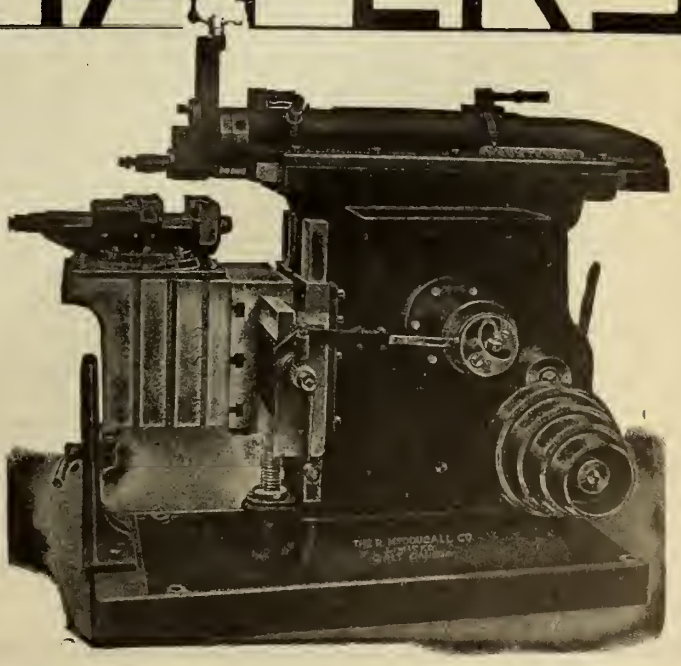

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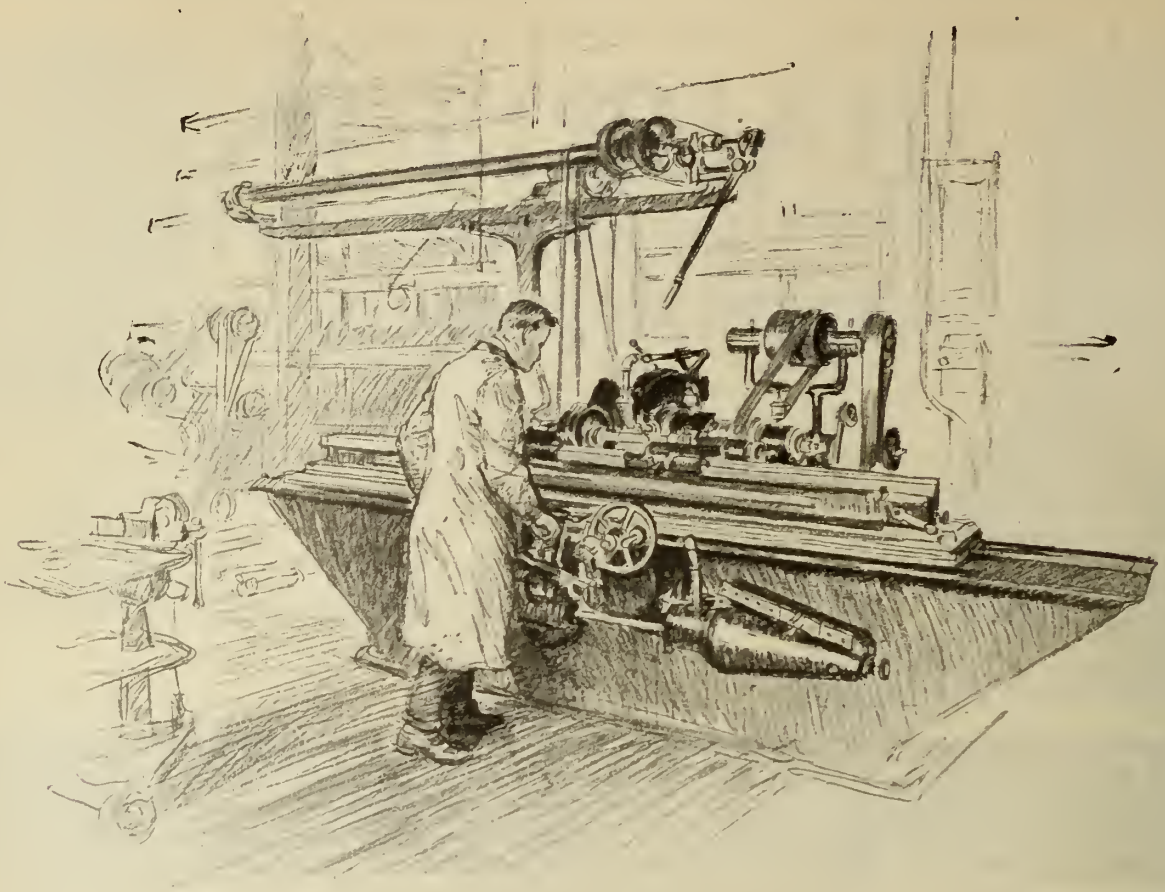

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By Charles H. Norton

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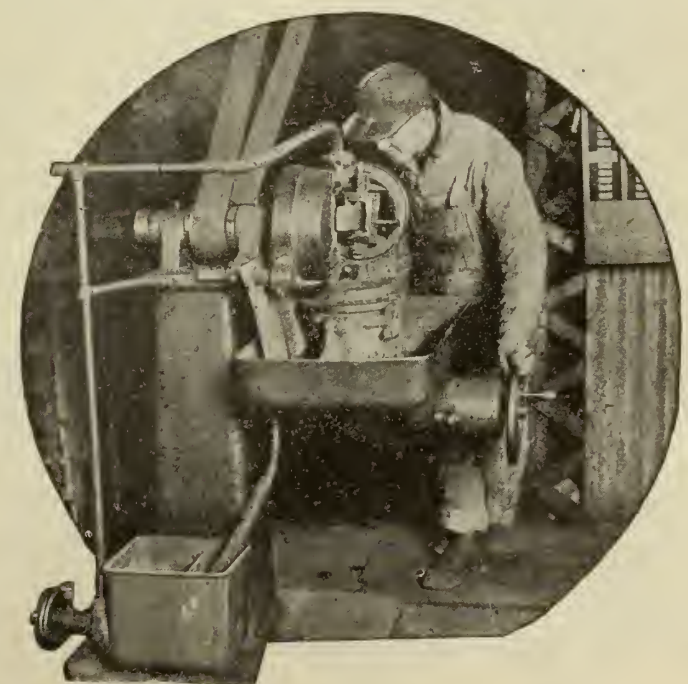

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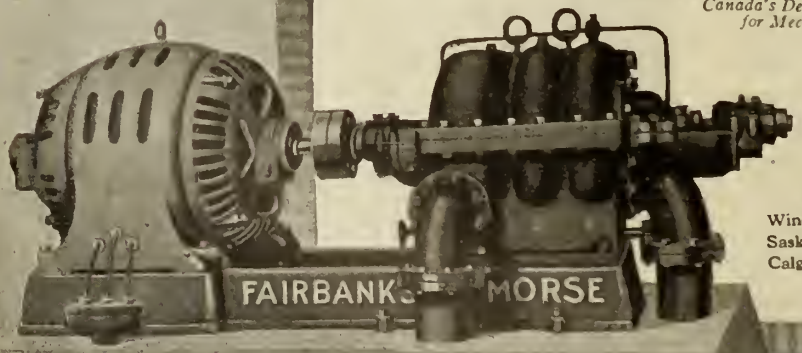

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MANUFACTURING NEWS

Vol. XXIV. No. 7 August 12, 1920

Design and Application of Keyway Broaches

The Use of Keyseating Machines, and Their Broaches, Is Not as Well Known as It Should Be—The Data Contained in This Article Are Both Valuable and Authoritative

By G. Laidler

KEYWAY broaches are commonly of three types: one consists of a series of toothed blades drawn through the hub of the work and held in relative position by means of a locating centre; a second has a blade of rectangular section secured in its own stock or carrier; and a third type has an integral blade and stock, and is termed a solid broach.

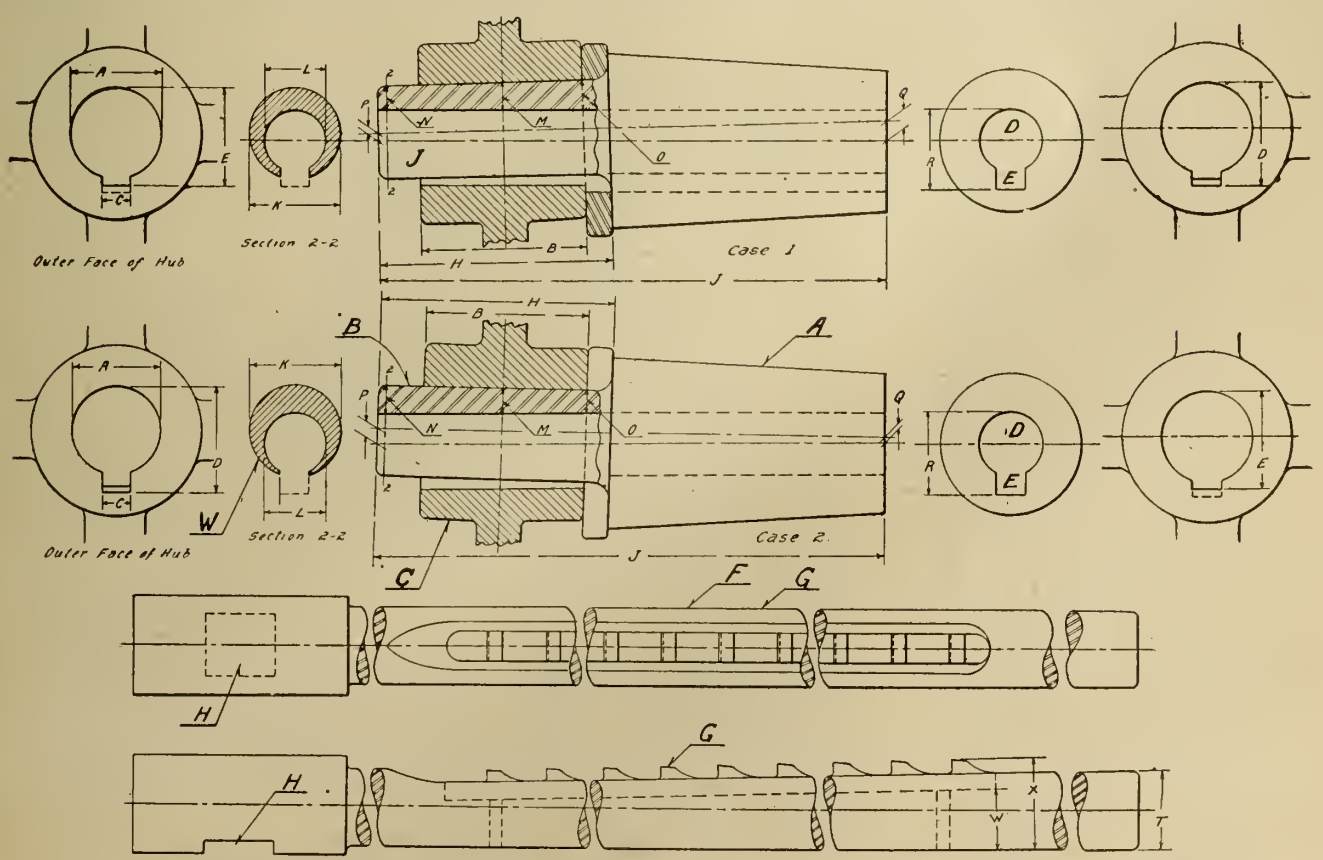
None of these methods of broaching keyways, it will be understood, can produce the highest degree of accuracy, but for commercial work on large quantities of similar pieces, keyway broaching is often quite good enough.

Without discussing the comparative merits of the various methods mentioned above, the writer proposes to describe the application of the second method, used by his firm to broach tapered single keyways in cast-iron hubs on horizontal keyseating machines of the Knowles and Lapointe make.

In these machines an adapter or arbor has a tempered end A, which fits into a socket on the machine. The outer end B of this arbor is parallel and is a sliding fit in the hub C to be keyseated. Through the arbor there is a hole D, which is concentric with the tapered portion, but eccentric with the parallel part. This hole has a slot E for the passage of the broach blade which "breaks through" the parallel end of the arbor as shown. The stock, F, of the broach, with its inserted blade G, or saw, slides in this slotted hole and is secured to the puller of the machine by a removable key which engages a slot H in the enlarged end.

The saw is of uniform height throughout. It has thirty-three teeth at ⅞-inch pitch, and is long enough to cut the deepest keyway at one stroke without unduly loading its teeth. By virtue of the inclination of the slot, in which it is held to the axis of the carrier, each tooth removes one thirty-third of the total depth of the keyway.

In operation the arbor is set so that the saw is on the underside to enable chips to fall clear; the work is placed on the parallel end, the broach is inserted



THESE VIEWS ILLUSTRATE DIFFERENT CONDITIONS, AND HOW THE DIFFERENT PARTS ARE PROPORTIONED.

and keyed up, and on starting the machine the saw is slowly pulled through. The machine stops automatically at the end of its stroke; the broach is disconnected and the work removed.

If the outer end of the arbor had its centre line coincident with that of the tapered portion, it is easy to see that the saw, in passing through, would produce a parallel keyway, that is, without any taper, and the calculations for the keyseating equipment for a given piece would be quite simple. But since most keyways are tapered and this taper is effected by setting the axis of the outer end of the arbor at an angle to that of the hole and tapered part, some careful figuring is necessary.

For turning this tilted end of the arbor a special offsetting fixture, Fig. 2, is used. It comprises a circular base, A, with ways planed across it at an angle B, corresponding to the required taper of the keyway, to receive a slide C, having a split boss D into which the tapered end of the adapter is clamped. This slide can be adjusted crosswise, and the amount of offset so regulated. For different tapers of keyway, the same slide is used in conjunction with bases planed to correspond to the required tapers.

In determining a standard method of calculation for several new sets of keyseating equipment, a number of arbors and broaches which had served for years was examined. Each particular piece to be keyseated requires its own arbor of the proper length, diameter and tilt, also its own broach with its inclined saw for the proper width and taper. It is evident that if the concentric hole D in the arbor be too large, the crescent-shaped section W of the hub end will be too weak, and conversely, if the hole be too small the broach will not be stiff enough to resist the bending moment at its outer end, J, as its saw enters the hub.

Taking the bore of the hub as a basic dimension, the mean ratio of broach diameter to arbor diameter was found on the existing sets to be as .68 to unity, and the mean ratio of thickness of the crescent at the centre of the hub to the arbor diameter as .28 to unity. These proportions were adopted in the table of formulae that was devised.

It will be observed that if the hub part of the arbor is tilted downwards at the outer end, the deep end of the keyway will be towards the machine, and the arbor will then be thickest there, where the greatest strength is required. This is the normal condition, termed Case I in the tables. A thick washer covers the strengthening fillet on the arbor and presents a true surface against which the preferably machined face of the hub is set. When the contour of an offset rim on the work prevents this condition by fouling the machine, the piece must be reversed and the deep end of the keyway is then outwards, giving a weaker pin, termed Case II.

As to the formulae, which explain themselves: commencing with the known data of the hub and the degree of taper required on the keyway, we decide to which case the work belongs, and then

		Formulae For Horizontal Keyseating Equipment		Standard Examples	
Dimension		Designation of Value			
Hub	A	Bore of Hub		1.380	1.436
	B	Actual Length of Hub on Sample.		2½	4 3/16
	C	Width of Saw or Keyway		.375	.370
	D	⊖ At Deep End	One is Specified; Calculate	1.557	1.586
	E	⊖ At Shallow End	the Other if Necessary.	—	—
	F	Taper of Key per Inch	For ½"·1 ft F = 1/24 For 7/8"·1 ft F = .026	1/24	5/16
	G	Case No. Deep End of Key Inwards = 1; Outwards = 2.		1	1
Arbor	H	B + 1		3½	5 3/16
	J	B + 5 1/4"		7¾	9 3/16
	K	A − .003"		1.377	1.433
	L	.68 K		.936	.974
	M	.28 K		.386	.401
	N	Case 1	$M-F\left(\frac{B}{2}+\frac{1}{2}\right) = M-F\left(\frac{B+1}{2}\right) = M-\frac{F.H}{2}$	.349	.374
		Case 2	$M+F\left(\frac{B}{2}+\frac{1}{2}\right) = M+F\left(\frac{B+1}{2}\right) = M+\frac{F.H}{2}$	±12	
	O	Case 1	$M+\frac{F.B}{2}$	.412	.423
		Case 2	$M-\frac{F.B}{2}$		
	P	$\frac{1}{2}+N-\frac{K}{2} = N-\frac{K}{2}+\frac{1}{2} = N-\left(\frac{K-1}{2}\right)$		.129	.145
	Q	Case 1	$P+F(J-\frac{1}{2})$	289	.242
		Case 2	$P-F(J-\frac{1}{2})$ If $F(J-\frac{1}{2}) > P$, the Axes cross		
	R	$(D-O)+\frac{1}{16} = (D-O)+.016$		1.161	1.180
Saw	T	L − .002		.934	.972
	V	T − .437	Depth of Saw = 7/16 = .4375"	497	.535
	W	Case 1	$D-(O+.433)$ $29\frac{1}{2} : \frac{3}{16} :: \frac{5}{8} : .004$	.712	.730
		Case 2	$E-(O+.433)$ Depth of Saw − .004 = .433		
	X	W + .433 = D − O		1.145	1.163

TABLE SHOWING FORMULAE FOR THE VARIOUS PARTS.

calculate the dimensions of the arbor and saw and tabulate them in the order given. The arbor is allowed to project ⅝ inch beyond the hub in order to support the outer end of the broach under its bending stress. Dimensions N and O are used as a check in turning the tilted portion of the arbor, whose centre-line is offset R and Q at the ends. These latter dimensions will not be used if the offset fixture is applied.

In shop application the process of dimensioning equipment for a given hub and keyway is much simpler than the description would convey. The toolmaker is given the dimension sheet and the diagram of arbor and saw, the formulae being for office use only, and from these he reads off the figures to which he is to work. The results are uniform as the method of calculation eliminates errors that are liable to creep into unsystematic manufacture, for example when the toolmaker is expected to make an equipment "like the last one," which means in other word, "out of his head."

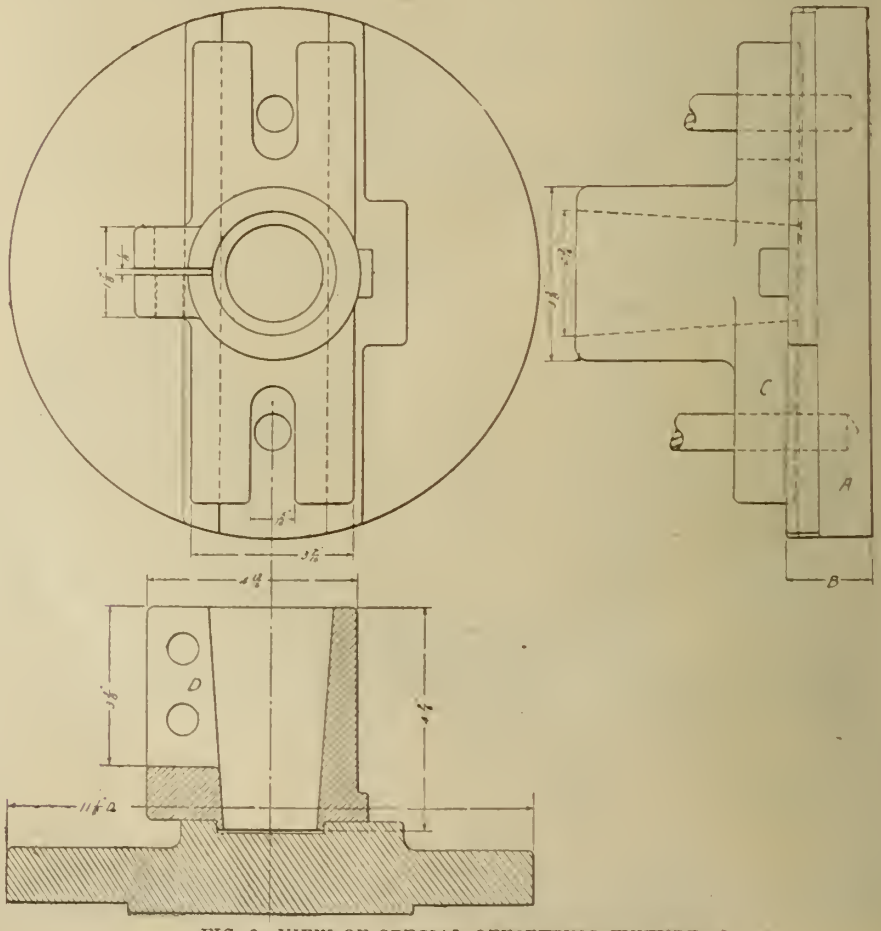


FIG. 2—VIEW OF SPECIAL OFFSETTING FIXTURE.

Careful Tool Layout Means Added Production

You Can Offset the Benefit of Any First Class Machine Tool by Poor Tool Layout—A Combination of a High Class Tool, Together With Intelligent Tool Layout, is Essential

By J. H. Moore

THE average machinist is always on the qui-vive for something which will make him a still better workman. A medium of information that seldom fails is that of a photograph. Show him a photo of some new machine, a tool set up, or in fact anything in the machine tool line and he will remember it clearer and longer by this means than by mere written description.

Proceeding on this assumption we illustrate various views of set ups as taken on a Reed Prentice Automatic Lathe. The first two deal with the machining of pistons, and referring to Fig. 1 we note that this shows the rough turning operation.

The piston being manufactured is 3¾ in. diameter and the operations performed are rough turning, grooving, facing, and bevelling, all in the one set up. The photo is taken just as the cut is completed.

The outside of the piston is a rough casting when it comes to this machine, but the open end has been previously faced, and the inside bored where it fits on the spindle of lathe. The wrist pin hole is also finished, while the spindle is made with a draw in collet arrangement.

The piston is placed on the spindle nose, the draw in handle is pulled forward, and a false wrist pin is inserted through the piston with another draw in arrangement. The spindle draw in handle is next pulled back clamping the piston tightly to the nose. This brings us to the point of starting the lathe.

The first tools to cut are the roughing tools in the shaped tool block A shown in photo at Fig. 1. Directly following the roughing tool is a semi-finishing tool which is held in the block B.

When these tools have completed their cut the carriage comes to a positive stop. This occurs just at the point where the three ring grooving tools shown at C are in correct position. These tools are run in by hand and cut the grooves almost to size.

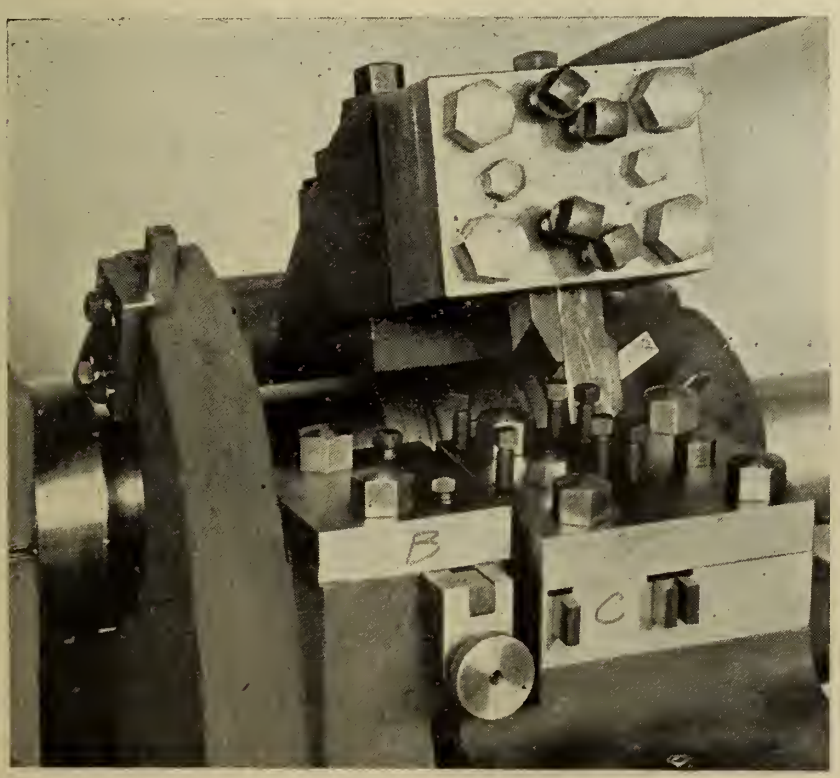


FIG. 1—THE ROUGH TURNING OF THE PISTON.

While these various operations have been progressing the back arm tools, that is, the bevelling and facing tools, have been forced into the work through the medium of an inclined cam mounted on the back of the carriage. This cam transmits motion to the back arm tools, which are mounted on the arms supported by the large round bar at rear of machine. It might be well to add that no centres are used on this operation. We are able to give the actual production figure on the work, the time being 1 minute and 35 seconds floor to floor.

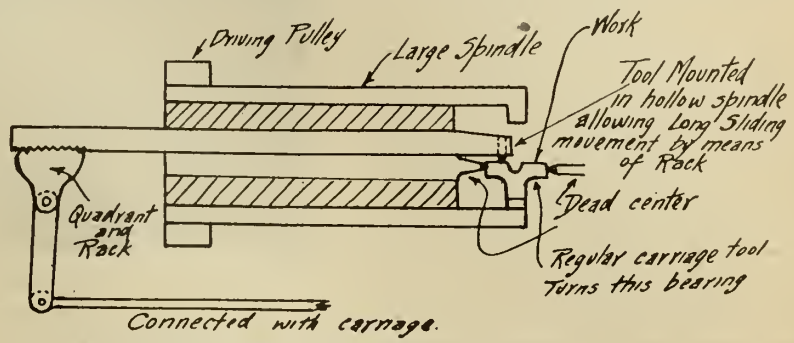

Driving Pulley
Large Spindle
Work
Tool Mounted in hollow spindle allowing Long Sliding movement by means of Rack
Dead center
Quadrant and Rack
Regular carriage tool Turns this bearing
Connected with carriage.

FIG. 4—ROUGH SKETCH SHOWING METHOD OF TURNING ONE SIDE OF JOINT.

Finish Turning

The finish turning operation, Fig. 2, deserves close study owing to the ingenuity displayed. The piston is mounted on the spindle as previously explained. The carriage on this machine moves from left to right, and not from right to left as it did in Fig. 1. We explain this at this point in order to avoid confusion of direction.

The front tools now begin their cut. When the tool shown to the left starts work on the skirt of the piston, the two tools to the right start in on the ring grooves. These tools turn the head of the piston slightly smaller than the tool turning the skirt. This is conceded to be good piston practice.

While these turning operations have been proceeding the back arm tools have been fed into the work. As the photograph shows these consist of the ring grooving and relief grooving tools. The other remaining back tools are the bevelling tool, and the one used for facing. The closed end of the piston. As these can be clearly noted there is no need for comment.

A good view is given of the inclined cam which is attached to the carriage, and the method of performing the entire operation is apparent by a study of the photo. The time used up in this operation is 2 minutes 15 seconds.

The Third Example

The third and final example is shown at Fig. 3. This view illustrates a Reed Prentice lathe with some special features. The machine is set up to finish. The two bearing surfaces of a Ford universal joint at one operation. We, of course, know only too well the shape of this piece from driving our favorite fliver.

The very shape of the piece, four of which are shown in the photograph, some finished and some unfinished, causes one to wonder how on earth to drive the piece, yet perform the double operation. The task seems impossible, yet here is how it is accomplished.

A very large cast-iron spindle is bored hollow, and a chuck or grip if you prefer to call it such, is provided in this spindle as shown in photo. Inside is mounted a long tool post or guide, extending completely through the spindle. This guide has a rack cut at its extremity. A lever quadrant engages with this rack, and the lever in turn is connected to the ordinary carriage of the lathe.

This means that the work is held in two dead centres as shown on rough sketch at Fig. 4, and the method of transmitting motion to the tool on the guided slide is self apparent. By using this novel method of tooling the production figure has reached 940 pieces per day, a record to be proud of.

From these few examples, one can readily agree that it pays not only to study your equipment, but also the tooling you use and adopt the same.

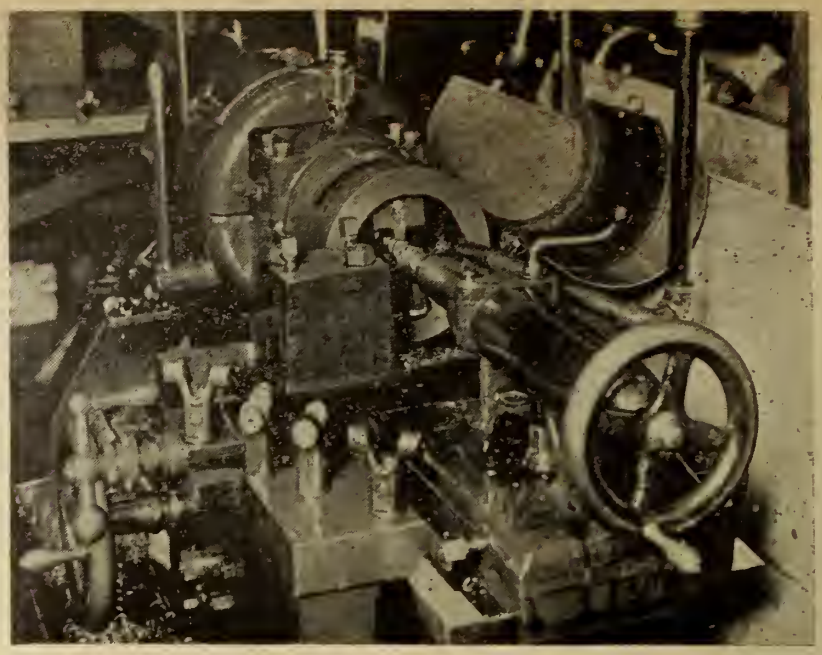


FIG. 3—FINISHING THE TWO BEARING SURFACES OF UNIVERSAL JOINT AT ONE OPERATION.

HINTS TO USERS OF DIAMOND TOOLS

In handling these tools, says "Machine Tool Review," users must bear in mind that the diamond is a natural product and not a manufactured article. Whilst they will withstand considerable heavy pressure, a small jar or blow will often fracture the stone, rendering it unfit for further use.

Large wheels require large size stones, as the vibration is so great that small stones would soon split under the great pressure, or else work out of their holders.

Wheels should be frequently trued so as to preserve an even or smooth surface. There is a limit to the amount of shock a rough diamond will stand from an uneven surface, and if a wheel is found to be badly out of truth, an ordinary type of Huntington or similar dresser should be used to bring the wheel to something like its proper condition before using the diamond tool.

Above all things, only take light cuts with the diamond, say about .002 at a time, as anything heavier than this will tend to burst the stone, owing to the great heat generated. Feed the diamond gradually to the wheel, don't bring it up with a bump, and take great care to see that the diamond is cutting properly and not merely rubbing away.

A diamond is similar in general effect to a steel cutting tool, and by the same rule its cutting edge should be watched to see that it is kept in proper condition. When it becomes worn or shows signs of having a flat surface, it should be immediately re-set to bring a new cutting edge into operation. Stones are frequently shattered owing to continued use after they should be re-set, as when the cutting edge is worn away to a flat surface it is similar to using a dull tool or drill. Also should a diamond show signs of fracture it should be examined and re-mounted immediately, as this may frequently be the means of saving a diamond from splitting into small pieces.

The greatest care should be taken to avoid grinding away the metal immediately surrounding the stone, otherwise the stone will soon work out and get lost. If possible, use an abundant flow of water on the diamond when in operation, as this will keep it cool, avoid strains and give it a much longer life.

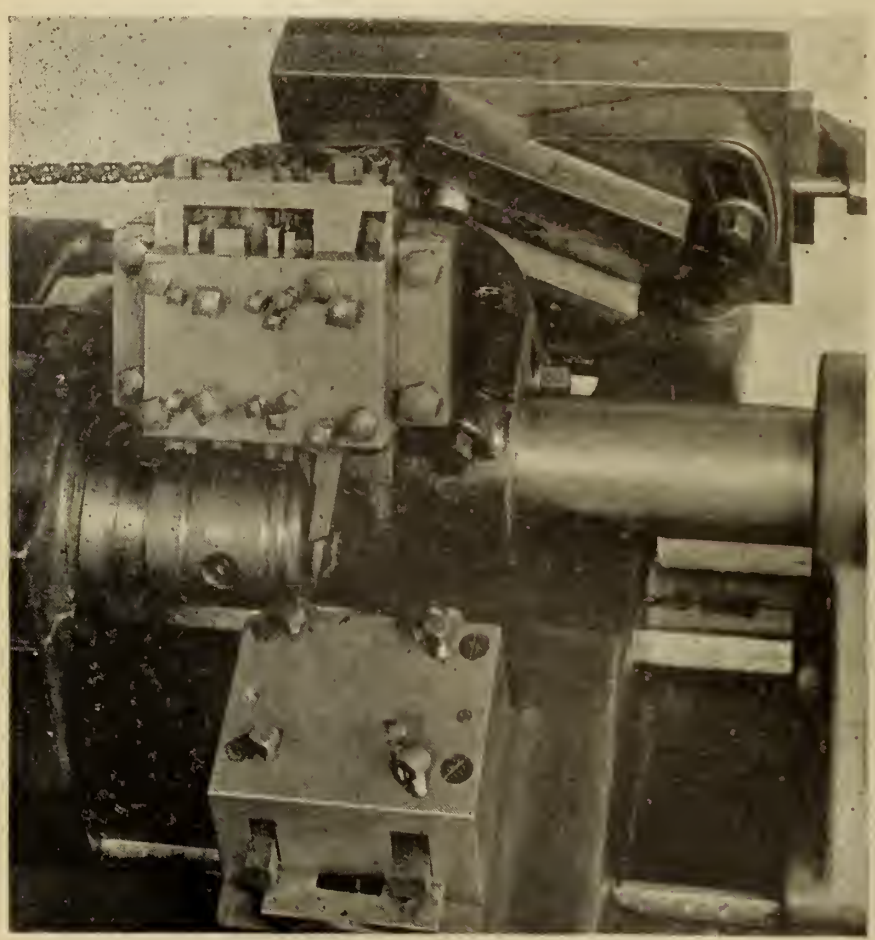


FIG. 2—THE FINISH TURNING OPERATION ON PISTON.

Can We Avoid Grinding Wheel Accidents?

The Author, Who is an Authority on the Subject, Gives Some Excellent Suggestions for the Care and Use of Grinding Wheels in General

By A. Rousseau*

TO INSURE safety in the use of grinding wheels the same fundamental principles apply as in the case of all other industrial operations—the prevention of accidents and protection of operators by mechanical means, and the education of the workmen to observe the proper precautions.

The operation of all high-speed machinery is hazardous, and the grinding wheel is no exception to this rule. The structure of a grinding wheel is fragile and under certain conditions can easily be broken. Under ordinary working conditions the periphery travels at a speed of approximately a mile a minute, so that if a breakage does occur the results are likely to be serious. Special precautions, therefore, must be taken; first, to prevent wheel breakages; and second, to guard the operators against injury in case breakage does occur.

When a grinding wheel accident occurs the cause can always be traced to one of the following sources: the wheel, the machine, the mounting, or the operation.

By making all the conditions of each of these sources ideal, grinding wheel accidents could be prevented. In other words, if a perfect wheel is properly mounted on a satisfactory machine, and is operated under ideal conditions, the chance is very remote that the wheel will break while in operation. I will attempt to describe these ideal conditions by practical suggestions, and if all grinding wheel users would follow these suggestions, grinding wheel accidents would be cut down to a minimum.

However, there enter into the practical application so many uncontrollable factors, the most important of which is the human factor, that, even though every effort is made to secure these ideal conditions, it is necessary to provide protection devices of some sort. There are three standard forms of protection devices, which will be described later. One of these forms, or its equivalent, is considered absolutely necessary and should be provided, except in those cases such as internal grinding, where the work itself forms ample protection.

General Description

The modern grinding wheel consists essentially of a large number of abrasive or cutting particles held together by the bond, which in vitrified wheels is of about the same structure as porcelain or glass. Therefore, a wheel must be treated with respect and should not be thrown about as if it were a chunk of steel. Many users of wheels do not recognize the fact that grinding wheels are fragile, and as a result many wheels, especially thin ones, are broken by careless handling.

Manufacturer's Duty

All reputable grinding wheel manufacturers take every possible precaution during the process of manufacture to produce only such wheels as are free from defects. Wheels are inspected between operations and any which are found to be defective are rejected and broken up.

After the final manufacturing operation, every wheel, larger than 5-in. diameter, is subjected to a mechanical test of sufficient severity to rupture a wheel which contains any inherent weakness. In this test the wheels are mounted on a spindle and revolved at a speed much higher than the recommended speed. The testing speed is sufficiently high to provide a factor of safety of at least 2½, in most cases considerably higher.

Each testing machine is equipped with a tachometer connected directly to the spindle, which enables the operator to tell the exact speed at which the wheels are revolved.

A complete record of all wheels tested is kept for reference. Daily affidavits as to the accuracy of these records are sworn to before they are permanently filed. The manufacturing and shipping check must also contain a record of the test, otherwise the inspection department will not pass the wheels.

Immediately after testing the wheels go to the inspection department where they are given the final inspection before being packed. Every wheel is given a careful and thorough examination by experienced men with eyes trained to detect imperfections of all kinds. The inspectors also check the size, shape, grain, grade, quantity, and special features. The utmost care is also used in packing. Beyond this, however, the manufacturer cannot go. It becomes the duty of each user of grinding wheels to determine if wheels have been damaged after leaving the manufacturer, and further to see that they are kept in good condition before and during use.

Customer's Duty

Immediately upon receipt the wheels should be examined to make sure that they have not been damaged in transit or otherwise. Each wheel should be held free and clear, then tapped lightly with the handle of a screwdriver or some other such implement. If the wheel is in good condition it will give forth a clear ring. If it does not give a clear ring, it is a fairly good indication that the wheel is cracked.

Damp wheels and those in which the spaces between the grains are filled with sawdust, also rubber and shellac-bonded wheels, do not give a clear ring when tapped in this manner. Such conditions should be taken into consideration when applying the test.

Care should also be exercised in the storage of wheels. They should be stored in dry places of even temperature. Shellac and rubber-bonded wheels, ¼ in. or less in thickness, should be laid flat on a straight surface to prevent warpage. All other wheels should be supported on edge in racks.

Before mounting, all wheels should again be carefully inspected to make sure that they are in good condition and that they have not been damaged by being moved about or roughly treated while in storage. This is very important, inasmuch as a wheel may sometimes be cracked by merely falling over from an upright position. The same "ring" test should he applied before mounting.

The selection of the proper wheel for the work required of it is sometimes an important factor in considering wheel breakages. A wheel which is too hard or too fine may generate sufficient heat to cause uneven expansien, thereby breaking the wheel.

Moreover, a wheel of weak structure or one of insufficient cross section might be broken by applying heavy work.

The Grinding Machine

The design and condition of the grinding machine are very important factors in the prevention of grinding wheel accidents. Improperly designed machines, and machines that are in poor condition, have been the cause of many wheel breakages.

Machines should be sufficiently heavy and rigid to prevent vibration and should be securely mounted on substantial floors, benches, foundations, or other structures. Bearing boxes must be of proper length to provide ample bearing surface, thereby preventing heating and rapid wearing. An automatic method of lubrication should also be provided.

The ends of the spindles should be so threaded that the nuts on both ends will tend to tighten as the spindle revolves. A simple rule to determine the direction of the thread is as follows:

To remove the nuts they should both be turned in the direction that the spindle revolves while the wheel is in operation.

If threaded in the wrong direction, the nuts would tend to loosen as the wheels revolve and serious consequence might result. The spindle should be of sufficient length to provide bearing for the entire length of the nut when the wheel and flanges are in place. The spindle end, nut and flanges should be protect-

*Paper read before Ontario Safety League. Author is connected with the Norton Co., Chippawa.

ed. (Properly designed hoods will take care of this requirement.)

Grinding machines should be located in well-lighted and ventilated rooms, and, in addition to the devices designed especially for grinding wheels, the usual safety rules for belt guarding and fast-moving machinery should be heeded.

Mounting

Wheels used for grinding on the periphery or on the sides near the periphery, are usually mounted on spindles, arbors, collets, or centres, and are held in place by flanges or collars.

Great care should be taken in mounting wheels. The hole in the wheel should be slightly larger than the diameter of the spindle or arbor on which it is to be mounted, so that it will not be necessary to exert any force to place the wheel in position. Experience has shown that the hole should be approximately 0.005 in. larger than the arbor.

Wheels of this type should never be mounted without flanges. The flanges should be made in accordance with the dimensions given in the Safety Code. The inner flange should always be either keyed, shrunk, or screwed to the spindle. The outer flange should be made to run perfectly true with the spindle. The outer flange should always be of exactly the same diameter as the inner flange. The hole in the outer flange should be made an easy sliding fit on the spindle or arbor. All flanges should be relieved or recessed at the centre to a depth of at least 1-16 in., in order that the flanges may bear at the outer edge only. All flanges must be true and in balance.

Compressible washers of blotting paper, rubber or leather should always be used between the wheels and the flanges. These washers would take care of any slight unevenness in the surface of the wheel, thereby insuring a uniform bearing around the entire periphery of the flange.

Before mounting the wheel, care should of any slight unevenness in the surface of wheel and the flanges are clean and free from foreign particles

When tightening the nuts, care should be taken to tighten them only enough to hold the wheel firmly. Excessive tightening may damage the wheel.

Other forms of mounting, such as cementing or sulphuring the wheel to iron backs and centres, or the clamping of segments to a metal ring, are only recommended for special purposes and no definite specifications can be given. Advice on doubtful cases of this kind should be obtained from experts before installing.

Mounting wheels with tapered holes on tapered arbors demands great care, for any forcing necessary to get the wheel in position would tend to crack the wheels.

Operation—Speeds

In the operation of a grinding wheel, speed is the first factor to be considered. Overspeeding is dangerous, as the higher the speed at which a wheel is running the less external force is required to break it. In fact, if speeded high enough the wheel would be broken from centrifugal force alone, without the aid of any outside force. For this reason, it is extremely important to keep the speeds correct.

Although the most efficient working speed for a wheel is usually a safe operating speed, conditions are frequently found where wheels are operated at speeds which are dangerous. An excessively high speed is allowed either because of the ignorance of the danger or through lack of proper supervision.

As a wheel wears down, the surface speed decreases, if the number of revolutions per minute is not changed. In order to keep the surface speed constant, various methods are used. The most common of these is to provide the grinding machines and countershaft with cone pulleys by means of which the revolutions per minute of the wheel can be changed.

Another method is to have a set of machines, each running at different speeds, and by changing the wheel from the slower to the faster machines, the surface speed can be kept approximately the same.

These methods are both satisfactory, but both require careful supervision to guard against accident. In the case of a machine which is provided with cone pulleys, the belts will usually be set for the highest speed when a wheel is removed. Unless a competent man is in charge of this work there will be a very good chance of the operator placing a new, full-sized wheel on the machine and starting it up without shifting the belts to the slow speed. Unless some sort of a locking device is provided there is also a chance of an operator increasing the speed before the wheel has been worn down to the proper diameter.

In the case of a set of machines running at various speeds, there is a chance of an operator placing a wheel of large diameter on one of the machines intended for a smaller wheel. This can be guarded against by the installation of some sort of a stop which would limit the size of wheel which could be mounted on each machine. In case machines are provided with protection hoods the opening in this hood can be made just large enough to permit the mounting of a wheel of the proper size. If protection hoods are not used, the same end can be accomplished by fastening a pin to the base of the machine in such a position that it will not permit the mounting of an oversized wheel.

For rough grinding on bench, floor, swing frame, and other machines, a speed of 5,000 peripheral feet per minute is recommended as the standard operating speed for vitrified and silicate wheels, except those known as cup and cylinder wheels. For these wheels a speed of 4,500 peripheral feet per minute is recommended. Speeds exceeding these figures should be used only upon the recommendation of the wheel manufacturer.

For some cases of precision grinding an operating speed of 7,000 peripheral feet per minute is sometimes recommended. Precision machines are usually built rigid and the wheels are kept true and in balance. They are also usually provided with good hoods. For these reasons the higher speeds are not considered as dangerous on this type of machine.

The actual speed at which the machine spindles are run should be frequently tested with a speed indicator, or tachometer. If a spindle is driven by a variable-speed motor, the speed control for the motor should be enclosed in a locked case, or some device should be used, which would prevent anyone but a man assigned to that duty from changing the speeds. The maximum size of a wheel which should be used with certain operating speeds should be indicated in a conspicuous manner on a card posted near each machine.

Work Rest

The proper adjustment of the work is also extremely important as many grinding wheel breakages have been caused by work being caught between the wheel and the rest. Although wheels do not always break from this source, many injuries to the workman's hands have been caused in such a manner. The work rest should be kept adjusted close to the wheel at all times, the space between wheel and rest being not more than ⅛-in. They should be of rigid construction and should always be securely clamped after each adjustment. Instructions should be issued, so that the rests will not be adjusted while the wheel is in motion.

Applying Work

When starting up a wheel it is well for the operator to stand to one side until the wheel has reached full speed and has been allowed to run at that speed for about a minute. If it stands up satisfactorily for that length of time it is usually safe to apply the work.

Work should never be forced against a cold wheel, but should be applied gradually, giving the wheel an opportunity to warm evenly and thereby eliminating possible breakage. This applies to starting work in the morning in cold grinding rooms, and to the use of new wheels which have been stored in cold places.

On such operations where work is applied continuously to the wheel, care should be taken that the heat generated will not be so great as to break the wheel. If a large amount of heat is generated, the condition can sometimes be overcome by a change in the grade of the wheel, or by applying a steady stream of water at the point of contact.

Truth and Balance

It is important that wheels be kept running true and in balance. The work of keeping wheels true should be assigned to certain men who have been given special instructions. An inexperienced man who attempts to true or dress a wheel frequently makes it worse than it was before. Wheels should be tested for balance occasionally, and if the out-of-balance conditions cannot be corrected

by truing or dressing, the wheel should be removed from the machine.

Wheels used for wet grinding should not be allowed to stand partly immersed in water. The water absorbed may throw the wheel dangerously out of balance.

Side Grinding

The question of grinding on the sides of a straight wheel has been much discussed. In some places this is absolutely forbidden. There are some classes of work, however, where it is necessary at times to use the side of the wheel for grinding. It is difficult to set a fixed role as to when this practice is permissible, as each case must be considered individually. It should be remembered that thin wheels are not as strong as thicker ones; also that coarse wheels and those of softer grades can be more easily broken than the finer and harder wheels.

If these things are taken into consideration, together with the nature of the work to be done, any mechanic of good judgment should be able to tell whether or not a certain operation is dangerous. We recommend, however, that for work where it is necessary to continually use the straight side of a wheel, or where it is necessary to exert considerable pressure on the side, cup wheels be used. The continued practice of grinding on the sides of a wheel intended for peripheral grinding will soon wear the wheel out of shape, thereby making it run out of balance, and sometimes weakening it beyond a safe point.

Eye Protection

In some cases of grinding there is considerable danger of eye injury. Where this danger exists the operators should be provided with goggles which should preferably be the property of the operator. They should be of such construction that the lens will be firmly held in the frame in case of breakage. In order to give the best protection from fine dust flying around in the air the frame should be made to fit snugly around the eyes, following the contour of the face. The edge of the frame which fits against the face should be provided with a cushion. At the Norton Company plant it has been found that the type which is held in place by means of an elastic head band is more satisfactory than those with the metal temple bows.

A piece of plate-glass held in a metal frame is sometimes fastened to the machine just above the point on the wheel where the work is done. For certain classes of work these shields have proved quite satisfactory. Another device which has been used with more or less success consists of a leather flap or spare brush which is attached to the hood and adjusted so as to interrupt the particles and dust.

Types of Protection Devices

As the time allowed for the presentation of this paper is limited a detailed description of the various forms of protection devices cannot be given here. We can merely give a brief outline of the principles of each.

There are three approved forms of protection for use in connection with grinding wheels—protection hoods, protection flanges and protection chucks.

Protection hoods consist mainly of an enclosure for the grinding wheel which retain all of the parts of a wheel which might break in operation.

Protection flanges are designed to be used with tapered wheels or wheels of special shape, their function being to hold together the parts of a broken wheel.

Protection chucks are designed for use with cylinder or ring wheels. The jaws of the chuck, by being clamped around the periphery of the wheel, would prevent the broken pieces from being thrown out by centrifugal force.

These are listed in the order of their relative efficiency and importance. It will be noticed that protection hoods head the list. This arrangement was decided on after very exhaustive tests, which proved conclusively that properly designed hoods are more efficient than protection or so-called "safety" flanges. An endeavor should therefore be made to provide all wheels with properly designed hoods.

However, there are some cases where hoods cannot be used and in such cases protection flanges are considered the next best. Of these the tapered flanges used with tapered wheels are the most common and most efficient. Other types, such as hub and ring flanges or dovetail flanges may be used in special cases, but care should be used in their design.

Complete specifications for the construction of those devices will be found in the Safety Code for the Use, Care and Protection of Abrasive Wheels, prepared by the Grinding Wheel Manufacturers of the U.S. and Canada, and approved by the National Machine Tool Builders' Association. Copies of this may be obtained on application to practically any manufacturer of grinding wheels.

Summary

These remarks can be briefly summarized as follows: "To insure safety in the use of grinding wheels seek first to prevent wheel breakages by the observance of common-sense rules. And secondly provide all grinding machines with one of the standard forms of protection devices to protect operators and others in case something goes wrong."

Mr. H. V. Hutton, Verity Plow Co., Ltd., Brantford, in speaking of this paper remarked that in his opinion Mr. Rousseau had given what he believed to be the last word on grinding wheels. As a representative of one of the big industries of our country, large users of grinding wheels, we have met with most of their problems, and this paper comes as a fine thing to us. It strikes me that a copy of same would be of untold value if placed in the hands of every foreman responsible for the care and maintenance of said grinding wheels. I personally will see that the Verity Plow foremen are so supplied.

I believe we should have a closer inspection of grinding wheels from both inside our plant and from safety and Government inspectors who visit our plant from time to time. I personally cannot remember that an outside inspector ever checked up the speed of our wheels. To prove the necessity for this —only recently we found the foreman's son in one of our well-managed departments operating a new wheel on the high speed pulley running close up to 7,000 surface feet per minute. Mr. Rousseau's report teaches us that we must have a higher respect for this grinding wheel. It has perhaps caused more accidents than from any other source in our factory. He warns us that it is fragile and tells us that it must be well cared for before putting into service and well protected and guarded when in service.

To get the most out of this paper we should discuss its different phases. A few questions have been prepared and we hope you have others to put before the meeting. With Mr. Rousseau here to give us expert advice, we should avail ourselves of this opportunity. While the greatest thing in life is eternal life, most of us want to live our allotted time here. Then let us think and plan safety for the other fellow.

I should like to ask Mr. Rousseau whether a properly guarded grinding wheel ever caused a fatal accident.

Mr. Rousseau: No such case has ever been recorded, while many fatalities have been prevented by the use of approved guards and flanges.

I would recommend the hood as being the best means of safeguarding the wheels, as they will keep the pieces in the machine. A certain small portion of the hood is left open for the man to insert his work, and a small portion of the wheel might fly off and hit the man in the hand, but it would not be fatal. I consider that the use of protective flanges is not enough for the large wheels as a heavy object might swing against it, causing a large piece to fly off and hit the man in a fatal spot. The flange diameter should be one-half that of the wheel.

If the wheels are properly equipped with the protective hood, the flange should be at least one-third the diameter, and if you do not use the hood the flanges should be much larger.

The latter varies with the size of the wheel and is based on the exposure between the flanges. For a 24-in. wheel the minimum is an 18-in. flange, on 30-in. wheel minimum 24-in. flange; 12-in. wheel the minimum is a 6-in. flange. The larger the exposure between the flanges the larger the pieces that can be broken off.

Mr. Lennard: Do you have any trouble in getting the men to keep the guards on, as so many of them say it gets in the way of the work?

Mr. Rousseau: We have very little trouble in getting them to keep the guards in place; the reason is that a properly designed hood is part of the machine and belongs there. The outside hoods are sometimes left off, but they are more in the way when left off than when in place. I believe that a lot of this trouble is caused by people using the wrong size flanges, and then some-

times use substitutes instead of restoring them when they are worn out. One man using a 12-in. wheel had a 6-in. flange on one side, and on the other where they were worn out had put on crooked washers. The foremen do not always think of these things. If you have a 24-in. wheel and 18-in. flange and the wheel becomes worn down, you can use 18-in. wheel and 12-in. flanges. When it is worn down below this point it is time to put on a new wheel. Men will sometimes put on a new 25-in. wheel and use the same flanges that were on the 18-in. wheel.

Mr. Hutton: Is the manufacturer ever justified in making a special wheel the use of which is not safe?

Mr. Rousseau: We get orders for all sorts of wheels of all shapes and sizes. We have in fact received orders for wheels a diameter of hole larger than the diameter of the whole. It is possible that the man who has ordered does not know this. We take it up with him and try to point out to him the best way to have the wheel designed. We get very good responses from the men in most cases, but if the customer does insist we will make the wheel for him, we being free from every responsibility.

Mr. Lennard: What is the best plan to get the men to wear goggles?

It is hard to get the men to use the goggles when going to the machine shop where the tool grinder is kept, the men will not put on their goggles for a few minutes. In this case we have found that the small glass shield on the machine is of value.

Mr. Hutton:—One of our men made the suggestion that a movable shield could be used and carried forward as needed and then thrown back if in the way of certain work.

Mr. Maclachlan: As far as grinding wheels are concerned I think that the greatest trouble is in looking after the grinding wheel that is a utility wheel and used for everything. Guards will sometimes make it useless for certain types of work. Referring to goggles, I have found one method very good, and that is to make the men realize the strength of the glass in the goggles. The men are afraid of getting the glass in their eyes.

Mr. Rousseau: We have found that it is very effective to make a test of the strength of the glasses, and for this purpose use a hammer. The men are usually very much impressed by this. In regard to the first item you mention about the hood on the general utility wheel. This is one of the things that we run up against quite often. You will find it will interfere with the operation of the wheel, and if you cannot think of any other way, a special hood should be designed. Grinding wheel accidents, when they do occur, are very serious.

Mr. Maclachlan: Many manufacturers and employees buy cheap goggles, and these are often broken, causing the pieces to fly in the men's eyes. Goggles should only be purchased from a reputable dealer.

Mr. Kuechenmeister: In regard to covering emery wheels, glass shields on the machines, we find, do away with the argument for goggles. We provide the men with the best goggles money can buy, and if we find that the lens does not suit the man's eyes he is sent to an optician who will grind a lens to suit his eyes, and these are put in the regular frame. We consider that the goggles are an essential part of the man's tools and we are trying to put them on the same basis.

Mr. Rousseau: I do not claim that glass shields are as good as the goggles, because nothing can take their place, but they are a help.

Mr. Falk: The men do not want to wear the goggles because of the discomfort. If the rim of the goggles is bound they are more comfortable and the men will wear them.

Mr. Albert: We have a large frame outside the office, and all the goggles that are broken are attached to the frame with information as to how they were broken. The men are shown the goggles and shown the records, and this persuades them to wear the goggles.

Mr. Wanzer: I have found that the ordinary goggles do hurt my eyes, as I have tried them on. If they are bent to the shape of the head it helps.

Mr. Kuechenmeister: The goggles can indeed be made to fit the eyes and to suit the eyes of the men, and this work is done by our first-aid man. His eyes are tested if he complains and a special lens is ground.

Mr. Wanzer: Are these the large size goggles?

Mr. Kuechenmeister: The regular 1¼ inch goggles.

We find that 50 per cent. of the accidents, including all cases in the doctor's hands, are eye cases. We are trying to get the men to wear their goggles all the time, and also to get them to buy them as they own them then.

Mr. Rousseau: In regard to this corrected lens. Is it made of regular lens stock?

Mr. Kuechenmeister: These are made of the regular stock and we haven't found a case where the pieces went into the man's eyes.

Mr. Rousseau: We had a case where the man's eye was cut by a piece from his goggles. We have made a sample pair from special lens, which we are going to submit to goggle manufacturers to see whether or not a practical goggle can be made from them

Mr Falk: We have made investigations and find that the Julius King Co., of New York, grind a special lens, and this is believed to be the best on the market. It is a single lens and the glass will stand a very heavy blow from a hammer and will not shatter.

Mr. Maclachlan: As all double lenses are cemented together with gelatine, this cannot be used in hot surroundings or in summer, as the gelatine will melt and obstruct the sight. You can get a very strong lens that will not shatter.

NEW PUBLICATIONS

The Canadian Engineering Standards Association have informed us that a stock of the most important publications of the British Engineering Standards Association are now available for distribution. Of course a nominal price must be charged for these publications. Below is a description of some of these books.

Requests for copies should be addressed: Secretary Canadian Standards Association, Room 112 West Block, Ottawa, Ont.

3-1903. Report on the Influence of Gauge Length and Section of Test Bar on the Percentage of Elongation, by Professor W. C. Unwin.—This report deals with the variation of percentage of elongation with different gauge lengths and sections of test bar. The tests cover a wide range of conditions, and no such complete information as to variation of elongation with the form of test bar has been previously available. 25 cents net.

C. L. 2582. Interim Report on British Standard Sizes of Single Row Ball Journal Bearings for Automobile.—Gives inch sizes for light and heavy type bearings for shafts from ¼ to 4½ inches diameter, and metric sizes for light, medium, and heavy type bearings for shafts from 10 mm. to 110 mm. diameter. 25 cents net.

6-1904. Properties of British Standard Sections for Structural Steel.—This important and complete report is likely to undergo revision in the near future, as an endeavor is being made to obtain a larger measure of agreement between British and American standard sections.

53-1913. British Standard Specification for Cold-Drawn Weldless Steel Tubes for Locomotive Boilers. (Revised August, 1913.).—Covers material, manufacture, physical and chemical properties, tests and inspection. 25 cents net.

61-1913. British Standard Specification for Copper Tubes and Their Screw Threads. (Primarily for domestic and similar work.).—Deals with three classes of tube for low, medium, and high pressure, and covers composition, tests, and standard sizes, with specification for suitable screw threads, giving complete dimensions. 25 cents net.

51-1913. British Standard Specification for Wrought Iron for Use in Railway Rolling Stock. "Best Yorkshire" and Grades A, B. and C. (Revised August, 1913.).—Covers physical properties, tests, manufacture, and inspection for puddled wrought iron plates bars, angles and other sections, also for billets and blooms for certain grades of material. 25 cents net.

15-1912. British Standard Specifications for Structural Steel for Bridges, Etc., and General Building Construction.—Covers manufacture, physical properties, tests, and inspection methods. 25 cents net.

24-1911. British Standard Specifications for Railway Rolling Stock Material. Part V.—Copper Plates, Rods Tubes, and Brass Tubes.—Covers analysis, tests, and inspection methods. 25 cents net.

The Prevention of Water Waste on Railroads

Water Waste on Railroads is a Very Serious Item, as Can be Gleaned From a Reading of This Paper Presented Before the American Waterworks Association Convention at Montreal

By C. R. Knowles*

IN presenting this paper on the prevention of water waste on railroads, I would like to emphasize the fact that I do not appear before you merely as a consumer of water pointing out the savings to be made only by reducing the quantities of water purchased, but also as a producer of water with problems and troubles very like your own. The sources of waste that may be enumerated and discussed at this time are as common to the supply furnished by a railway company's pumps as to the supply purchased from a city waterworks plant.

The duties of a city waterworks manager and the duties of a superintendent of railway water service are along parallel lines, namely, the economic production of water adequate in quantity and satisfactory in quality. There is this difference, however, the manager of the private or municipal waterwokrs is in constant touch with his plant or plants, and has direct supervision of their operation, while the plants on a railway system may be scattered over half a continent and are subject to the varying conditions peculiar to the territory in which they may be located. Consequently some of the problems encountered in the prevention of water waste on railroads may be novel to the city waterworks man.

The writer has been conducting a water waste campaign on the Illinois Central system for the past five years, endeavoring to impress on officers and employees the value of water and the importance of water waste prevention. It is very gratifying to be able to report that this campaign has resulted in a material reduction in the waste and unnecessary use of water.

The total consumption of water on the Illinois Central system for the past five years, divided between water pumped by company forces and water obtained from an outside supply, is shown in the following table:

	Company Plants Gal.	Outside Supply Gal.	Total Gal.
1915..	15,300,000,000	2,986,000,000	18,286,000,000
1916..	15,100,000,000	2,844,000,000	17,984,000,000
1917..	14,000,000,000	2,754,000,000	16,754,000,000
1918..	14,140,147,000	2,771,674,000	16,911,921,000
1919..	12,967,260,000	2,655,740,000	15,622,000,000

It will be noted that the consumption in 1919 was 2,664,000,000 gallons less than in 1915, while the average reduction for the five-year period is 1,468,619,750 gallons. During the above-mentioned period there was an increase of over 20 per cent. in tonnage handled, which would indicate that a still greater reduction was made in the waste of water than is shown by the above table.

The reduction in the waste of water was accomplished by frequent water waste surveys at all points of the system, these water waste surveys varying from an investigation of a single hydrant at an outlying station requiring only ten or fifteen minutes' time, to an investigation of the water supply at large terminals, sometimes requiring several days. As an example of conditions found in these water surveys a few instances may well be cited.

At a large Southern terminal a request had been made for authority for an expenditure of approximately $20,000 for new pumps and pipe lines, the request being based upon the assumption that the old pumps and pipe lines were too small to furnish sufficient water. A water waste survey disclosed the fact that 40 per cent. of the water pumped was being wasted. When these conditions were corrected there was no difficulty in providing all the water required without any expenditure for additional equipment.

Water Consumption

The consumption of water at a large office building used for general railway purposes had increased to approximately 8,000,000 gallons per month, and as this consumption appeared excessive a water waste survey was made, with the result that the consumption was cut to approximately 2,000,000 gallons per month, a decrease of 75 per cent. The conditions at this point were due to general waste of water through almost every water facility in the building. For example, the controlling valves on the boiler feed water heater were not operating properly, allowing unlimited quantities of water to pass through the heater to the bilge tanks, where it was being pumped by an electric bilge pump to the sewer, this waste causing a threefold loss:

1. The cost of furnishing the water.
2. The loss of the coal required to heat the water, which at the time the investigation was made was estimated to be the equivalent of 250 B.h.p.
3. An additional loss of electric current required to pump the water from the basement level to the city sewer, the bilge pump operating every 50 seconds at the time of the investigation.

The urinal tanks, eighteen in number, were found to be flushing at intervals of from 50 seconds to 1 minute and 10 seconds. These tanks were of the three-gallon flush type, probably 2,000,000 gallons of water being used through these urinals. The controlling valves to the house tanks were in bad order, and the overflow from these tanks to the sewer was practically constant. In addition to these large wastes there was a number of minor wastes of hot and cold water in the restaurant and other places in the building.

At a large engine terminal in the Middle West the automatic valves controlling the water supplied to a large water boiler washing system were found inoperative, the consumption of water through this system amounting to 300,000 gallons per day. Upon repairing and adjusting the valves the consumption decreased immediately and the daily consumption at the present time is approximately 60,000 gallons, a saving of 80 per cent. of the water formerly used.

At another point the consumption was decreased nearly 3,000,000 gallons per month by adjusting and repairing automatic valves controlling water supplied to a boiler feed water heater and boiler washing system. In this particular instance the saving in heat applied to the water wasted was in excess of the cost of the water.

Numberless other instances could be cited where material economies in the use of water has been effected through these water waste surveys, those quoted above being merely given as examples. The favorable result of our efforts towards prevention of water waste have not been easily obtained as it is extremely difficult to convince the average railroad employee that he should exercise care in the use of water, as he cannot understand why one should worry about water with innumerable lakes and rivers on and adjoining the right of way. He cannot appreciate the fact that costly pumping stations, reservoirs, water-softening plants, storage tanks and pipe lines, are necessary to deliver the water to the point of use.

I have been asked why the city waterworks manager should be interested in water waste prevention where the water was supplied through meter and the cost of such waste billed against the consumer.

Prevent Waste

In the first place it is to the interests of all public officers to prevent waste in any form, as their interests are not limited to the individual but to the community as a whole, and they recognize it as their duty to lead in campaigns for the elimination of all waste in every form, as the creation of waste benefits no one and adds nothing to the wealth of the country, institution or the individual. The city waterworks manager, realizing his duty to the public good, in his efforts to eliminate waste, does not stop to question whether the waste goes to make up a part of his revenue or not. While there may be some few instances where a waste of water would increase the revenue of the company without materially affecting the operation of the plant, unlicensed waste on the part of one consumer jeopardizes the supply to

*Superintendent Water Service, Illinois Central Ry.

others, and in justice to all waste cannot be tolerated whether the waster pays for it or not. The water company cannot afford to encourage waste, even by metered consumers, on account of the example set to those who are not metered and have no interest in keeping down the consumption. Excessive waste such as might occur with a large consumer as a railway company causes a great fluctuation in the demand. While a million a day more or less would make but little difference with a plant pumping a hundred million gallons or so per day, it would create a serious condition with many smaller plants, and doubtless in many places the correction of waste, leakage and unnecessary consumption would eliminate the necessity of expenditure for additional pumping equipment and distributing systems, which is a serious matter under present material and labor conditions. This was appreciated by the committee on war burdens water works in the States, in their report, in which they stated: "Pressure will doubtless be brought to bear to force communities to husband their water supply by reducing waste, leakage and even unnecessary consumption in order to curtail unnecessary investment in plants thus made necessary." While the above statement had direct reference to war conditions, in a large measure they are just as true of conditions to-day.

The heavy migration to the cities in recent years has increased the urban population and the demand for water for domestic purposes to such an extent that many waterworks are facing heavy expenditures for additional capacity at a time when it is extremely expensive and difficult to make such extensions. The reduction of waste will undoubtedly postpone these extensions until conditions return more nearly to normal.

A writer in "Engineering and Contracting" calls attention to the enormous waste of water by one of the largest cities in the world and goes to show that the prevention of waste through installing meters at a cost of $13,000,000 would save an investment of $94,000,000 for additional equipment, not to mention a saving of $69,000,000 in coal, wages, and repair.

As the equipment and appliances used in modern works have increased in cost 50 to 300 per cent., there is no question that many waterworks plants are overworking their power houses to supply water to be wasted, and that many requests for appropriations are the direct result of waste beyond the control of the waterworks manager.

The annual consumption of water by the U. S. railroads is estimated at 900,000,000,000 gallons per year, 225,000,000,000 gallons of which is purchased from private or municipal waterworks plants, and undoubtedly represents no inconsiderable portion of the water pumped by these plants.

Many cities supply water at sliding rates, giving the large long hour user the benefit of low rates. As the railways are such large consumers, the water which they waste is nearly all furnished at the lower rates, which rates yield a comparatively small net profit to the waterworks company. If this water was made available for distribution to a large number of small consumers, the net revenue would be increased materially, thus benefiting both the railway and the water company.

It has been estimated that 20 per cent. of the water used on the railroads of the country is wasted. If this estimate is correct we have 180,000,000,000 gallons of water pumped per year for no purpose other than to increase the expense of railroad operation and burden the pumping plants with an additional load. Using the figures of 25 pounds of coal for each 1,000 gallons of water pumped, the waste requires the consumption of 2,250,000 tons of coal, or more than 6,000 tons per day, and no doubt the part that this waste pays in the expense for additions to power and pumping equipment makes the coal bill look insignificant by comparison.

What Do You Know Regarding Monel Metal?

The Story of Its Discovery, Its Varied Adaptability, and How It Should be Used is Stated Herein—Castings, Hot Rolled Rods, and Sheets Are Discussed in Turn

By J. H. Moore

HOW many readers can truthfully stand up and say, "Oh, yes, we know what monel metal is and what it can accomplish." While we are not of a gambling tendency we could safely wager that a good percentage might be tempted to ask the question, "What is monel metal?"

Believing that they will be interested in the uses and working of the same, we append the following:

This metal has only been known since 1905, yet is already being successfully used by industrial plants for a great variety of purposes. The metal, which is a natural alloy produced from the distinctive nickel-copper sulphide ores of the Sudbury district, Ontario, has a tensile strength equal to or exceeding that of mild steel. Its non-corrosive, acid-resisting, heat-resisting and ductile qualities have opened up for it a wide field of possibilities.

At first its resistance to the corrosive action of sea-water seemed to be the big feature of its commercial value, and the propellors of many a vessel are made from this metal. It was discovered later that it possesses another distinctive and commercially valuable peculiarity, namely, that it resisted the weakening effect of high temperatures on the strength of metals much more successfully than some other commoner metals. This fact led to the use of monel in fittings for cast steel valves, the blades of steam turbine impellers, and so on.

Its varied adaptability is such that every progressive shop should not only get to know its uses, but also its working, for it can be readily machined, forged, soldered and welded. Owing to unusual toughness and hardness certain precautions must be observed, so that proven and approved methods should be followed to assure low production costs and satisfactory results.

The metal cuts like no other metal. In respect to the power requirements, it is not unlike steel, owing to its high tensile strength and its resistance to shear, but so far as the cleaving action of the cutting tool is concerned, it is more like brass or the other more ductile metals. The metal is removed in ribbons, rather than in chip form, necessitating—on account of its toughness—the employment of high-speed-steel cutting tools with keen edge and decided rake.

The better grades of high-speed steel only should be employed for cutting tools, and care should be exercised to follow carefully the directions for treating the steels furnished by their makers.

As a general rule monel metal can be machined dry, though, of course, cutting lubricants and cooling solutions may be employed or may even be necessary for fine work.

It can be machined effectively at a wide range of cutting speeds—from a slow speed of 8 ft. or 10 ft. per min. with a heavy cut and feed to as high as 250 ft. per min. with a light cut and feed, provided ample power is available. As a rule, on general work a speed of 50 ft. or 60 ft. per min., with a ⅛ in. cut and a 1-32 in. feed, will be found to be effectively satisfactory, but if a high finish is desired the depth of the cut should be decreased and a higher cutting speed employed, care being taken to keep the tool sharp. The metal is susceptible to a high and lasting polish, and when ground and buffed has an appearance resembling that of pure nickel, but with a shade difference in color that adds to its attractiveness for novelties, plumbing fixtures, automobile trim, yacht fittings, etc., the permanency of the polish making it also of particular value for instrument mechanisms

and fabrication. Unusual attention has been given to polishing operations, and standardized processes for the effective finishing of the various forms of metal stock have been established.

Castings

(1) Use a solid stone, of which there are several grades and makes. The Norton Company's grade "Q," grain No. 20; and Carborundum Company's grade "G," grain No. 16, are very satisfactory. (2) A rag, wood, or canvas wheel coated with No. 40 emery. (3) A rag, wood, or canvas wheel coated with No. 120 emery. (4) A rag, wood, or canvas wheel coated with No. 120 emery and finished with an ordinary buff, using buffing compound.

Hot-Rolled Rods

(1) A rag, wood, or canvas wheel coated with No. 90 emery. (2) A rag, wood, or canvas wheel coated with No. 120 emery. (3) A rag, wood, or canvas wheel coated with No. 120 emery and finished with an ordinary buff, using buffing compound.

Sheets

(1) A rag, wood, or canvas wheel coated with No. 90 emery. (2) A rag, wood, or canvas wheel coated with No. 120 emery. (3) A rag, wood, or canvas wheel coated with No. 120 emery and finished with an ordinary buff, using buffing compound.

This metal can be forged as readily as can iron or steel if certain but simple necessary precautions are taken. A low-sulphur fuel should be employed for the heating, oil or gas preferably, and the flame conditions should be neither strongly oxidizing nor strongly reducing. The metal should be heated to at least 900 deg. C. (1652 deg. Fahr.), but to not more than 1100 deg C. (2012 deg. Fahr.), and to secure a forging of maximum strength, the forging should be finished at a temperature of from 500 deg. to 600 deg C. (932 deg. to 1112 deg. Fahr.).

Owing to the low heat conductivity of the metal, care should be exercised to have the bars or ingots uniformly heated throughout and to have the heat extend well past the working section. This is best realized by turning the ingot or bar quite frequently while in the furnace.

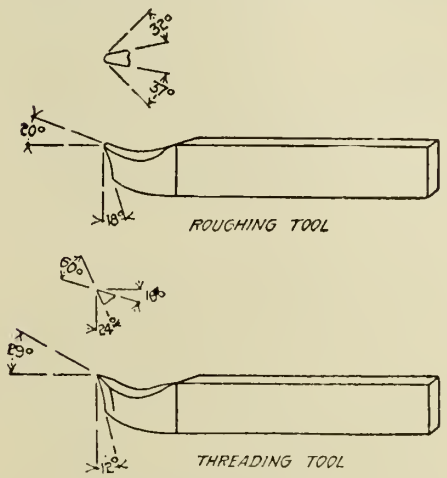
Castings, rods, and sheets of the metal can be welded with the aid of a monel-metal welding rod, and by either electric or oxy-acetylene processes.

The chief precaution necessary is to avoid overheating the parts, and this can be guarded against by limiting the welding temperature to approximately that recommended for forging operations. The strength of the weld can be materially increased by finishing it at a reduced temperature—one in the neighborhood of 500 deg. C. (932 deg. F.) or at a color slightly fainter than a dull blood red, the color of the work at the commencement of the weld being a yellowish white.

The effective annealing of the metal entails precautions against the formation of excessive oxide and anneals of somewhat longer duration than required for most other metals, but except for these safeguards, rods, sheets, and wire can be rendered soft and ductile without difficulty. Monel-metal castings are not annealed, but are used as cast. A reducing anneal should be employed, embedding the metal between layers of charcoal in tight boxes in order to prevent the formation of oxide so far as possible.

The increased duration of the anneal is due to the low heat conductivity and great heat-storing capacity of the metal, necessitating prolonging somewhat the period at which the metal should be maintained at the uniform annealing temperature. Compensating in some measure for the increased duration of heat, however, is the fact that no particular care is required to guard against either a too rapid heating of the metal or a reduction in temperature so rapid as to produce chilling. The low heat conductivity of the metal automatically assures an orderly molecular construction, conforming readily to the necessarily gradual heat variations.

The metal has, of course, to be thoroughly and uniformly heated. In



ILLUSTRATING THE CORRECT ANGLE FOR GRINDING THE TOOLS.

the case of rods the temperature should be between 800 deg. and 1000 deg. C. (1452 deg. to 1832 deg. F.), and in the case of sheets any temperature above 875 deg. C. (1607 deg. F.) that may be safely maintained without danger of burning the sheets. As a rule the higher the annealing temperature is carried, the softer does the metal become; but when 1,000 deg. C. is exceeded, in the case of rods, little or no additional softening is realized, and the danger of overheating becomes a factor to contend with, while in the case of monel-metal plates and sheets the advisable limiting temperature should not be more than 50 deg. higher, or 1100 deg. C. at the most.

The metal may be pickled, but the practice is not to be recommended if the metal can be softened as well by annealing, on account of the greater expense of the pickling operation and the fact that in pickling an objectionable oxide scale is formed and has to be removed. However, if pickling has to be resorted to, the bath should be made of a 12 deg. Baume solution of ferric sulphate in water and kept at a temperature of between 38 deg. to 60 deg. C. (100 deg. and 140 deg. F.), maintaining at all times sufficient ferric sulphate in solution to prevent precipitation of copper. A large excess of ferric sulphate is only objectionable in that it adds to the consumption of pickle, although at the same time somewhat decreasing the time required for the pickling.

A satisfactory pickling bath may also be made of a solution of 1.1 specific gravity hydrochloric acid at boiling temperature, provided the oxide formed is not so excessive as to be objectionable and a hindrance in the work.

The formation of nickel and copper oxides produces the objectionable scale that adheres to the metal and puts copper in the bath. The metal like iron has the property of cementing the copper, for which reason the adequate supply of ferric sulphate in the bath is essential. Even with a plentiful supply of ferric sulphate in the bath all danger of cementation is not removed, for should continued contact occur between the monel metal and some iron pin, rod, or other iron part, copper cementation will result; so care must be taken to guard against the contact of the monel metal, while in the bath, with any object constructed of iron—more than passing contact, in any event.

While the pickling takes place, part of the oxide scale that is formed dissolves, and the balance remains adhering to the monel metal, so that progress of the pickling is observed and measured by the tenacity with which the scale adheres to the metal. At intervals, therefore, a piece of the metal should be removed from the bath and the progress of pickling noted by washing it under a jet of water or by rubbing it with a piece of waste. As soon as the scale becomes loose enough to be easily removed—that is, when the metal can be washed clean by an ordinary water jet or by light rubbing—the pickling is completed, and the metal should be taken from the bath and washed clean, or the loosely adhering scale brushed or rubbed off.

From the foregoing, it will be seen that while the working of this metal presents no great difficulty, a certain skill is necessary in the handling, therefore, there are certain points to watch. Keep the tools sharp and ground to proper shape, and supply ample power for them to accomplish their work. As far as the other operations, welding, forging, etc., are concerned, follow the precautions stated in this article and you will find the task just as simple as the working of any other metal.

Arthur Jackson, formerly of the Gould-Shapley & Muir Company, Brantford, Ont., also the Jones & Lamson Company, Springfield, Vt., and for the past five years selling and demonstrating Gridley Automatics in Great Britain, has been appointed Potter & Johnston representative with the Yamtake Company, of Tokyo, who are Japanese agents for the Potter & Johnston Machine Co., Pawtucket, R. I.

WELDING AND CUTTING

Lessons on the A.B.C. of Good Welding

Dealing With the Welding of Automobile Frames—Compensation for Service, Causes of Failure, Etc., Etc.

By W. B. Perdue

FRACTURES of frames are most likely to occur at or near some connecting cross member, and often in positions where it is inadvisable or impossible to insert or use any additional strengthening material, or where the use of such material might entail an expensive labor bill and keep the car out of service for several days.

Exhaustive tests have been made to determine the efficiency of welded work, the best of which may be mentioned as that of frames welded several seasons past, and which have since been in continuous service, some of them under the most trying conditions over rural and mountain roads.

More impressive tests have been made by testing such welding frames under powerful presses to determine their endurance under bending strains sufficient to buckle the original material. Crushing and tensile tests of welded section have also been made, in all of which the results of well executed welds have proved most gratifying, many instances being on record where the strength of the repair was equal to or greater than that of the frame itself.

Compensation for Services

Granting that the welder is qualified to do work of this character; one of the first questions that arise is "What should the car owner pay?" Shall he be charged the customary price for labor and material, or shall an additional charge be made?

At first thought it seems an extortion to charge an owner a fancy price for a repair simply because few shops are willing to undertake it and because without such repair his car is useless. He must either pay what is asked, purchase an entire new frame which may require weeks to deliver, or else lose his original investment in the car.

For welding repairs which can be made by the ordinary "metal melter" the shop is justified in charging for the services of the journeyman mechanic. When it is necessary to send out for an expert in any particular line the shop is justified in charging for his services plus a small percentage of profit. If the expert who is able to make this repair is available as one of the regular mechanics of the shop, it can not be denied that while engaged in work of this nature the shop is entitled to compensation for the services rendered just as though an expert had been called in for the purpose.

Few self-traned men are able to do dependable work of this nature.

In most cases those who can do this work have spent some time and a certain amount of hard earned money to secure instruction at the hands of other experts. The cost of such instruction represents an investment upon which they are entitled to returns.

Furthermore, the individual or shop selling service for less than that charged by others for the same grade of work eventually loses the respect of customers. The average man does not care to be considered as an object of charity. He expects to pay a reasonable sum for services rendered, and often forms the opinion that the fellow who works for little has a reason for doing so. To charge less than the other fellow is to admit the superiority of the man or the methods he employs. Price cutting is business suicide — the most effective means of advertising your competitor.

Causes of Failure

1. Improper Regulation of the Flame.

2. Working the Weld in the Wrong Direction.

Chiefest of all causes of failure should be mentioned the improper adjustment of the welding flame. Not one welder in a dozen knows how to secure the true "neutral flame" that is absolutely essential to the efficient weld. The freedom of a flame from being carbonized or oxidized is not necessarily indicated by the clear outline of the cone. This clear outline merely indicates that all the particles of oxygen and carbon coming in contact with each other are burned. An excess of oxygen passed through the flame will drive before it a corresponding quality of acetylene. therefore it follows that:

The welding flame may be at one and the same time both oxidizing and carbonizing.

The consumption of equal quantities of oxygen and acetylene means nothing. The use of excess oxygen, commonly called a waste of oxygen, means a corresponding but slightly lessened waste of acetylene.

If a reducing flame is produced by an excess of acetylene the weld will be hard and brittle. The same result may obtain from the use of a tip too small or a torch of inadequate capacity to perform the work with the required rapidity. A bubble, slightly reddish in color, just beneath the surface of the melted metal is an indication of an excess of acetylene, and absorption of carbon by the metal. Frothing, foaming and excessive discharges of sparks are indications of excess of oxygen.

It is gratifying to state that with reasonable care in the regulation of the flame the ill effects of excesses of either or both of these gases may to some extent be neutralized or overcome by the experienced operator. Some suggestions follow:

(a) Commence vertical welds at the bottom and work upward. See Figs. 29 and 30, July 1st issue. This prevents the deposit in the weld of any excess of gases that may be present, or of the products of combustion in the outer envelope of the flame.

(b) Keep the torch in motion from side to side, making sure that each ripple extends the full width of the weld. To hold the torch "dead," that is without motion, will cause the deposit within the weld of the products of combustion, and with an inexperienced operator will cause the metal to become locally overheated and to spill out of the weld.

(c) To carry inadequate acetylene pressures is to effect improper combustion. The pressure given in tables furnished by torch manufacturers apply to pressures actually delivered to the tip.

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From two to five pounds excess pressure should be carried at the regulator to allow for the lowering of pressure while passing through the hose to the torch.

(d) With equal pressure and injector types of torches the pressure at the regulator should be sufficient to cause the flame to break away from the tip of the torch with the torch valve two half turns open. With torches which mix the gases by the stirring process all that is necessary is to turn on enough acetylene to secure perfect combustion. When this point is reached smoke will cease to be given off from the end of the flame.

(e) The use of high oxygen pressures is unnecessary and fatal to good welding. The flame can not be forced back into the acetylene line if the oxygen pressure is slightly lower than that of the acetylene. Aside from the production of superior welds the use of low oxygen pressures is decidedly economical.

Lack of Penetration

This is as often the fault of experienced welders as of beginners. To secure proper penetration it is necessary:

(f) To secure the proper bevel. Experience has proved that a bevel of at least 45 degrees is absolutely essential to secure proper fusion of both faces of the parts to be joined. Attempts to melt out the bevel with the torch are as a rule unsuccessful. The bevel may be cut out with the cutting torch provided all traces of slag are afterward removed with a chisel or wire brush.

(g) As in boiler welding it is essential to allow an opening of one-eighth inch, NO MORE, NO LESS, between the beveled edges. This permits the flame to penetrate the weld properly without causing the bottom of the bevel to break down and spill out on the reverse side.

Plastic Welding

Many welders of the old school will say "Your ripple weld does look a little prettier, but my plastic weld is just as good." The plastic weld is defective because of:

(h) Interposition of oxide between the wide fills thereof through which sufficient heat can not be transmitted to cause proper fusion with the adjoining metal.

(i) In the plastic weld the added metal is not manipulated, and is therefore in a "cast" condition possessing very little strength.

Proper manipulation of the weld does for it what forging or rolling did for the original ingot. In addition to this it also helps to bring any impurities to the surface and float them out of the weld. The addition of the very small amount of metal necessary to make the ripple permits it to be thoroughly fused with the adjoining bottom and sides of the weld. The welder who holds a "dead rod" can not hope to produce a weld of very great strength. The grain of such a weld will be extremely coarse.

(j) Heating and hammering are not recommended in such cases. This practice may have its uses, but the automobile frame should not be so treated.

Pre-Heating

(k) Such pre-heating as may be necessary in welding automobile frames should be done with the welding torch. The use of other torches for pre-heating may unnecessarily anneal the parts to be welded causing loss of strength. In addition there may be deposited in the weld certain impurities that may cause the weld to become defective.

Improper Fusion

The average welder is over-anxious to "get the work going" by the addition of the welding rod. The appearance of a film of oxide on the surface of the heated metal is often mistaken for the fusion of the metal itself. This may be due to (l) the use of a torch in which the gases are not properly stirred together, (m) the use of an excess of oxygen, improper motion imparted to the torch—that is a successive lifting and lowering of the flame—causing the oxygen of the surrounding air to produce a destructive effect upon the heated surfaces; or to many other causes.

(n) Holding the torch at an improper angle, (o) a slovenly, jerky motion or otherwise improper motion imparted to the torch—generally the result of wrist instead of free arm movement, (p) the use of a welding tip of a size unsuited to the work, the too rapid or improper addition of the welding rod, (q) or its addition before the bottom and sides of the weld are in proper fusion are common faults. To overcome these faults it may be necessary to have some other welder study and observe your use of the torch. This in the end is the safest and least expensive plan, since the loss from the failure of even a single weld may amount to a far greater loss than would be thus expended. Those faults which do not detract from the appearance of the weld are extremely serious, since that which has a perfectly sound appearance may have a line of weakness throughout its entire structure.

(r) Another example of improper fusion is the tendency of some to cover too little area with the torch, and to "slick" away the fused metal from the edges of the weld by burrowing into them with the flame. The danger sign in this case is the rapid flowing away of the metal from an edge that presents a reddish appearance and distinctly shows the grain of the metal. (s) An excessive oxygen pressure may cause the same trouble.

Clean Surfaces

Clean surfaces are absolutely necessary for making good welds. (t) If scale, rust or grease is permitted to remain on the surface to be welded, a slag is formed that will make a streaked and seamy weld. All welded surfaces and those adjoining must be kept free from foreign substances. (u) All traces of brass, zinc, babbitt, solder, etc., must be removed from the welding zone.

SOME VALUABLE DON'TS

The Hart-Parr Co., Charles City, O., who issue a factory paper called Hart-Parrtners, have in their issue some hints, or rather don'ts, for the dictator, which are well worth repeating. Here they are, just as the willing but sorely tried stenog believes they should be said:

Don't keep your hand over your mouth while dictating. Give your words a chance.

Don't turn your back to the stenographer. She likes to hear you talk.

Don't chew gum, a cigar, pipe, your mustache or correspondence. It isn't polite, and looks bad.

Don't keep your chair revolving and complaining. Sit still—it quiets our nerves.

Don't get up and take your morning exercise while dictating. It annoys us.

Don't get peeved if you drop half a sentence down your shirt front and the stenographer has to get you to dig it up again.

Don't use a barrage of tobacco smoke to put your stenographer out of business. If you must smoke, buy her a gas mask.

Don't be afraid to drop your voice at the end of a sentence, your stenographer won't run away with it.

Don't chin with the boys all day, then dictate at 5.29 and expect your stenographer to have it out by 5.30. Be reasonable.

Don't try to exceed the speed limit when dictating; none of us are court reporters, and anyway look what has been happening to the speeders around town lately — SAFETY FIRST.

Don't expect your stenographer to laugh hilariously at some of your old last year's jokes. Her sense of humor has its limits.

Don't wear out the batteries on the buzzer if your stenographer doesn't appear on the instant. She might be powdering her nose getting ready to vamp you when she comes in, and such a delicate operation should not be interrupted.

Interesting Facts To Be Found In This Week's Advertising Section

How to link Science with Industry.

Telling one method of chipping.

That it is a good thing to have confidence in yourself.

How to protect your profits.

A tale of grinding.

A story about the mastery of water.

How to eliminate milling uncertainties.

A handy and simple aid.

What to do when thinking of belting.

DEVELOPMENTS IN SHOP EQUIPMENT

AUTOMATIC MILLING MACHINE

AN automatic milling machine intended for the manufacture of duplicate parts in large quantities is a recent product of the Brown & Sharpe Mfg. Co., of Providence, R. I. It is essentially a manufacturing machine and is known as the No. 21 Automatic Milling Machine, see Fig. 1.

The machine has structural characteristics common to the other styles of plain milling machines of the column and knee type made by this concern. However, in the application of the automatic control to that of a plain milling machine many new and important features were developed.

Automatic Controls

Embraced in the design of the machine is the automatic control of the spindle and table. By means of the adjustable dogs on the front of the table, the control of the spindle and table is entirely automatic. These movements include a variable feed, constant fast travel, and a stop for the table; start and stop, and right and left hand rotation for the spindle. The table and spindle may be operated independently of each other and these movements may or may not be intermittent in either or both directions and may take place one or more times. The spindle may be stopped upon the return travel of the table, thus eliminating the possibilities of marring the work, and the spindle reverse allows of the use of two sets of cutters, with teeth facing in opposite directions so that one set may be in operation for one direction of table travel and the other set for the opposite direction of table travel. A constant fast travel and a slow variable feed in both directions is automatically controlled by the table dogs. The machine can be set and the dogs will operate the table independently of the spindle.

Adjustable Table Dogs

As the various automatic operations of the machine are performed through the medium of the adjustable table dogs it will perhaps be of interest to note a description of these dogs.

There are four different style dogs necessary to operate all the automatic movements of the machine. However, for all ordinary milling operations two or three of the styles are usually sufficient.

Referring to Fig. 2. A long dog "A" used at "A" or "B," controls the reversing of the table. This same dog also stops the table if it is so desired and the table stop lever is set.

Dog "C" controls the constant fast travel, and dogs "D1" and "D2" control the variable slow feed, it being possible to set these dogs to operate in either direction. The variable slow feed dogs are trip dogs and are made changeable to operate as shown at "D1" when the direction of the table travel is to the right, and as shown at "D2" when the direction of the table travel is to the left.

The table always moves at its constant fast travel when reversed, and

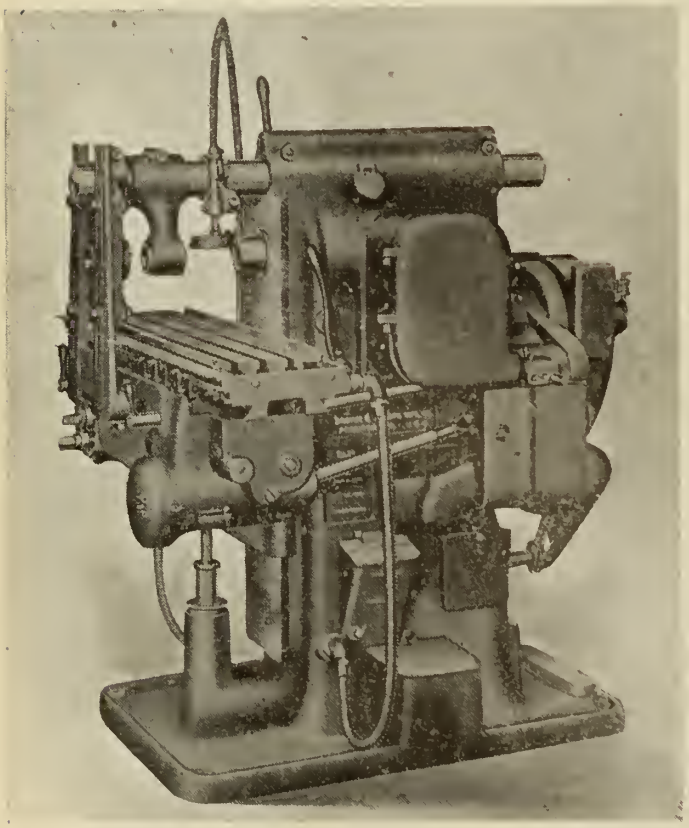

FIG. 1—GENERAL VIEW OF THE MACHINE.

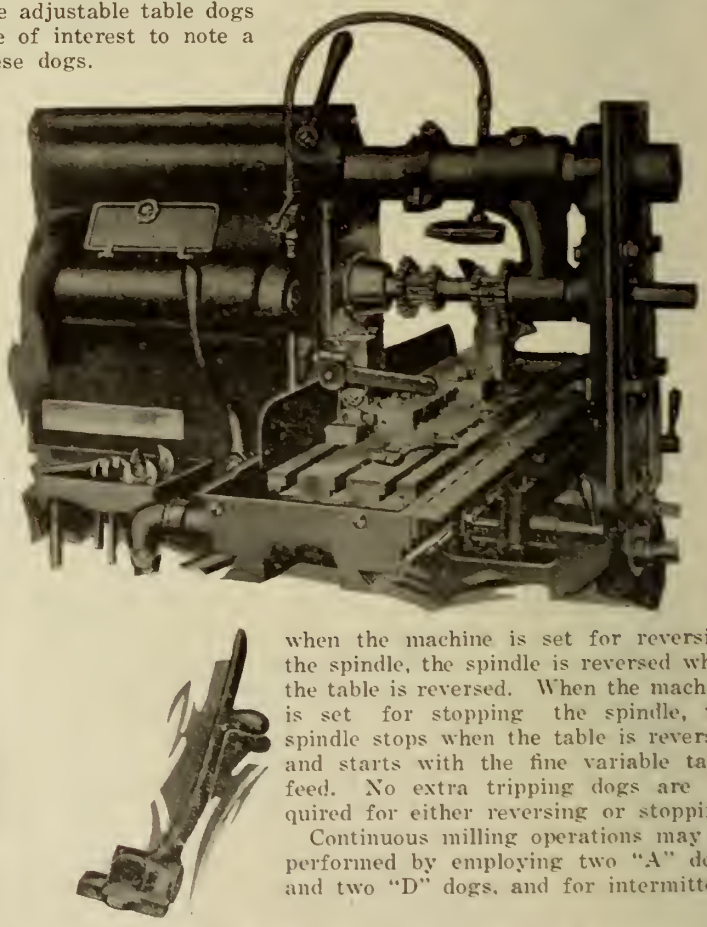

FIG. 3—TYPICAL EXAMPLE, ILLUSTRATING THE AUTOMATIC CONTROL BY THE TABLE DOGS.

when the machine is set for reversing the spindle, the spindle is reversed when the table is reversed. When the machine is set for stopping the spindle, the spindle stops when the table is reversed and starts with the fine variable table feed. No extra tripping dogs are required for either reversing or stopping.

Continuous milling operations may be performed by employing two "A" dogs and two "D" dogs, and for intermittent

milling operations, dogs "A" and "B" and dogs "C" and "D" are employed, the number of pairs of "C" and "D" dogs depending upon the number of pieces of work on the table.

An interesting example of the application of these dogs is illustrated in Fig. 3. Two fixtures are set in a staggered position and at opposite ends of the table and two sets of cutters are employed. The dogs set in their proper position, the table travels at a constant fast travel of 210" per minute to a cutting position immediately before the subject to be milled when the cutting feed is automatically engaged. Upon the completion of this cutting operation, a dog reverses the table and spindle simultaneously and the table travelling at a fast constant travel brings the fixture at the opposite end of the table under the other set of cutters. This cycle of operations is then continuously

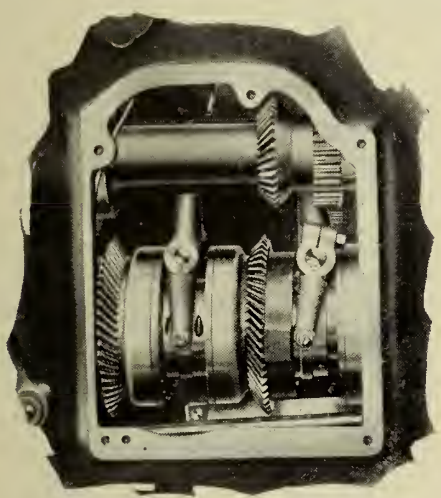

FIG. 5—DRIVE SHAFT MOUNTING, FRICTION CLUTCHES AND SPIRAL GEARS.

repeated, the operator but loading and unloading the fixtures.

Hand Control

Although the automatic control of the spindle and table is by means of the table dogs, the same results may be attained by hand, employing the two controlling levers located on the front of the saddle.

Occasionally the loading time of a piece exceeds the cutting time and the table is set to stop for the safety of the operator. Under these circumstances the machine is semi-automatic in operation, and the hand control levers are employed in place of the dogs.

The manipulation of these controlling levers is extremely simple and the ease and rapidity with which they may be operated, is in some cases faster than when it is fully automatically operated.

By means of the hand control levers the machine may be operated as a plain milling machine, accomplishing within its capacity, all that of an ordinary plain milling machine.

The constant speed type of drive permits the machine to be driven by belt, direct from the main shaft to the single driving pulley. This pulley runs at a constant speed and is mounted upon a sleeve of the main driving shaft. Contained within the pulley is a friction clutch for the starting and stopping of the machine and an efficient brake for the instantaneous stopping of the machine. This brake also affords a spindle lock when removing an arbor or cutter. The friction clutch is operated by a lever located on either side of the column at the front of the machine.

Mounted upon the drive shaft, see Fig. 5, are the friction clutches for the starting, stopping and reversing of the spindle automatically. This mechanism mounted upon the drive shaft relieves the spindle of all unnecessary weight. Power is transmitted from this shaft to the spindle through a series of spiral bevel gears which furnishes a smooth and powerful drive.

Another feature of the constant speed type of drive is the complete separation of the spindle speeds and the table feeds, permitting any combination of the two within the capacity of the machine. Variations of the spindle speeds are obtained through change gears, giving sixteen changes of speeds in geometrical progression from 28 to 695 r.p.m. in either direction. The table feeds are positive and are entirely independent of the spindle speeds. There are 12 changes, ranging from 1.37" to 18.38" per minute. This provides a range of 0.002" to 0.026" per revolution of the spindle for small mills, and 0.026" to 0.656" per revolution of the spindle for large mills. Both sets of change gears are contained within heavy cast iron cases and are made readily accessible by covers, upon which are cast tables of the proper gears for the various spindle speeds and table feeds. This is clearly illustrated at Fig. 6.

Motor Drive

This type of constant speed drive milling machine is well adapted to the application of a motor. The motor is placed at the rear of the machine where it is completely out of the way and does not increase the floor space occupied. The motor is mounted on a heavy bracket that is firmly bolted to pads provided on the base of the machine. A belt transmits the power from the motor to the single driving pulley and a cast iron guard protects these parts from dust and grit and the operator from injury.

Taper Nose Spindle

The front end of the spindle is tapered, hardened and ground and has a recess to receive a cutter driver and clutch on arbors and collets. Arbors and collets are provided with clutches and have a threaded hole in the end of the

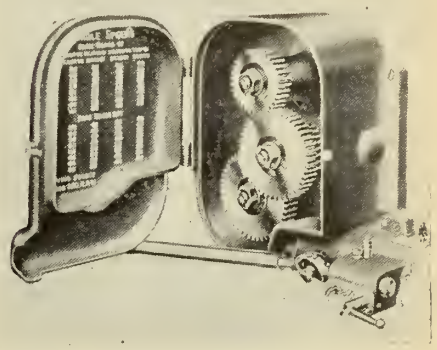

FIG. 6—VIEW OF SPINDLE SPEED GEAR CHANGE CASE.

shank, the clutch fitting into the recess in the end of the spindle and the arbor or collet being drawn into place and held securely by the drawing-in bolt which passes through the centre of the spindle. The threaded end of drawing-in bolt enters the end of the shank of the arbor or collet and is tightened with a wrench from the back of the machine.

Operating Mechanisms

The reverse gearing and cams that are actuated by the table dogs are assembled as a unit in an oil tight case and operates the reverse and stop movements of the table and spindle. This unit of mechanism is automatically lubricated and is protected by a safety friction coupling set to slip at a predetermined load thus guarding against possible damage.

The other unit of mechanism that responds to the action of the table dogs is that which controls the constant fast travel of the table and the variable table feeds. This unit is provided through-

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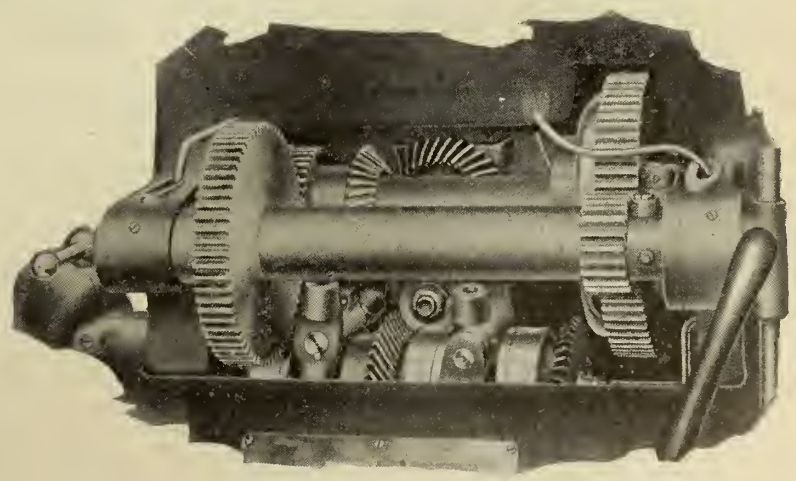

BACK GEARING WHICH IS THROWN IN AND OUT OF ENGAGEMENT BY A SINGLE LEVER.

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Getting Back to Normal

ONE of the most encouraging signs that have been seen of late is contained in the replies of 23 manufacturers to a questionnaire recently sent out by the Merchants' Association of New York. These replies show that slowly but steadily the output of labor is reaching a higher percentage of its possible maximum, and that, man for man, the worker is working more steadily, and producing more during his working time, than he has been doing for some time past. If this tendency persists, and a higher plane of efficiency ensues and remains, then a long step has been made towards the reduction in the cost of living. It is a fact that there has been, pretty well throughout the world, a tendency on the part of the average worker to hold back, so as to make the work in hand last as long as possible, and thereby, in his opinion, preserve the era of plentiful employment and high wages. This tendency was perhaps not so much in evidence on this continent as it was in other countries, Great Britain especially suffering from this viewpoint of labor. Over there they had a regular name for it, thus giving it the dignity of a policy. It was known as ca' canny, which is a Scotch colloquialism for "take it easy," and for which the French use the expression "laissez faire."

Conscientiously carried out, this policy results in bringing the production costs of every article it is applied to up to an ever increasing figure, a figure which represents far more than the real value of the finished article. Brought to bear over a wide range of articles, it naturally affects the pockets of the men themselves who are responsible for it, and forces them to demand a correspondingly higher rate of pay. So the thing goes on. The surest way to obtain better living conditions and a reasonable wage, which will allow the worker to obtain the comforts of life, is for him to work while he is at it, without skimping and holding anything in reserve. An article produced by maximum efficiency, at lowest cost, will be in greater demand than when the same article is produced at a price which puts it out of the reach of many who would otherwise use it. The workman can receive a higher wage, the manufacturer can realize his profit, and a far larger demand is created. High wages in themselves are not an objectionable feature to any manufacturer. Where he loses money is in training men to supply a constant turnover, and in having machines standing idle or operating at low efficiency through the unwillingness of a man to give his best when he is receiving the wages he has demanded. If this condition is passing away, there is much to hope for. It would seem that the common sense of the workers was at last asserting itself, to the detriment of those who have so long been trying to lead him along what looked like the flowery paths of ease. This return to a normal viewpoint will be no doubt viewed with alarm by some of these erstwhile friends of the people.

The Niagara Industrial Conference

THE progressive people of the Niagara Peninsula have been demonstrating to a gathering of manufacturers from Great Britain, the United States and Canada the potentialities of the district for industrial purposes. They point with pride to the cheap power that will be available, although it is evident that it will eventually be only cheap comparatively. The chief engineer speaks of power that will cost $1,000 per horse-power to develop. That does not seem to be a very attractive figure, but, perhaps, spread over a sufficiently large industrial population, the cost to the individual might not be prohibitive. The most interesting part of the movement is that which deals with bringing the sea into direct communication with the Great Lakes, by making it possible for ocean-going steamers to navigate up the St. Lawrence and on to Port Arthur. This is an ambitious scheme, but we are told that the Federal Government has been conducting preliminary surveys for the last three years, looking to the development of the water-powers along the route, as well as deepening and widening the canals. Before this can become an accomplished fact, many, many millions of dollars must be spent, and while it is possible that the development of the water-powers would eventually prove an adequate return, it is doubtful whether the navigational end of the project would ever be justified. The present lake freighter, which has been evolved from many years of experience for a special purpose, can carry freight at a rate cheaper than any ocean freighter. When the great grain crop has to be removed, these vessels are available in large numbers to bring the grain down to the elevators, where it can be shipped into the ocean-going steamer for transportation overseas. Their special facilities for loading make them capable of a much quicker turn round than is possible with any ocean boat. The extra cost of the long inland navigation for a large ocean-going steamer, with her big crew, heavy insurance fees, pilotage dues, etc., would make the inland voyage a very expensive proposition. It must also be remembered that for navigational purposes the whole project would be useless for the larger part of the year. A waterway from the sea that is blocked off from the sea by ice for six or seven months is a questionable asset. It should be the subject of long and careful enquiry from every possible angle before the country is committed to the outlay of millions and millions of dollars, which might better be spent in developing the industries already here. Our national canal might easily be as expensive, or more expensive, than our national railways, and they are surely luxury enough for a young country like this. Festina lente is a good motto sometimes.

Making a Rebel Out of a Good Workman

How the Campaign Is Being Carried On in Various Industrial Centres—Holds Out Inducements That Example of Russia May Be Followed With Success in This Country

THERE is little doubt in the mind of the average man but that there is some secret and sinister influence at work, which is calculated to intensify and fan the smouldering embers of discontent in the mind of the man who earns his living by the exercise of trade or by his labor. The evidence of this is the epidemic of strikes and threats of strikes over grievances which sometimes exist only in the imagination of the men making them. What is the germ that, lodging in the mind of the usually reasonable and open minded man, turns him into an element of a mob, which is frankly and avowedly out to get everything it possibly can for itself, regardless of the effect of its action on any other section of the community, or even of the ultimate effect on the industry which provides the fields for their labor? The average member of a trade union is a good solid citizen, very often possessing a stake in the country in the shape of his home, and with children that he is educating with a view to giving them a better start in life than he has had. It is hardly this type of man one would expect to find developing into a revolutionary. He wants to get adequate return for his labor, and a fair share of the comforts of life for himself and his family.

Of his own volition, he would attain this object in a constitutional manner. The mounting costs of food, house rent and clothing have made it necessary for a man to earn higher wages, but on the other hand, the demanding of exorbitant wages can only have the effect of still further increasing the cost of commodities. When these demands are coupled with demands for the shortening of the working day, involving a lessening of production, the struggle begins to look like a war of extermination, involving both sides in irretrievable disaster, and with them all classes of the population who are not directly concerned with the dispute at all. There is strong evidence that this feeling of industrial unrest is being deliberately fostered and encouraged by a group whose object is to produce chaos and revolution of the type that has been scouring Russia for so many months. The means chosen are the distribution of literature, carefully graduated and dispensed in doses almost homeopathic, but continued steadily till the ideas suggested begin to take hold of the least susceptible of those treated. The goal to which the worker's mind is directed in this propaganda is the eventual destruction of all capital, the abolishment of the wage system, and the dedicating of industry for the benefit of the worker only. This is the familiar Soviet doctrine, although any reference to Communist or Soviet ideas is carefully avoided until the way has been paved.

The first approach to the workman is by means of a pamphlet, which contains the preamble of the Industrial Workers of the World. The following ideas are expressed in this sheet:—"The working class and the employing class have nothing in common. Between these two classes a struggle must go on until the Workers of the World organize as a class to take possession of the earth and the machinery of production, and abolish the wage system. Instead of the conservative motto, 'A fair day's work for a fair day's pay,' we must inscribe on our banner the revolutionary watchword, 'Abolition of the wage system.'"

Then Starts the Work

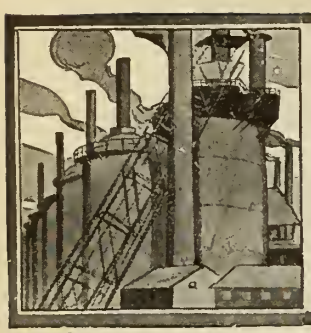
This is the introductory step. The consideration it receives will naturally depend on the temperament of the recipient. A certain proportion of the men will consign the thing to the gutter after one glance, others will give it a certain amount of thought and then reject it, but there will be a few who will think it over and let the idea seep into their minds. The first pamphlet is then followed up after a short period with this: "Value of Industrial Action." "We cannot successfully meet the well organized employers with the antiquated trade union methods. United industrial action under which an injury to one means an injury to all. All power to the rank and file." This is calculated to open his mind to the possibilities of what is called in England direct action. In order that his mind may be kept in the right direction, he receives the third week another dose of the propaganda, which says:—"Revolt, Secession, and Re-organization are in progress. Do you desire to see forces of the workmen scattered or do you wish to see the One Grand Union for all the workers? There is one enemy to the working class—the Industrial Barons, the exploiters. **There is room for only one industrial union.** Act together. Unite together. We will stand together and fight together for the day of industrial freedom." Here the idea is frankly and plainly set forth that the only enemy of the worker is the man that employs him, or as the propaganda prefers, exploits him. By standing together the worker is told that he will hasten the day of industrial freedom, whatever that is. The next pamphlet suggests that although wages have been increased, they are really being reduced, owing to the low purchasing power of money. It further states that the standard of living is being reduced by the fact that wages are not keeping pace with the soaring prices. The same pamphlet states that the remedy for all this is an organization with which to overthrow capital, and the capitalist wage system. Any strike or lockout in any department of any industry should be the signal for a complete cessation of every branch of industry. At the same time that he receives the pamphlet he receives a chart showing the organization of the Workers' International Industrial Union. The head body of this is known as the International Bureau of the Workers' International Industrial Union. It is divided into the American, Australian, British, etc., administration. The American branch of this is subdivided into various departments, the lowest of these being the local industrial union to which the worker belongs. After a pamphlet has been distributed showing that every class of worker is striking, and incidentally "showing the bosses what they can do when they stick together," while at the same time it attacks the American Federation of Labor, a further step along the revolutionary road is taken. It suggests that the union leaders from Gompers down have been playing their own game by keeping the various unions separate, and that the workers should form shop committees and workers' councils for agitating and organizing. "Establish industrial unions in the different industries and join them into **one big revolutionary union of all the workers to fight the bosses and their Government.**"

Beginning to Unfold

Here is what the propaganda has been gradually leading up to. The worker is told that his union is working with the bosses and the government, and that he has to fight the government, and that therefore he must be well organized and strong enough to carry on that fight. The ugly head of revolution is beginning to be plainly seen through the camouflage of words.

Just previous to the first of May literature was distributed urging the workers to stop work on that date. They were invited to show labor's triumph over capital by a general cessation of work and a celebration of the International Labor Day. The final pamphlet shows clearly the source from which the whole poisonous doctrine is emanating.

Continued on page 63



MARKET DEVELOPMENTS

General Dullness Pervades All Lines

Railroad Rates May Bring More Activity—Steel Mills Are Not Finishing Up More Than They Can Ship—Pig and Scrap Iron Markets Show a Better Tendency

THERE is but little stirring in the local markets, and while there have been so far no changes in prices, this is, perhaps, due to the fact that there is so little business being done. In some lines of machine tools deliveries are better, but in most conditions are the same as for some time past. There has been a slight reduction in the production of pig iron and in finished steel in the United States mills. A number of mills are keeping their product in a semi-finished state, and finishing just enough to keep the cars available filled. Transportation facilities are said to be improving lately.

The dullness of the markets in the metal business is exciting no comment in the United States. It is pointed out that the two midsummer months are always dull, and that the first two weeks of August are the dullest of a slack period.

The settlement of the railroad rate case will result in a better outlook for the steel trade, not necessarily for the amount of business to be got from the roads, but because the roads will be put into better physical condition. They will thus be able to keep the wheels of industry in general going more smoothly, which will in turn react to the benefit of the steel industry.

In connection with this increase in the rates on U.S. roads, it is felt that it will be very soon followed by increases on Canadian roads. Then, again, a betterment of transportation facilities will help the production of plate, and this in turn will mean more cars being built. Some authorities think that it will be fairly late next year before the car situation is normal.

BETTER BUSINESS IS LOOKED FOR AFTER HOLIDAYS

Special to CANADIAN MACHINERY.

Montreal, Quebec, Aug. 9. — The opinion is widespread that industrial activity will show a gradual betterment from now on, due partly to the nearing close of the holiday season and partly to the fact that the railroads have been given increased inducement in the matter of rates on freight transportation. The car shortage, however, is an actuality and not as some people suppose a lever being used to obtain higher rates. A dealer here, who has studied the conditions from every angle, intimates that it will be well into next year before a normal condition of car supply will again be evident. The trade here is looking forward to renewed activity early in the fall.

Advances in Steel Prices Likely

The granting of increased freight rates to the railroads has given a new aspect to the industrial situation, but one that will not materially aid in removing the tension that is only too pronounced at the present time. There is a prospect, however, that the shipment of goods will show improvement, but the scarcity of cars is still of such a character that immediate betterment can hardly be expected. The congested condition at the steel mills has resulted in considerable curtailment in production. A dealer here, buying regularly from a large American mill, stated that this plant has been practically idle for several weeks, owing to the lack of yard space to store the finished product. Many mills are continuing to take orders, but on the basis that these will be booked under the no cancellation clause, that the material will be run off when convenient, and that the finished product will be stored at the expense of the purchaser, and finally delivered when transportation facilities are favorable. This is not conducive to heavy buying and present placements are generally made only for immediate requirements and delivery on this basis is usually on a pretty stiff premium. Dealers here are showing no anxiety regarding warehouse supplies, as it would be undesirable to carry heavy surplus stock when same would have to be obtained at premium prices. Another factor that engages the attention of buyers, just now, is the possible effect increased haulage rates will have on prices of different commodities. It is believed that the added charges will be handed on to the consumers, so that early quotations are likely to show advances, particularly on lines that are brought in from the States. It is thought that it will only be a question of a few weeks when traffic rate revision will be adopted on the Canadian roads. The production of cars is dependent on plate supply and it is hoped that early betterment in transportation will aid in solving this problem. Railroads constructing cars are in a better position to secure material as they can usually furnish the necessary cars to the producing mills. Nominal prices prevail here, but dealers are anticipating an early upward revision.

Better Trade Looked For

Machine tool houses have experienced a quiet week and look for little improvement in the immediate future. Little inquiry has come through for new equipment, and with used tools being scarce, buying on this class of machinery has recently shifted to the States, where it is stated, considerable supplies are available. The difficulty is in getting delivery. The inadequate transportation of late has seriously interfered with many lines of activity, and industries in different sections of the country have had to curtail or suspend operations. There is an optimistic feeling that the railroads will, in the near future, find themselves in a position where freer movement of freight

will feature general traffic, and consequently bring about increased interest and renewed confidence in industrial trade circles, with better buying on the part of consumers, even though prices are expected to advance.

Quiet But Strong

The listless condition of the scrap market is a continued feature of dealers' activities, or rather the lack of them. Buying is confined to small quantities for foundry purposes and chiefly of a local nature. The general restriction of trade, due to continued car shortage, has curtailed buying on every side, and scrap movement has been reduced to a minimum. A slight upward revision has been made in some lines. Brass turnings are up 1-2 cent per lb. Wrought iron axles, at $25, are higher by $5 per ton. Steel axles at the same nominal figure show an advance of $3 per ton. Rails are up, the present price being $23 per ton. Malleable scrap is quoted at $26.00, an advance of $3 per ton.

The Local Market Remains Quiet

Practically All Branches of Metal Trades Experience Dullness

TORONTO.—Writing a market report under present conditions is like making a chronicle of events that never happened. The dullness characterizing last week's markets has been carried over into this, but in even greater degree. There are various theories mentioned to account for this, and one can take the one that appeals most to his fancy, or make a brand new one if one so desires. Among dealers in the machine tool trade there are several different opinions. One gentleman gave it as his opinion that everybody was holding back in the anticipation of another war developing, and that this was influencing the banks also. And the opinion was that business generally was marking time until the crop was harvested, and the wheat exchanged for money and credits to keep the country going. A third ascribed it to the fact that it was always a dull season during July and August, and so many people being away on holidays, caused decisions to be deferred to a later date. It is quite probable that while none of these reasons alone are sufficient to account for the stagnation, they are all contributory in some degree. Everybody will hope very sincerely that the first opinion is altogether without foundation. Steel warehouses are in the same position as the machine tool dealers, and of course the local situation has been affected by the closing down of the Dominion Shipbuilding Co. and Willys-Overland factory. Speaking to one local dealer on the subject of deliveries, we heard that in some lines these were better. In the majority of machine tool lines, however, deliveries were still requiring periods of from three weeks to five months. In the small tool business, such as drills, reamers, taps, milling cutters, etc., there has been a fair demand for small lots, over a wide range of customers, but those that buy in big quantities have not been in the market. In the old material market about the same state exists as in the machinery lines. There is no change in prices as yet, but there is a possibility of a decline, with the market in its weak state.

MILLS ARE NOW SHIPPING MATERIAL AS IT IS FINISHED

Special to CANADIAN MACHINERY.

PITTSBURGH, August 12. — Production of pig iron by the merchant blast furnaces was 2.9 per cent. lower rate in July than in June, while production by the steel works furnaces decreased 2.3 per cent., making a decrease in pig iron production as a whole of 2.5 per cent. This is a smaller decrease than usually occurs in July, the high humidity in the midsummer period causing a decrease in the output of furnaces individually. As the production of a furnace decreases from this cause, the consumption of coke per ton of pig iron made increases, and the probability is that coke consumption was at a higher rate in July than in June. Thus the slightest decline in pig iron production could hardly be ascribed directly to coke shortage, although it is a fact that there remains a coke shortage. If there were more coke, some furnaces that are banked or cold would resume operations.

Statistics of steel production in July are not available at this writing, but the presumption is that there was a decrease from the June rate of a very few per cent. The decrease in production of finished steel was greater, since not a few steel works have been accumulating semi-finished steel, fearing to put all their steel output in the finished form because the particular material rolled might not be acceptable to customers when shipped. The common rule among mills now is to put into finished form only the amount of steel that can be shipped with such cars as are available.

Transportation Improving

There has been a decided improvement in rail transportation conditions as affecting the blast furnaces and steel mills. The producers are unwilling to admit all of the improvement, fearing the admission would bring demands from customers for heavier deliveries. In fact, the producers have experienced difficulty for some time past in convincing customers that transporation conditions were as bad as they were. A difficulty not infrequently experienced is that of a given customer feeling that on account of his supposedly special condition he should receive special treatment.

The majority of mills now have an even break between their production of finished steel and their shipments, and in some cases there have been slight reductions in stock of finished steel. On the whole, however, the steel that has accumulated in the past four months or so on account of transportation difficulties has still to be moved, a quantity somewhere in the neighborhood of 2,500,000 tons.

Unfinished Steel Easier

There are reports current of middlemen offering sheet bars at $68 a ton, and possibly even at $65, while the market for some time previous had been quotable at $70 to $75, and some important tonnages had brought the full $75. The mills themselves are indisposed to admit declines, and seek the highest prices possible, even when they have steel for early rolling. Among buyers of slabs, billets and sheet bars, there is a disposition to hold off as far as possible, in expectation of lower prices, and thus those who come into the market are only those who must have early deliveries. The market is in the curious position of being supported by inability to ship all the steel produced, when at the same time there are some large accumulations of unfinished steel awaiting cars for shipment.

Dull Markets

The pig iron and steel markets are extremely dull, but the dullness produces no particular comment, and is not necessarily an unfavorable feature since the markets are always dull in the two midsummer months, and the first fortnight of August is usually the dullest of the whole period.

The light demand, in point of tonnage,

POINTS IN WEEK'S MARKETING NOTES

Deliveries are better in some lines, but there is little demand, and the situation is one of extreme quietness.

Transportation in the U. S. has shown an improvement of late, especially as it affects the blast furnaces and steel mills.

Although there are large stocks on hand at the mills, lack of cars to ship finished steel results in the market being kept up.

Mills are finishing only such steel as can be shipped in cars available.

It is hoped that the increase in rates just granted the U.S. roads will enable them to give better service, and thus help business all round.

that has existed for several weeks has not weakened the merchant furnace position, as they are encouraged by the fact that consumers in need of early deliveries have difficulty in making any purchases at all, and every now and then the market advances a trifle. Thus a couple of sales of basic iron of 2,000 tons each have just put the market up 50 cents a ton. The market now stands at $46 for foundry, $46.50 for basic and $47 for Bessemer, f.o.b. valley furnaces, freight to Pittsburgh being $1.40, but market for a 40 per cent. advance about August 26.

Plates continue to show a very easy tone, and a fairly attractive specification for early delivery can be placed at 3.25c. The decline in the independent market is attributed partly to the fact that the Steel Corporation's deliveries are now heavier in proportion to the total demand, all the Steel Corporation plates being at 2.65c.

Sheets, on the other hand, are stronger. The mills are so well filled for deliveries in the next few months that it is difficult to buy at all, and thus the occasional offerings go at still fancier prices than two or three weeks ago, a price of 8c on No. 28 black being not uncommon.

The Railroad Rate Settlement

The iron and steel trade feels that the settlement of the railroad rate case, by which the railroads are authorized to advance freight and passenger rates by amounts practically equal to all they asked, will have a favorable influence upon business, by removing another of the uncertainties. As to actual orders, these will not be large in proportion to the present capacity of the steel industry. There has been much misapprehension as to the ratio between railroad requirements and the tonnage capacity of the steel industry. The industry's capacity, in finished rolled steel, is about 40,000,000 gross tons a year, while if the steam roads take 2,000,000 tons of rails in a year for replacements and extensions of track they are doing quite well. The building even of 100,000 freight cars would require less than 2,000,000 tons of steel. However, there will, at any rate, be much more railroad business in steel in the next twelve-month than there has been in the past couple of years, or since the Government ordered a considerable number of cars which it had great difficulty in inducing the railroads to accept, many roads claiming either that they did not need the cars or that the price was too high, or both. The iron and steel industry, however, is taking a different interest in the railroads now than it used to do. Then it wanted orders. Now it wants the railroads to function, giving good service to industry in general, for then the demand for steel for general purposes will be increased.

PIG IRON TRADE

There is a better tone to the pig iron market in the United States. In the Philadelphia district furnaces are all sold up, and some of them oversold, the lowest price for iron now being $46.75 to $47 base furnace. No. 2 iron, which was sold recently at $49, is now being sold at $51. Chicago reports show a somewhat smaller inquiry recently, although some buyers are showing interest in iron for first half of 1921. Some iron has been sold for this delivery at $46 Chicago furnace. Malleable has sold recently at $48.25 furnace. A good demand for steelmaking grades has developed in the Pittsburgh centre, and basic iron has advanced about 50 cents a ton as a result. Furnaces are well sold up and in some cases are only now delivering iron contracted for first half of this year. There is a good demand in New England, although total sales are not quite up to the usual average. New York reports a considerable interest being shown in the 1921 market, for first half delivery. One large machinery manufacturer has an inquiry for 10,000 tons for first quarter delivery, mostly foundry iron. Furnaces are not generally anxious to quote on this business, costs being an uncertain feature, especially in view of the railroad increases just granted. The market is generally strong, with prices tending upward.

U.S. SCRAP METAL

Reports from various United States centres show that on the whole the market is on the upward trend. While demand in one or two places is weak, the general tendency is towards a stronger position. Thus, while both Chicago and Boston report the market as dull, New York is holding steady with an upward movement in heavy melting steel. This grade is now $20 to $21 f.o.b. New York. Philadelphia reports a stronger market, 5,000 tons steel being sold recently at $23.50 delivered to an Eastern consumer. A large amount of steel scrap is being shipped to England and Scotland on recent contracts, which amount to about 160,000 tons, one third of which has been shipped. Buffalo has good enquiries for practically every grade of scrap material, and prices are firm. It is anticipated that the new railroad rates will make an increase of from $1.20 to $1.50 per ton on all grades. Advances of from 50 cents to $2 per ton have been made in the Pittsburgh district, where heavy melting steel is now quoted at from $26.50 to $27 per ton. There is a heavy demand for export trade, and large shipments have been made to Italy recently. From Birmingham come reports of a better tone and strengthening prices.

OVERSEAS TRADE ENQUIRIES

The following opening for goods of Canadian manufacture are reported by the Overseas Trade Commissioner: A London, Eng., firm which handles large quantities of constructional steel, mild steel bars, rods, plates and other sections would be pleased to consider offers from Canadian manufacturers.—Reference No. 1367.

A leading firm in British Guiana desires to stock for the hardware department, brass foundry, plumbers and cabinet ware.—1368.

One of the leading firms in British Guiana desires to hear from Canadian manufacturers or suppliers of tin ware, enamelled ware, etc. Manufacturers at or near seaboard preferred, in order to save railway freight.—1369.

An important firm in Rome desires to hear from Canadian exporters of coal, metal, mineral oils and technical articles.—1370.

A Buenos Ayres firm of hardware importers is interested in receiving quotations for flat headed woodscrews, all sizes. These screws were formerly made in a local facory, which can no longer supply the demand. Samples can be seen at the Commercial Intelligence Branch Department of Trade and Commerce.—1371.

A firm of Commission agents in Rome would like to hear from Canadian exporters.—1376.

A large firm in Milan, Italy, is desirous of purchasing electrical material in Canada.—1377.

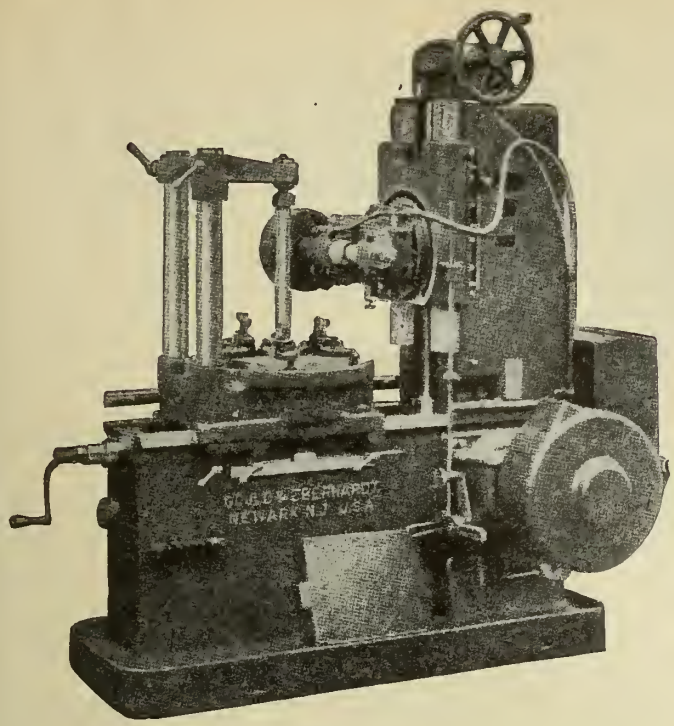
A Natal, South Africa, firm specializing in agricultural machinery, asks for quotations on discs, the exact diameter being 24 and 1-8th inches by 5-32, the concavity is 3 3-8 inches and the weight about 21 lbs. This firm will order in large quantities if the price is satisfactory. Any Canadian firm enquiring can figure on an order of not less than 2,000 discs. Sample can be seen at the Exhibits and Publicity Bureau, Department of Trade and Commerce.—1382.

A firm in British Guiana, with large capital for the cultivation of cassava on a large scale, desires to be put in communication with suppliers or preferably manufacturers of engines for motor machinery, agricultural machinery, tractors and ploughs.—1383.

The hardware branch of one of the leading firms in British Guiana would like to import Canadian tin and steel travelling trunks.—1386.

An important London, Eng., firm are open to purchase lacrosse sticks, and invite quotations from Canadian manufacturers.—1389.

A retired younger member of a firm in Cape Town, with several years' experience in the paint brush trade, desires Canadian agency in paint brushes. Further details, including the names and addresses of the firms mentioned here, may be obtained from the Department of Trade and Commerce, or the office of Canadian Machinery, 143 to 153 University Avenue, Toronto.—1394



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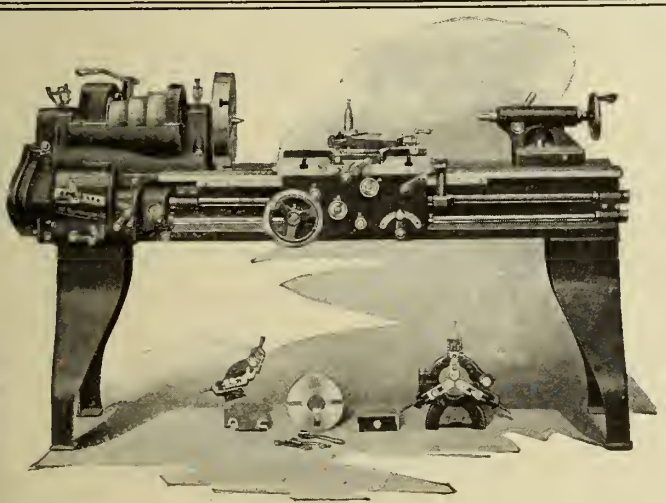

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THE NIAGARA PENINSULA INDUSTRIAL CONFERENCE

The three days' conference of the Niagara District Industrial Association was a busy time for those attending, and the industrial possibilities of the district and Ontario generally were well canvassed. Following a visit to the falls on the first day, the guests of the Association were tendered a banquet, at which Senator G. D. Robertson, Minister of Labor, W. M. German, M. P. for Welland, and H. G. Acres, Chief Engineer of the Chippewa Creek development were present. Speaking after the banquet Mr. German traced the development of the power from Niagara from 1893 to the present day, and predicted the time when every drop of water going over the falls would be utilized in power production. Mr. German issued a friendly challenge to the American visitors to attempt a commercial conquest of Ontario by developing their industries in the province, and at the same time cement Anglo-Saxon relations. Mr. H. G. Acres gave some figures relative to the power developments. He said in part, "There is now 250,000 h.p. being developed, and in 1922 there will be 450,000 horse power needed for Ontario requirements. The final scheme includes power development at Niagara, in the Trent Valley and the interprovincial power resources of the Ottawa river." He also said that there was a further 80,000 h.p. possible of development from the drop between the Chippewa canal inlet and the Niagara river. He also said the time would come when this power would be cheap at $1,000 per horse power. Senator Robertson spoke on the necessity of conserving the coal supply from the United States, which was needed by Central Canada.

Transportation

The second day of the conference was devoted to transportation questions. Marine, railway and highway angles of the subject were discussed by men from each division. The slogan of "Bring the ocean to your doors" was very much in evidence. In his after dinner address Senator Robertson spoke on highway development in the peninsula. After stating that the Queenston-Hamilton road would be proceeded with immediately, and the Welland-Port Colborne road pushed to completion, he said he was in favor of building a higher bridge over the Niagara river to relieve the present traffic congestion at the frontier. Speaking of the National Railways, he said that service would be the basis of competition, with the C. P. R. as a standard. He said that the Federal Government had for more than three years been surveying the St. Lawrence canals with a view to power development and deepening the waterway from Lake Ontario to the sea. Several speakers dilated on the necessity of having deep water communication from the St. Lawrence to the head of the lakes, which they said was needed by both the United States and Canada.

The third day was devoted to visiting various industrial plants in the Niagara peninsula, and Port Weller and the Welland Ship Canal works were also shown to the visitors. Thorold and Port Dalhousie were included in the itinerary. The industrial possibilities were fully canvassed during the three days' proceedings, and the Niagara Peninsula given a good deal of valuable publicity.

CLEANING AND STERILIZING WELL WITH STEAM

After other methods failed, steam generated by a locomotive, was used successfully for cleaning and sterilizing a well located on the line of a railroad.

A steam ejector was screwed on the lower end of a pipe, then the pipe was lowered into the well casing and held with ropes so that its lower end came within about 4 in. from the bottom of the well. A flexible hose fed the steam supply from the boiler to the ejector. As the steam was permited to flow through the apparatus discharging the water, workmen stirred the bottom of the well with poles. Thereby the sand and mud which had accumulated was caused to rise and, together with considerable water, was ejected through the discharge pipe. The water was heated almost to a boiling temperature. After the discharge had been operating for three hours, the water which flowed out became clear and clean, indicating that the job had been completed.

A previous attempt made to clean the well with steam from a pile driver was unsuccessful because of the relatively low steam pressure which its boiler developed.

CATALOGUES

N. A. Strand & Co., Chicago, and for whom R. E. T. Pringle, Ltd., Toronto, Ontario, are Canadian distributors, have issued a very interesting catalogue. It is known as catalogue No. 20, and deals with various types of equipment fitted with flexible shafts of both the wire core and link type. A copy of this book will be forwarded upon request to anyone interested.

The Buffalo Forge Co., Buffalo, N.Y., have issued their catalogue No. 421, dealing with their line of Niagara Conoidal Fans. Details of design and tables of performances are given, and, as the foreword of the catalogue announces, the tables will enable beginners and architects to make fan selections to meet any demands met in ordinary heating and ventilating practice. A copy of this book will be forwarded upon request.

The United Alloy Steel Corporation, Canton, Ohio, have published a very interesting book dealing with Electric Furnace Alloy and Special Carbon Steels. A comprehensive talk is given on the production and uses of the electric furnace steels. The various steels and their uses are described in detail. The concluding portion of the book is devoted to various tables of interest. A copy of this book can be obtained upon request.

The Dominion Steel Products Co., Brantford, Ont., have issued a very handsome catalogue dealing with their plant, its past accomplishments and its present capacity for service. They state that the purpose of the book is to trace briefly the development of their plants, and the ideals that have made them so widely known.

The book contains 61 pages, and is on beautiful stock, the illustrations being in colors. The plant, the personnel, the consulting staff, their form of service, and other important items are discussed.

We understand that any executive interested in this volume can obtain the same upon request.

Catalogue No. 11 of the Independent Pneumatic Tool Co., Chicago and New York, is now off the press. It contains over 70 pages of real live information regarding their lines of drills, grinders, chisels, etc., etc., and a copy of the same can be had upon request.

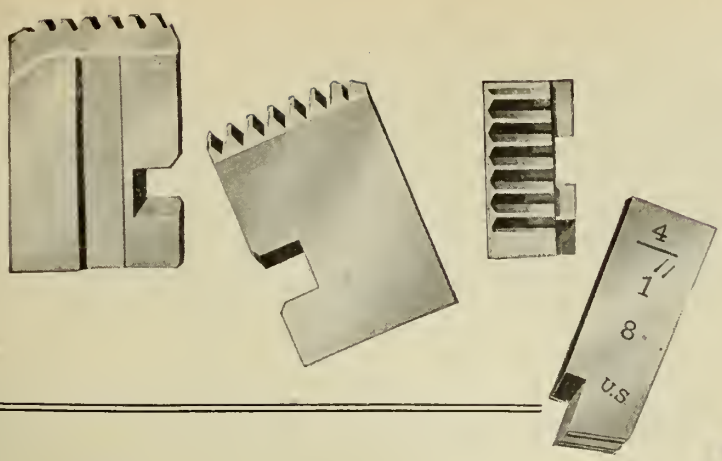
The Orton & Steinbrenner Co., Huntington, Ind., have issued a very attractive catalogue, dealing wtih their line of material handling machinery. This includes locomotive cranes, gantry and cantilever cranes, drag line excavators, clam shell buckets, coal crushers, orange peel buckets, bridge and pillar cranes and elevating and conveying machinery.

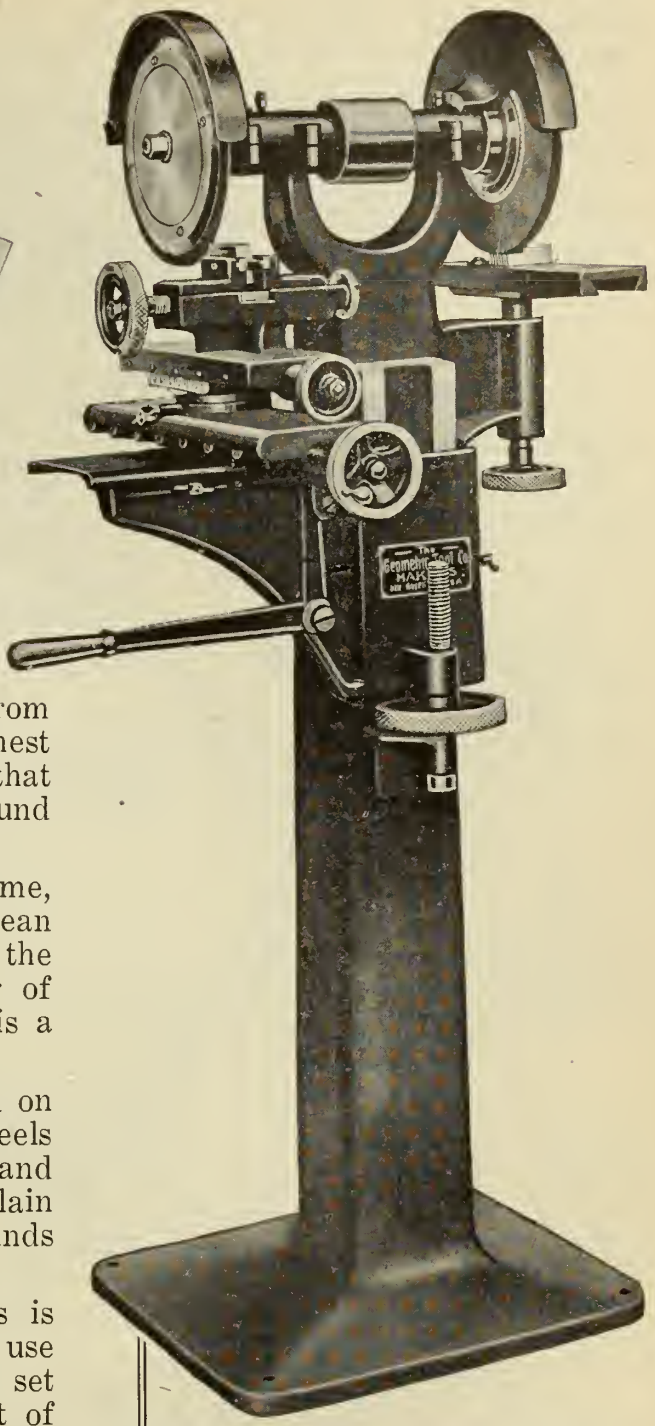
There are some 50 pages to the book and it is profusely illustrated.

The Clipper Belt Lacer Co., Grand Rapids, Mich., have issued a booklet dealing with their line of lacing. The story of the idea as first thought of is given, together with its development. Examples of lacing problems are also shown.

The B. F. Sturtevant Co., Hyde Park, Boston, U.S.A., have issued a new catalogue No. 264, dealing with their line of electrical apparatus. The book is very well prepared and covers various types of motors, generators, generating sets, propeller fans, air heaters, and other electrical apparatus for special applications. Varied and interesting data relative to the various lines is also given. A copy of this catalogue can be obtained upon request.

Before the war Canada's principal source of supply of plate glass was Great Britain, with Belgium second, the imports from the two countries in 1914 being 2,307,670 and 1,976,563 square feet respectively, whereas during the fiscal year 1919 Canada obtained but 152,558 square feet from Great Britain and none from Belgium. At present over 99 per cent. comes from the United States, the quantity in 1910 being 1,736,805 square feet, whereas, in 1914, only 299,042 square feet came from that source.





Sharp Chasers Cut Clean Threads

Accurate, uniform threads result only from dies which are maintained in the highest state of cutting efficiency. This means that chasers must be kept sharp, and ground uniformly.

Even if just touched up from time to time, the chasers respond splendidly, with clean threads. And with this machine — the Geometric Chaser Grinder—the matter of keeping threading tools up to scratch is a comparatively simple matter.

Various makes of chasers can be ground on this adaptable machine. The two wheels permit the easy grinding of both milled and tapped chasers. In addition, the plain wheel lends itself readily to various kinds of tool grinding.

Uniform grinding of a set of chasers is purely a mechanical matter through the use of adjustments which can be accurately set to govern the grinding of an entire set of chasers.

The Catalogue describing this machine is a mine of information on chaser grinding. Write for it.

THE GEOMETRIC TOOL COMPANY

NEW HAVEN **CONNECTICUT**

Canadian Agents: Williams & Wilson, Ltd., Montreal; The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg, and St. John, N.B.; The Canadian Fairbanks-Morse Co., Ltd., Manitoba, Saskatchewan, Alberta.

If interested tear out this page and place with letters to be answered.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$42 40
Lake Superior, charcoal, Chicago	57 00
Standard low phos., Philadelphia	50 00
Bessemer, Pittsburgh	43 00
Basic, Valley furnace	42 90
Toronto price:—	
Silicon, 2.25% to 2.75%	52 00
No. 2 Foundry, 1.75 to 2.25%	50 00

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	$ 5 50
Steel bars, base, Toronto	5 50
Iron bars, base, Montreal	5 50
Steel bars, base, Montreal	5 50
Reinforcing bars, base	5 00
Steel hoops	7 00
Norway iron	11 00
Tire steel	5 75
Spring steel	10 00
Band steel, No. 10 gauge and 3-16 in. base	6 00
Chequered floor plate, 3-16 in.	8 40
Chequered floor plate, ¼ in.	8 00
Bessemer rails, heavy, at mill	....
Steel bars, Pittsburgh	3 00-4 00
Tank plates, Pittsburgh	4 00
Structural shapes, Pittsburgh	3 00
Steel hoops, Pittsburgh	3 50-3 75
F.O.B., Toronto Warehouse	
Small shapes	4 25
F.O.B. Chicago Warehouse	
Steel bars	3 62
Structural shapes	3 72
Plates	3 67 to 5 50
Small shapes under 3"	3 62
	C.L. L.C.L.

FREIGHT RATES

Per 100 Pounds.

Pittsburgh to Following Points		
Montreal	33	45
St. John, N.B.	41½	55
Halifax	49	64½
Toronto	27	39
Guelph	27	39
London	27	39
Windsor	27	39
Winnipeg	89½	135

METALS

	Gross. Montreal	Toronto
Lake copper	$25 00	$24 00
Electro copper	24 50	24 00
Castings, copper	24 00	24 00
Tin	62 00	65 00
Spelter	11 50	12 00
Lead	10 75	11 00
Antimony	13 00	14 00
Aluminum	34 00	36 00

Prices per 100 lbs.

PLATES

Plates, 3-16 in.	$ 7 25	$ 7 25
Plates, ¼ up	6 50	6 50

PIPE—WROUGHT

Price List No. 44—April, 1920.

STANDARD BUTTWELD S/C

	Steel Black	Steel Galv.	Gen. Wrot. Iron Black	Gen. Wrot. Iron Galv.
⅛ in.	$6 50	$ 8 50	....	....
¼ in.	5 13	7 26	$ 6 43	$ 7 56
⅜ in.	5 13	7 26	5 43	7 56
½ in.	6 84	8 42	7 27	8 84
¾ in.	8 45	10 58	9 03	11 16
1 in.	12 50	15 64	13 35	16 49
1¼ in.	16 91	21 16	18 06	22 31
1½ in.	20 21	25 30	21 59	26 68
2 in.	27 20	34 04	29 05	35 89
2½ in.	43 00	53 82	....	....
3 in.	56 23	70 38	....	....
3½ in.	71 30	88 32	....	....
4 in.	84 48	104 64	....	....

STANDARD LAPWELD S/C

	Steel Black	Steel Galv.	Gen. Wrot. Iron Black	Gen. Wrot. Iron Galv.
2 in.	$30 90	$37 74	$34 60	$41 44
2½ in.	45 34	56 16	51 19	62 01
3 in.	59 29	73 44	66 94	81 09
3½ in.	73 14	90 16	82 34	99 36
4 in.	86 66	106 82	97 56	117 72
4½ in.	0 98	1 23	1 24	1 49
5 in.	1 15	1 44	1 44	1 73
6½ in.	1 49	1 86	1 87	2 25
7 in.	1 94	2 43	2 42	2 90
8-L in.	2 04	2 55	2 54	3 05
8 in.	2 35	2 94	2 92	3 51
9 in.	2 81	3 52	3 50	4 21
10-L in.	2 61	3 26	3 25	3 90
10 in.	3 36	4 20	4 18	5 03

Prices—Ontario, Quebec and Maritime Provinces

WROUGHT NIPPLES

4" and under, 60%.

4½" and larger, 50%.

4" and under, running thread, 30%.

Standard couplings, 4-in. and under, 30%.

Do., 4½-in. and larger, 10%.

OLD MATERIAL

Dealers' Average Buying Prices.

	Per 100 Pounds. Montreal	Toronto
Copper, light	$15 00	$14 00
Copper, crucible	18 00	18 00
Copper, heavy	18 00	18 00
Copper wire	18 00	18 00
No. 1 machine composition	17 00	17 00
New brass cuttings	11 00	11 75
Red brass turnings	14 50	15 75
Yellow brass turninbs	9 00	9 50
Light brass	7 00	7 00
Medium brass	8 00	7 75
Scrap zinc	6 50	6 00
Heavy lead	7 50	7 75
Tea lead	4 50	5 00
Aluminum	19 00	20 00
	Per Ton	Gross
Heavy melting steel	18 00	18 00
Boiler plate	15 50	15 00
Axles (wrought iron)	25 00	20 00
Rails (scrap	23 00	18 00
Malleable scrap	26 00	25 00
No. 1 machine east iron	32 00	33 00
Pipe, wrought	12 00	12 00
Car wheel	33 00	33 00
Steel axles	25 00	20 00
Mach. shop turnings	11 00	11 00
Stove plate	26 50	25 00
Cast boring	14 00	14 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, 7-16 and up	+10
Carriage bolts, ⅜-in. and less	Net
Coach and lag screws	—15
Stove bolts	55
Wrought washers	—25
Elevator bolts	+10
Machine bolts, 7-16 and over	+10
Machine bolts, ⅜-in. and less	+10
Blank bolts	Net
Bolt ends	Net
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	+25
Machine screws, fl. and rd. hd., brass	**net**
Machine screws, o. and fil. hd., brass	**net**
Nuts, square, blank	+25 add $2 00
Nuts, square, tapped	add 2 25
Nuts, hex., blank	add 2 50
Nuts, hex., tapped	add 3 00
Copper rivets and burrs, list less	15
Burrs only, list plus	25
Iron rivets and burrs	40 and 5
Boiler rivets, base ¾" and larger	$8 50
Structural rivets, as above	8 40
Wood screws, O. & R., bright	75
Wood screws, flat, bright	77½
Wood screws, flat, brass	55
Wood screws, O. & R., brass	55½
Wood screws, flat, bronze	50
Wood screws, O. & R., bronze	47½

MILLED PRODUCTS

(Prices on unbroken packages)

	Per Cent
Set screws —20% 25 and	5
Sq. and hex. hd. cap screws	12½
Rd. and fil. hd. cap screws	plus 25
Flat but. hd. cap screws	plus 50
Fin. and semi-fin. nuts up to 1-in.	12½
Fin. and Semi-fin. nuts, over 1 in., up to 1½-in.	—5
Fin. and Semi-fin. nuts o er 1½ in., up to 2-in.	+12½
Studs	+5
Taper pins	—12½
Coupling bolts	+40
Planer head bolts, without fillet, list	+45
Planer head bolts, with fillet, list plus 10 and	+55
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	+60
Collar screws	list plus 20, 30
Thumb screws	40
Thumb nuts	75
Patch bolts	add +85
Cold pressed nuts to 1½ in.	add $1 00
Cold pressed nuts over 1½ in.	add 2 00

BILLETS

	Per gross ton
Bessemer billets	$60 00
Open-hearth billets	60 00
O.H. sheet bars	76 00
Forging billets	56 00-75 00
Wire rods	52 00-70 00

Government prices.

F.O.B. Pittsburgh.

NAILS AND SPIKES

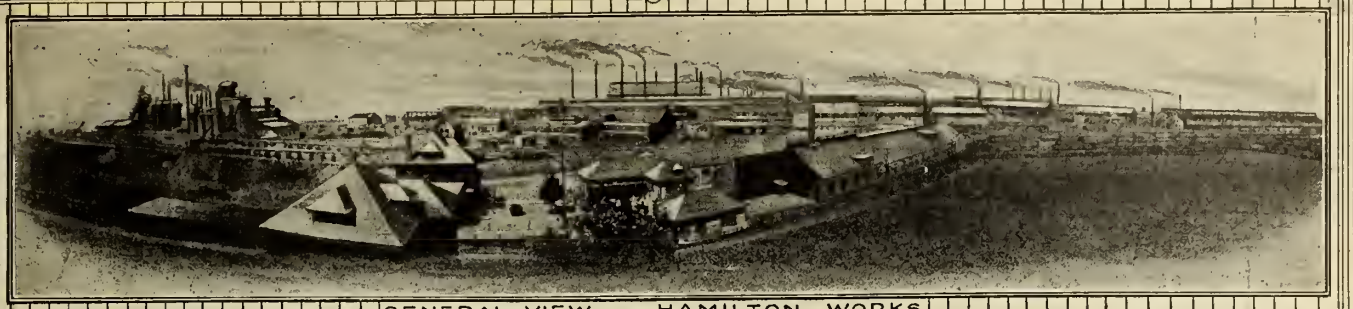
Wire nails, base	$6 10
Cut nails, base	7 00
Miscellaneous wire nails	50%

ROPE AND PACKINGS

Plumbers' oakum, per lb.	0 10¼
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 35½
British Manila rope	0 28
New Zealand hemp	0 28

POLISHED DRILL ROD

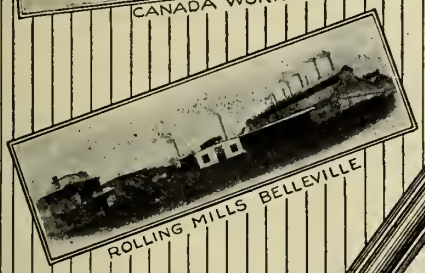
Discount off list, Montreal and Toronto	net



GENERAL VIEW HAMILTON WORKS

CANADA WORKS HAMILTON

DOMINION WORKS MONTREAL



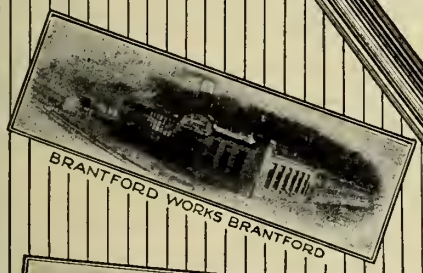
ROLLING MILLS BELLEVILLE

ST. PATRICK WORKS MONTREAL

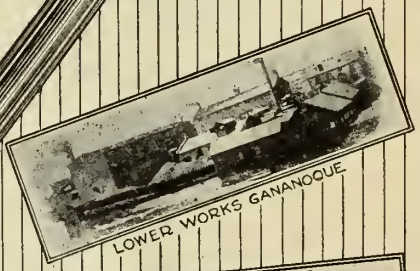
Quality

THE
STEEL COMPANY
OF
CANADA
LIMITED
HAMILTON MONTREAL

Service



BRANTFORD WORKS BRANTFORD



LOWER WORKS GANANOQUE

SWANSEA WORKS TORONTO

ST. HENRY WORKS MONTREAL

GENERAL VIEW OF NOTRE DAME WORKS MONTREAL

These Plants and the Organization that directs and operates them, stand back of and Guarantee Quality and Service at All Times

MISCELLANEOUS

Solder, strictly	$ 0 35
Solder, guaranteed	0 39
Soldering coppers, lb.	0 62½
White lead, pure, cwt.	20 35
Red dry lead, 100-lb. kegs, per cwt.	16 00
Gasoline, per gal., bulk	0 38
Pure turp., single bbls., gal.	3 15
Linseed oil, raw, single bbls.	2 37
Linseed oil, boiled, single bbls.	2 40
Wood alcohol, per gal.	4 00
Whiting, plain, per 100 lbs.	3 00

CARBON DRILLS AND REAMERS

S.S. drills, wire sizes	32½
Can. carbon cutters, plus	20
Standard drills, all sizes	32½
3-fluted drills, plus	10
Jobbers' and letter sizes	32½
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	50
Sleeves	50
Taper pin reamers	25 off
Drills and countersinks	net
Bridge reamers	50
Centre reamers	10
Chucking reamers	net
Hand reamers	10
High speed drills, list plus	10 to 30
Can. high speed cutters, net to plus	10
American	plus 40

COLD ROLLED STEEL

[At warehouse]

Rounds and squares	$7 base
Hexagons and flats	$7.75 base

IRON PIPE FITTINGS

	Black	Galv.
Class A	60	75
Class B	27	37
Class C	18	27

Cast iron fittings, 5%; malleable bushings, 22½%; cast bushings, 22½%; unions, 37½%; plugs, 20% off list.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$8 50	$10 50
Sheets, Blue ann., No. 10	8 50	9 50
Canada plates, dull, 52 sheets	8 50	10 00
Can. plates, all bright	8 60	9 00
Apollo brand, 10¾ oz. galvanized	....	....
Queen's Head, 28 B.W.G.	11 00	....
Fleur-de-Lis, 28 B.W.G.	10 50	....
Gorbal's Best, No. 28	....	....
Colborne Crown, No. 28.	....	....
Premier, No. 28, U.S.	11 50	11 60
Premier, 10¾-oz.	11 50	12 00
Zinc sheets	16 50	20 00

PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13.00; 5-16, $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.20; ¾ in., $9.30; ⅞ in., $9.50; 1 in., $9.10; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $13.00; 5-16 in., $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.50; ¾ in., $9.30.

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

BOILER TUBES.

Size.	Seamless	Lapwelded
1 in.	$27 00	$.....
1¼ in.	29 50	.....
1½ in.	31 50	29 50
1¾ in.	31 50	30 00
2 in.	35 00	30 00
2¼ in.	35 00	29 00
2½ in.	42 00	37 00
3 in.	50 00	48 00
3¼ in.	.. ..	48 50
3½ in.	63 00	51 50
4 in.	85 00	65 50

Prices per 100 ft., Montreal and Toronto

OILS AND COMPOUNDS.

Castor oil, per lb.	
Royalite, per gal., bulk	27½
Palacine	30½
Machine oil, per gal.	54½
Black oil, per gal.	28
Cylinder oil, Capital	82½
Petroleum fuel oil, bbls., net	18

BELTING—No 1 OAK TANNED

Extra heavy, single and double	6½
Standard	6½
Cut leather lacing, No. 1	2 00
Leather in side	2 40 3 00

TAPES

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	$4 60
Polishing wheels, bull-neck	2 00
Emery in kegs, Turkish	09
Pumice, ground	06
Emery glue	30
Tripoli composition	09
Crocus composition	12
Emery composition	11
Rouge, silver	60
Rouge, powder, nickel	45

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	.08½
Grits, 80 and finer	.6

BRASS—Warehouse Price

Brass rods, base ½ in. to 1 in. rod	0 34
Brass sheets, 24 gauge and heavier, base	$0 42
Brass tubing, seamless	0 46
Copper tubing, seamless	0 48

WASTE

XXX Extra	.24	Atlas	.20
Peerless	.22½	X Empire	.19½
Grand	.22½	Ideal	.19
Superior	.22½	X Press	.17½
X L C R	.21		

Colored

Lion	.17	Popular	.13
Standard	.15	Keen	.11
No. 1	.15		

Wool Packing

Arrow	.35	Anvil	.22
Axle	.28	Anchor	.17

Washed Wipers

Select White	.20	Dark colored	.09
Mixed colored	.10		

This list subject to trade discount for quantity.

RUBBER BELTING

Standard ... 10% Best grades... 15%

ANODES

Nickel	.55 to .60
Copper	.38 to .40
Tin	.70 to .70
Zinc	.16 to .17

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	$42 50	$43 00
Copper wire, list plus 10		
Plain sheets, 14 oz., 14x60 in.	46 00	44 00
Copper sheet, tinned, 14x60, 14 oz.	48 00	48 00
Copper sheet, planished, 16 oz. base	46 00	45 00
Braziers', in sheets, 6 x 4 base	45 00	44 00

LEAD SHEETS

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$10 75	$14 50
Sheets, 3½ lbs. sq. ft.	10 50	14 00
Sheets, 4 to 6 lbs. sq. ft.	10 25	13 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS

Acid, boracic	$ .23
Acid, hydrochloric	.04
Acid, nitric	.11
Acid, sulphuric	.04
Ammonia, aqua	.15
Ammonium, carbonate	.23
Ammonium, chloride	.22
Ammonium hydrosulphuret	.75
Ammonium sulphate	.30
Arsenic, white	.14
Copper, carbonate, annhy	.41
Copper, sulphate	.15
Cobalt, sulphate	.20
Iron perchloride	.62
Lead acetate	.30
Nickel ammonium sulphate	.20
Nickel carbonate	.32
Nickel sulphate	.22
Potassium sulphide (substitute)	.42
Silver chloride (per oz.)	1.30
Silver nitrate (per oz.)	1.25
Sodium bisulphate	.14
Sodium carbonate crystals	.06
Sodium cyanide, 127-130%	.38
Sodium hyposulphite per 100 lbs	8.00
Sodium phosphate	.15
Tin chloride	.80
Zinc chloride, C.P.	.30
Zinc sulphate	.10

Prices per lb. unless otherwise stated

Dumore Grinders in the Delco Tool Room

BUSY, EFFICIENT, ADAPTABLE TOOLS

THE Dumore Grinders at the Dayton Electric Laboratory Company (Dayton, Ohio) are continually busy and the Delco tool makers surely like them. The job you see chucked in the heavy lathe is one of a lot of fine counterbores used in the production of distributor cams on Delco ignition sets. Fine limits are fixed on this job and the Dumore as an internal grinding machine has amply proven its dependability for the accurate grinding of duplicate diameters.

This is only one of the many uses made of Dumore Grinders. For all work where speed and production costs are to be considered—where accuracy is of prime importance—and also for the multitude of odd jobs that arise every day — Dumore Grinders are indispensable

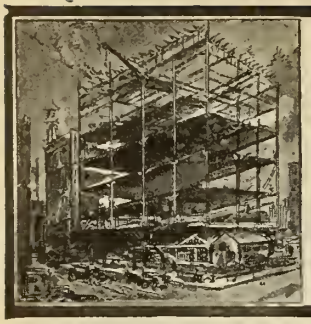
Dynamically balanced, no end play, no vibration. Equipped with S. K. F. and Norma ball bearings. Well built, adaptable, efficient—Dumore Grinders cut costs throughout the shop.

WISCONSIN ELECTRIC COMPANY

2926 Sixteenth Street **RACINE, WISCONSIN**

DUMORE HIGH SPEED GRINDERS

If interested tear out this page and place with letters to be answered.



INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS
PERSONAL AND TRADE NOTES

TRADE GOSSIP

Opened New Depot—The L'air Liquide Society, in addition to opening new stations recently at Sydney, N. S., and Windsor, Ont., have also opened a depot at St. John's, Nfld., for supplying customers there with oxygen.

To Give Bond.—After his appointment as assignee for the Dominion Shipbuilding Company Mr. Osler Wade said there would be no statement of assets and liabilities for another three weeks. Mr. Wade gave a security bond of $200,000 in a security company. It is hoped that the wages due the employees will be paid in a few days.

Have Bought Factory.—The Dominion Cone Company have sold their factory at 14 Morrow Avenue to Tarbox Bros., specialty manufacturers. The building is of two storey brick, with a basement, the total floor space being 12,500 square feet. The frontage is 40 feet The deal was closed through Robins, Ltd.

Guelph Moulders Strike.—Several firms in Guelph have been affected by a strike of the moulders employed in their foundries. The firms are: Crowe's Iron Works, White Sewing Machine Company, Griffin Foundry Company, and the Callender Foundry Company. The increase asked for, it is understood, is one of 25 per cent.

Brantford City Engineer.—Mr. Frank Adams, city engineer of Chatham, has been appointed city engineer of Brantford, at a salary of $3,600 for the present year, and $4,000 for next year. Mr. Adams is an old Brantford boy, and well acquainted with the locality, and its special problems. He will take up his duties on September 15th next, succeeding the late Major Harry Jones.

Want .Cheap Rates.—The Calgary Board of Trade passed a resolution recently demanding that a western sitting of the Railway Commission be held. The matters they wish taken up at this meeting would be consideration of the railway's application for increased rates, with a suggestion that certain classes of freight such as coal be given special consideration.

Buys Plant in Montreal.—The plant of the Canada Stove & Foundry Company, Ltd., Montreal, has been purchased by the Gurney Foundry Co. The purchase was made to relieve the congestion at the Toronto plant, which did not lend itself to expansion. The head office of the company will be in Toronto still, and the West Toronto plant will be enlarged to take over certain lines now made in the King street factory.

Canada Car Defers Action.—It was decided at a recent meeting of the board of the Canada Car & Foundry Company to defer action on the payment of the 22 3-4 per cent. deferred dividend until a further meeting of the board on Sept. 2. A proposal to issue ten-year 7 per cent. income bonds in lieu of cash was favorably received, and it is likely that something of this nature may be the plan adopted at the forthcoming meeting. The majority of the board favor the early liquidation of the arrears.

Prepayment of Freight.—The situation caused by the exchange rate in connection with shipping goods across the line is under discussion by the Interstate Commerce Commission and the Railway Commissioners of Canada. The railways in the States in order not to lose by the exchange situation demanded some time ago that the American portion of the haul be prepaid. The shippers protested and the Interstate Commerce Commission made an order restraining the roads from the practice. The roads ignored this order, and the whole question is now being gone into by the two governing bodies.

Extensive alterations and additions are being made to the plant of the National Farming Machinery Company of Montmagny, Quebec. The company has been making preparations to manufacture all lines of farming machinery and to meet the requirements for large production it has been necessary to carry out a plan of considerable expansion. One of the features of the new developments is the erection of a commercial rolling mill for the production of the grade of material used in the construction of farm machinery. This mill, which it is expected will be in operation next year, will be equipped with a 20-inch, a 12-inch and an 8-inch mill. The company are fabricating all the structural steel for the new buildings and also constructing the units that will be used in the mill. They likewise anticipate operating the plant with power developed from a dam which they are constructing several miles up the river. Plans have also been prepared for the erection of a stove plate foundry and a malleable iron foundry, but it is not expect that building operations on these two latter buildings will be commenced until next year.

MARINE

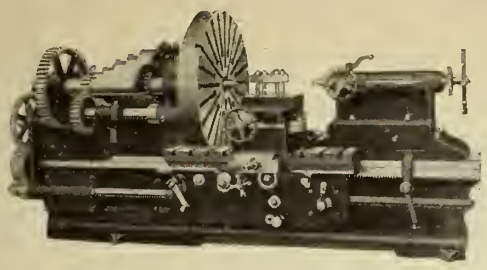
May Start Work Soon.—It was stated by the assignee of the Dominion Ship Building Company that work might soon be started again on the unfinished ships. This work would be carried on by the creditors, who are the owners of the ships.

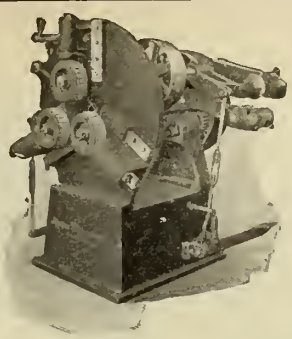
The Rapids King, the river boat of the Canada Steamships Line which has been located at the Victoria Pier for some weeks doing the service of a summer hotel, has again been placed in service, as it is felt that the hotels of the city are now able to take care of the tourists coming to Montreal.

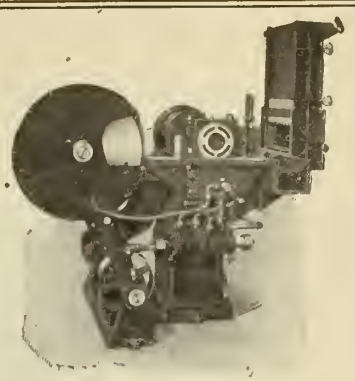
The Canada Vickers Company again celebrated the launching of another Government steamer when the hull of the "Canadian Conqueror" was placed in the water recently. This is the ninth vessel that this company has launched for the C. G. M. M. The keel for another Canadian Government boat was ready to be placed as soon as the Conqueror passed down the ways. Three vessels are still under construction for the Government.

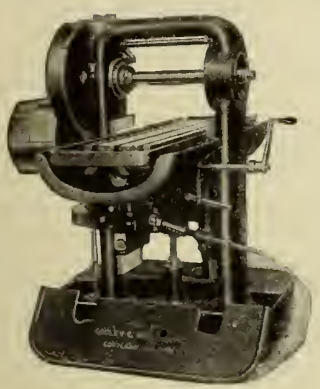
Motor Ship in Montreal.—The 8,750 ton deadweight motor ship "Oregon" has arrived in the St. Lawrence and will load at Montreal for River Plate ports. She was built at Copenhagen in 1916, and is owned by the Scandinavian American line. She has Diesel engines of 2,600 h.p. and a speed of 10½ knots. She is commanded by Capt. Julius Lissner, and carries a crew of 35 men all told. The auxiliary machinery is electrically driven. Her usual port is New York, but labor troubles made her visit Montreal this voyage.

The Danish vessel Oregon, the first motor driven ship to come up the St Lawrence, arrived in the Port of Montreal last week. This vessel is a freighter of about 3,000 tons, with a deadweight capacity of 8,750 tons. This ship was built at Copenhagen and is fitted with two powerful Diesel motors of 2,600 h.p., capable of making 10½ knots. It was stated that the vessel consumes about 9½ tons of oil per 24 hrs., while an oil burning ship of the same dimensions and









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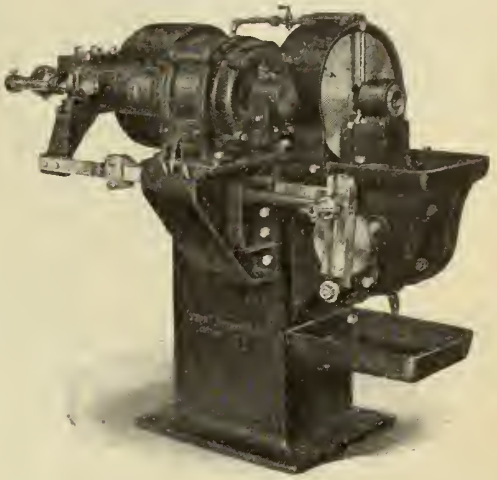
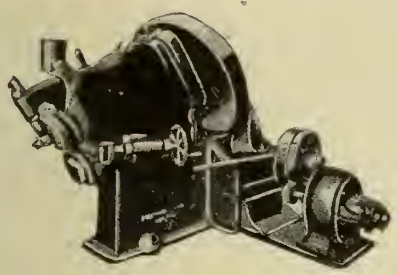
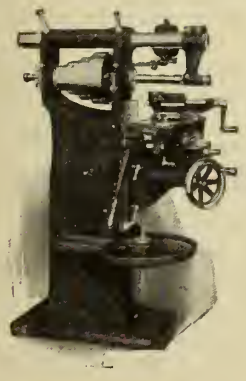
And others.

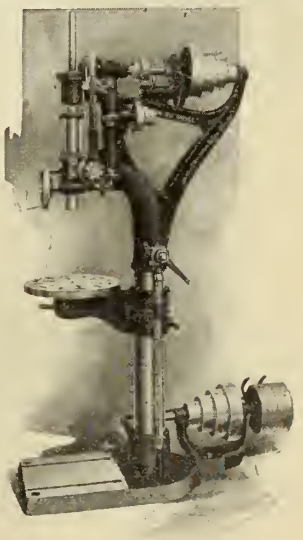
We have a large stock of machine tools, automatic machinery, and wood-working machines, high-speed drills and transmission supplies, etc., in our Toronto warehouse, 163 Dufferin Street.

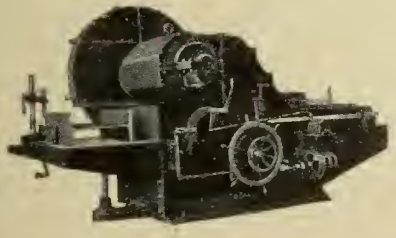
May we have your enquiries?

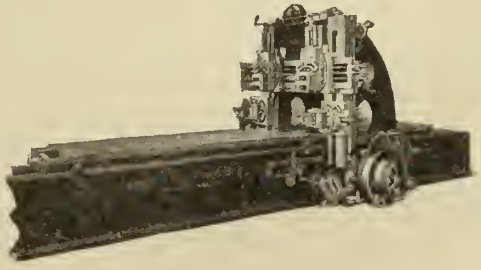












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"Everything in Wood Working and Metal Working Machinery"

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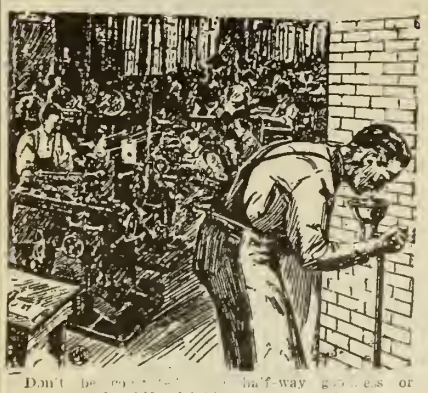

Don't be [illegible] half-way [illegible] or make-shift drinking arrangements.

Throw out the germ-laden Drinking Cup!

Give your men a clean drink

PURO SANITARY DRINKING FOUNTAIN

(MADE IN CANADA)

Allows just the proper amount of cool, clean, fresh water to come through the bubbler. No spurting, overflowing, no loss. "Puro" regulates itself.

"Puro" saves 35% on water bills, too. You can attach it in a few minutes. Tell us how many men, how many departments and we'll tell you how much the cost will be.

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making the same speed would require about 35 tons of oil. Economy of space is a feature, with less firemen and more engineers.

PERSONALS

T. E. M. Murphy, who for many years has been in business for himself, is now associated with the Gates Engineering Company, 348 St. James St., Montreal.

Herbert Johnson, of the Armstrong Whitworth Company of Canada, has been appointed general superintendent of the plant at Longueuil. Lawrence Russell, the general manager, will be in charge of the sales.

The Canadian Pacific Railway Company announce the apopintment of Mr. F. S. Rosseter to be acting Superintendent, Chapleau Division, with headquarters at Chapleau, vice Mr. W. R. Boucher, who has received a month's leave of absence.

John W. Gates, formerly president and general manager of the Gates Refractories, Limited, has resigned his position with this firm and has opened an office at 348 St. James Street, Montreal, where he will carry on business under the name of the Gates Engineering Company, Limited. The new organization will be under the direct supervision of Mr. Gates, and will specialize in boiler settings, special furnace brick work, and general contracting for power plant furnace installations. Mr. Gates has had a life-long experience in this line of work, and is the patentee of the Gates boiler furnace blocks. He has supervised some of the largest boiler setting installations in Canada.

ACCIDENT PREVENTION

Accidents and accident prevention in machine building are discussed in Bulletin No. 256 published by the United States Bureau of Labour Statistics. The booklet gives the result of an investigation to ascertain the frequency and severity of accidents in the machine-building industry, and to study and analyse these accidents in such a way as to supply the information necessary for effective safety work, To this end the report seeks, as far as possible, to locate the accident hazards in particular departments and occupations, to discover the reason and causes for the occurrence of accidents, and to point out some of the more successful methods for their prevention. The investigation was limited to certain selected plants representing the more important classes of product, and covered in all 194 plants. Accident rates are analysed for the industry as a whole, by character of products, and by departments. Inability to speak English as related to accidents, safety organization, direct safeguarding methods in machine building, and machine design as a factor of safety, are among the subjects discussed.

Many proposals have been made for utilizing the huge amount of "scrap" left over from the war. One device recently patented was for a pump made from shell cases. Still more recent is the invention by a British engineer of a simple arrangement for converting shells into a hydraulic jack. The body is formed by a 4.5 high explosive shell and the ram by an 18-pounder shrapnel shell.

AUTOMATIC MILLING MACHINE

Continued from Page 167.

out with ball bearings and is also automatically lubricated, being contained within an oil-tight case.

Automatic Lubrication

The automatic lubrication of all rotating parts within the frame of the machine is another important feature of the machine. Filtered oil is pumped to a reservoir cast in the top of the frame and by means of pipes and a gravity system oil is constantly distributed to the various bearings. For manufacturing purposes an abundant supply of cutter lubricant is pumped from a large tank located within the base of the machine.

Realizing the importance of a rigid construction in a high productive machine of this type, the designers have embraced features adapted to these conditions. The column, knee, and table, being provided with internal bracing and reinforcing ribs; it can support work to its full capacity. The arbor is amply supported by means of an adjustable overhanging arm and an arbor yoke employed at any intermediate point near the cutter, furnishes added support for heavy duty work. The wearing surfaces of the table and bearings throughout the machine are of such proportions as to provide for the severe services that a strictly manufacturing machine is subjected. Means of compensation for wear is provided throughout the machine. The conveniently located arrangement of levers, etc., insures a flexibility and concentration of control that tends to develop a high degree of efficiency in the operation of the machine.

Briefly here are the main specifications. Capacity: Longitudinal feed, 22"; transverse adjustment, 6½"; vertical adjustment, 14½"; longitudinal feed, automatic. Spindle: No. 10 taper hole; hole through spindle, 21 32" diameter. Drive: Diameter of pulley, 13"; width of belt, 3"; 5 H.P. required; constant speed, 300 R.P.M.; 16 changes of spindle speeds, 28 to 695 R.P.M. in either direction Arbor Support: Diameter of hole in bushing, 1 13 16"; centre of spindle to under side of arms, 5½"; greatest distance, end of spindle to centre in arbor yoke, without arm braces, 16". Greatest distance, end of spindle to arbor bushing in arm braces, 10½"; greatest distance, face of column to arm braces, 16". Table: Working surface, 34" x 11"; overall dimensions of table, 44" x 11"; 3 T-slots, ⅝" wide. Feeds: Positive, independent of spindle speeds; 12 changes from 1.37" to 18.38" per minute; fast travel between cuts, 210" per minute. Cutter Lubrication: Tank cast in base. Pump furnished inside of frame; capacity of tank, 7 gallons. Vise: Flanged. Capacity: 6¼" wide, 1 9 16" deep, opens 3⅝". Floor Space: At right rangles to spindle, 67"; parallel to spindle, 59½". Weights: Net, about 3,350 lbs.; ready for shipment, about 3,775 lbs. Dimensions for shipment, 62" x 42" x 66".

MAKING A REBEL OUT OF A GOOD WORKMAN

Continued from page 169

This has been carefully disguised in the preceding pamphlets, but it is evidently thought that by the time a man has read all the others, he is ripe for this one, and in this way they are pretty sure that the men who read this final pamphlet will not turn away from the propaganda on account of its source. It reads as follows:

"The sun of communism is rising in the east."

"From Russia its invigorating rays are awakening the Proletariat of the world.

"The revolutionary advance guard of the Proletariat calls upon the workers everywhere to break the bondage of economic and political slavery and demonstrate for the cause of real freedom.

"Finding the capitalist governments in a conspiracy to crush the workers' Republic of Russia, it becomes our task and duty to direct our demonstration on May first against the murderous conspiracy.

"All power to the workers.

"All industry to the workers.

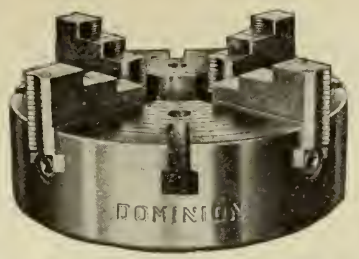
"Long live the social revolution.

"COMMUNIST LABOR PARTY."

Now,—How to Meet It

This is the kind of stuff that is being secretly disseminated among the workmen. It requires a man of strong mind not to be affected eventually by the constant reiteration of these suggestions. The flaunting of their new made wealth by many who daily demonstrate their unfitness for it is a constant irritation to the men who are living close to the line that divides ease and comfort from a daily struggle. These men are in a state of mind that is easily fanned to a deeper discontent by just such means as we have been discussing.

This propaganda must be met by a campaign of education, which will enlighten the average worker on the ordinary workings of the laws of economics. Where the one influence appeals to his passions, the other should appeal to his reason. He is a man of intelligence, and often of very high intelligence, and can distinguish right from wrong as quickly as any other member of the community. However, if he is continually having the wrong held up to him in an attractive garb, and nothing shown him from the other side, it is only to be expected that he will sometimes be led in the wrong direction. The whole world has suffered untold loss and misery since the end of the war, through the attempts to put into practice the visionary ideas of the Communists. If the doctrine is allowed to spread on this continent without any efforts being made to combat it, we are liable to see upheavals and disturbances which will make all those we have previously experienced pale in comparison.



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HEAVY DUTY MACHINE TOOLS
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CANADIAN AGENT WANTED — AMERICAN firm whose line (high grade factory specialty) is being manufactured in Canada, wishes to get in touch with live man who will act as Provincial or Dominion representative. Box 679, Canadian Machinery.

FOR HIGH-GRADE AMERICAN-MADE LATHE —14 to 26. In replying state territory you can cover and cover thoroughly. Box 682, Canadian Machinery. (c22m)

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WANTED TO PURCHASE BY U.S. FIRM, small shop equipped with automatic screw machines. Box 699, Canadian Machinery.

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TORONTO PATTERN WORKS, 65 JARVIS Street, Toronto. Patterns in wood and metal for all kinds of machinery. (ctfm)

BRANTFORD PATTERN WORKS ARE PREpared to make up patterns of any kind—including marine works—to sketches, blue prints or sample castings. Prompt, efficient service. Bell 'Phone 631; Machine 'Phone 733. Brantford Pattern Works, 49 George St., Brantford, Ont. (ctfm)

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FOR SALE—HARDWARE MANUFACTURERS —the patent rights, or Canadian manufacturing rights of letters patent No. 201,327, relating to self-contained soldering iron. This tool generates its own fuel and would be a boon to mechanics and motorists. Fred Mayor, 36 O'Leary Ave., Toronto. (c7m)

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QUALIFIED ELECTRICAL AND MECHANIcal sales engineer. Technical graduate having travelled and made connections in South America, France, Belgium, India, China, would like to represent Canadian manufacturing and export house. Box 594, Canadian Machinery.

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MACHINE WORK WANTED FOR LATHES, shapers, milling machine and planer, etc. Hourly or contract basis. Prompt delivery. W. H. Sumbling Machinery Co., Toronto. (ctfm)

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Renold Chains, being positive, yet flexible, prove themselves a big factor in increasing the rate of production and in raising the quality of the product. With this form of transmission equipment the engine or motor may be started and run during the day and during the night without any decrease in the transmission efficiency and under almost any conditions.

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Double the capacity of your ordinary furnaces with the same oil consumption. This is a record that has been established by Oilgas Industrial Furnaces in many of Canada's prominent manufactories. There is an Oilgas Furnace for every process requiring heat. Investigate.

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1—Open Tank 6′ dia. x 6′ high, with heating coils.
1—16′ 10″ long x 5′ 6″ dia., ⅜″ plate.
1—35′ 4″ long x 10′ 0″ dia., ¼″ plate.
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2—Annealing Furnaces complete, new.
Full line High-pressure Triplex Plunger Pumps.
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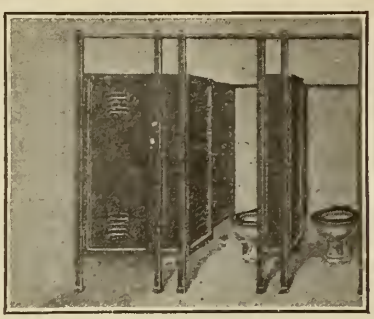

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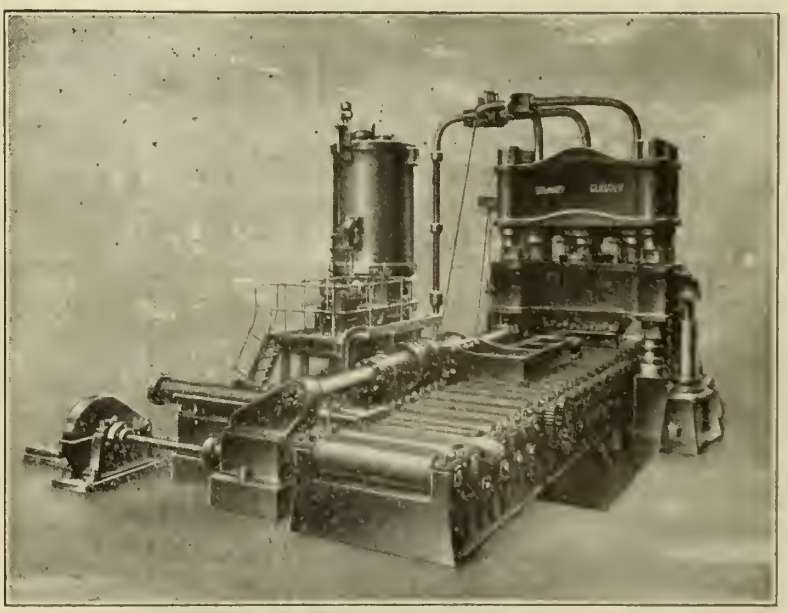

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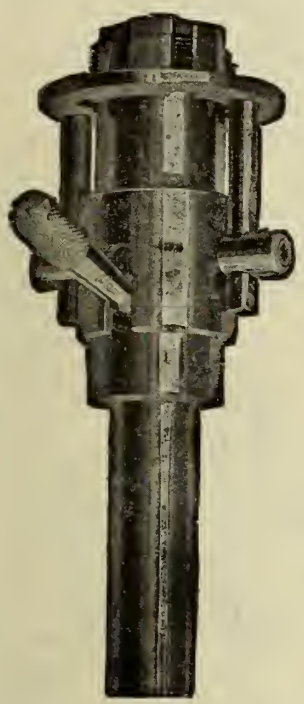

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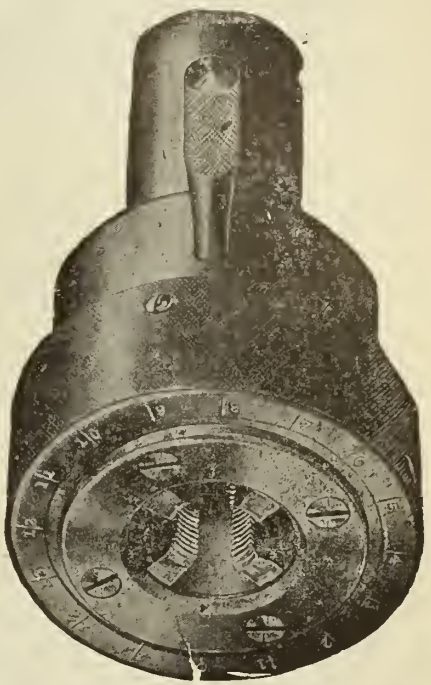
Murchey Taps and Dies do better and quicker work and last longer than ordinary tools.

Send for a tap and die to-day. Nothing is to be gained by delay.



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The Coats Machine Tool Co.,
14 Palmer St., Westminster, London, England.

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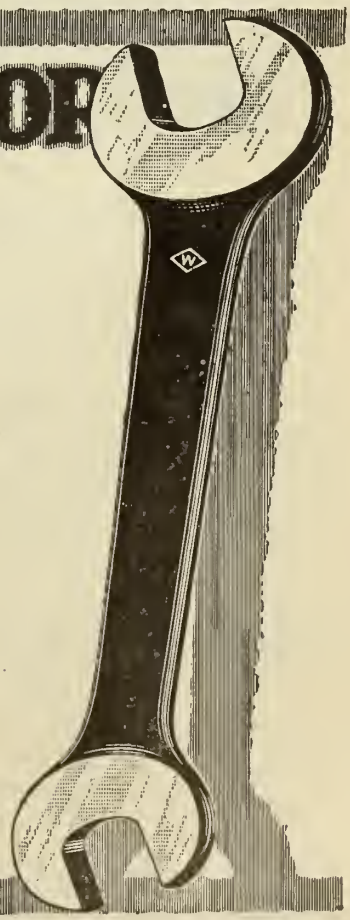
WILLIAMS' SUPERIOR DROP-FORGED WRENCHES



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40 standard patterns in nearly 1000 sizes—$^{3}/_{16}$ to $7^{5}/_{8}$ inches.

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as its name implies, is a quality tool steel. Made of the finest raw material by experts among experts in steel making—EXTRA is the standard for fine tools because uniformity and consistency are assured.

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EXTRA cast steel is carried in our warehouse stocks annealed.

⅛" to 7" Round and Square
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for blanking, forming, drawing punches and dies, also drills, taps, reamers, milling cutters, chasers, forming tools, broaches, fine gauges, precision tools, etc.

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JOHN J. COLEMAN, Can. Manager

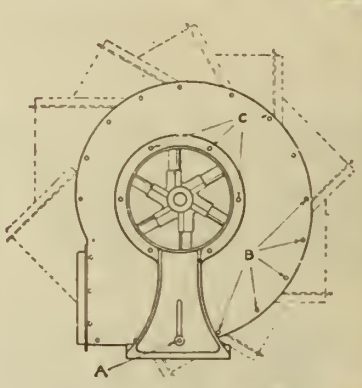
Canadian

The Canadian Standard Reversible Mill Exhauster will keep your shop clean, remove sawdust, shavings, fumes, gas or any loose materials and disagreeable odors.

Insurance rates can be reduced; floors and machines covered with sawdust, chips or shavings, increase the fire risk.

Insurance companies reduce the premiums where adequate precautions have been taken to prevent fires.

Blast Wheel — This wheel is so constructed that it will handle any kind of stringy material efficiently, such as sawdust, shavings, cotton lint. Will also handle gases, fumes, smoke, etc.



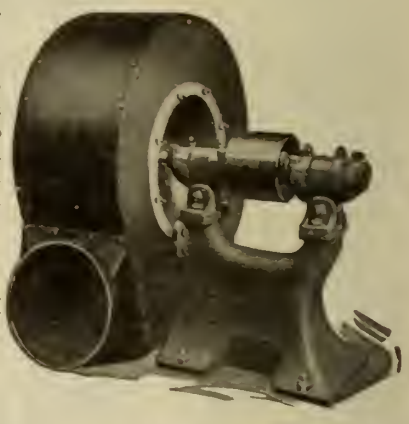
The Canadian Standard Planing Mill Exhausters have reversible housings so that the outlet can be adjusted instantly to any angle desired.

This eliminates necessity of crossed belts. Simplifies changes on alterations in piping or building.

The housing is of heavy rolled steel plate securely bolted together with angle irons. Round cast iron outlet bolted to the housing. Blast wheel mounted on heavy cast iron spider.

Every fan carefully tested by running test at speeds in excess of that required.

Write for catalog 16



Canadian Blower & Forge Co.

Kitchener - Ontario

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Insure the future success of your new plant by locating there

To the manufacturer locating in St. Johns go all the advantages of a commanding geographical location, unequalled transportation facilities and a cheap and abundant power supply. These features assure every facility in manufacturing and allow him to successfully meet competition.

St. Johns is only 27 miles from Montreal and is directly connected by rail with the Montreal docks, providing unusual ocean shipping advantages. It is particularly suitable as a Canadian location for the American manufacturer wishing to trade within the British Empire.

Seven railroads, including the Canadian Pacific and Grand Trunk, pass through the city and are inter-connected in the St. Johns Yards by a terminal switching company at very low rates.

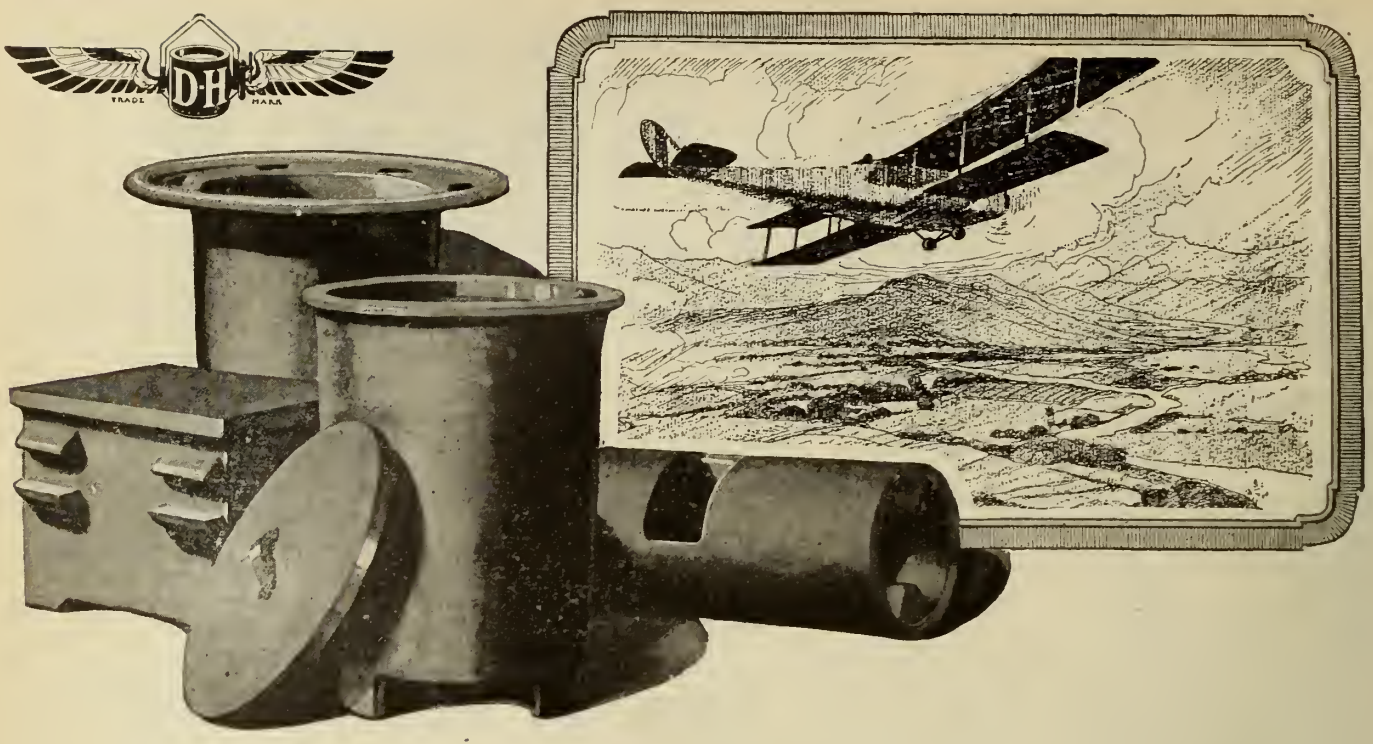
Skilled and unskilled labour is always plentiful, and owing to an unusually low cost of living labour troubles are practically unknown.

To the manufacturer seeking a location for his plant the following inducements offered by St. Johns are especially attractive: Exemption from taxes for a period of fifteen years, same being subject to extension; all public improvements required, such as street extensions, sidewalks, waterworks and sewage; five per cent. bonus on your payroll for five years. If you wish it this bonus will be advanced to you to be applied to the construction of any building suitable to your purpose.

For more detailed information write

The Secretary, City Council

ST. JOHNS, QUEBEC, CANADA



Sustained Power and Stamina—

Via
Bulletin N-21

Heat Treating Containers of

AIRPLANES are valued on the basis of performance — not by weight. Sustained power and stamina depend so largely on the bearings and other vitals that the case-hardening and other heat treating operations cannot be too accurate.

Cast Nichrome Heat Treating Containers contribute to dependable results because their physical characteristics are practically unchanging under repeated heating and cooling.

Service and results constitute the sound basis on which to buy heat treating containers. The Cast Nichrome Service Guarantee covers thousands of hours at 1800 deg. F. Stock patterns in hundreds of sizes, or special designs for special requirements.

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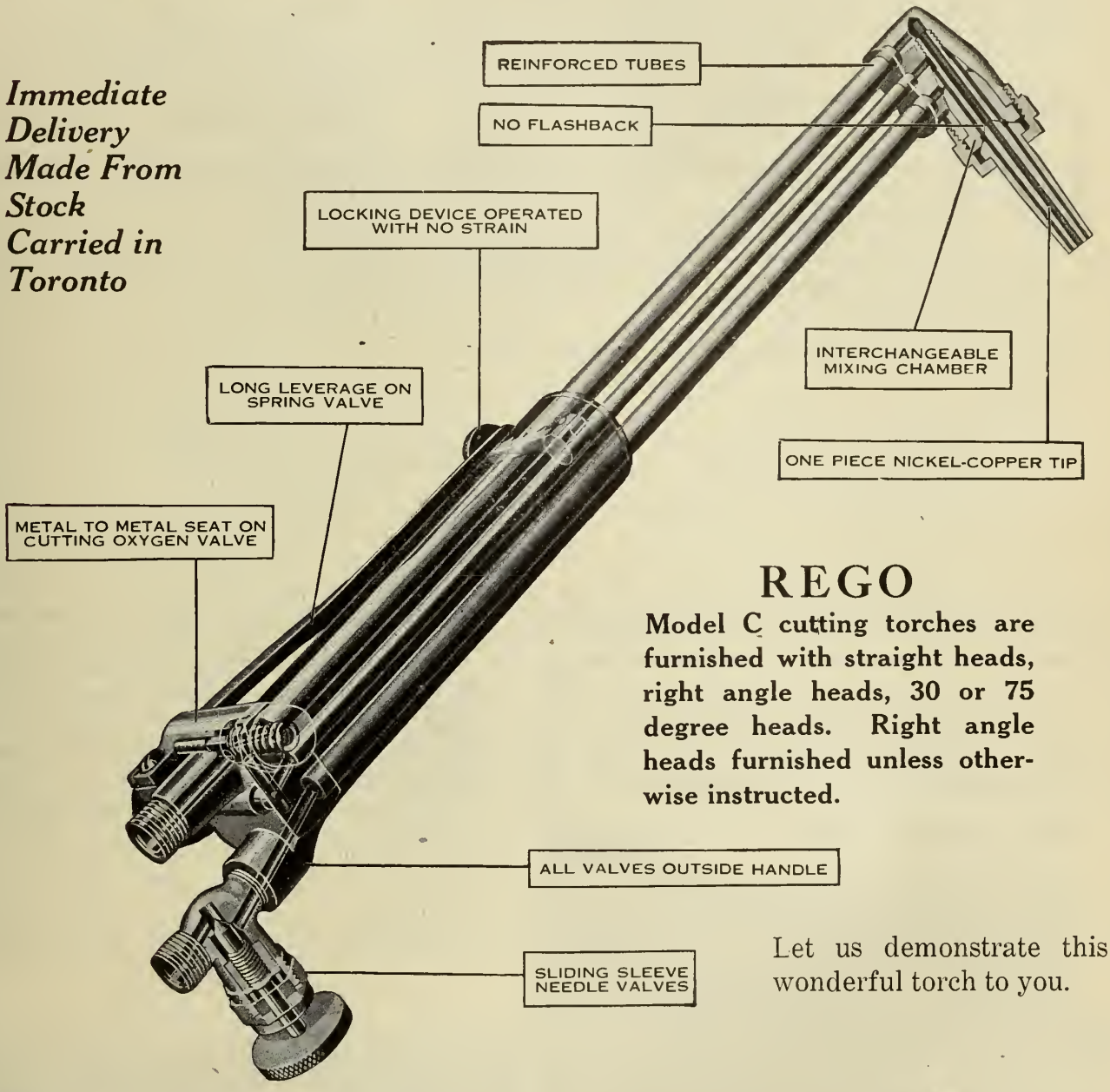
Better Cutting and Welding at Lower Cost

Immediate Delivery Made From Stock Carried in Toronto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ONE PIECE NICKEL-COPPER TIP
METAL TO METAL SEAT ON CUTTING OXYGEN VALVE
ALL VALVES OUTSIDE HANDLE
SLIDING SLEEVE NEEDLE VALVES

REGO

Model C cutting torches are furnished with straight heads, right angle heads, 30 or 75 degree heads. Right angle heads furnished unless otherwise instructed.

Let us demonstrate this wonderful torch to you.

The Carter Welding Co., of Toronto, Limited

9-11 Sheppard St., TORONTO, Ontario **Telephones** Adelaide 1524 Adelaide 2841

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Grind your cutting tools in exactly the right way to get best results—and you save time. That's obvious. It is precisely that that this Tool Grinding Chart enables you to do.

It has been adopted as standard by many firms that found it a long way better than guess work.

CANADIAN MACHINERY would like to see this Chart in every shop in the Dominion. Mail the coupon below for your copy to-day.

Shows at a glance Correct Clearance and Rake Angles for Cutting Tools

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CANADIAN MACHINERY,
153 University Avenue, Toronto.

Please send me / us free, one of your tool grinding charts.

Signed .....

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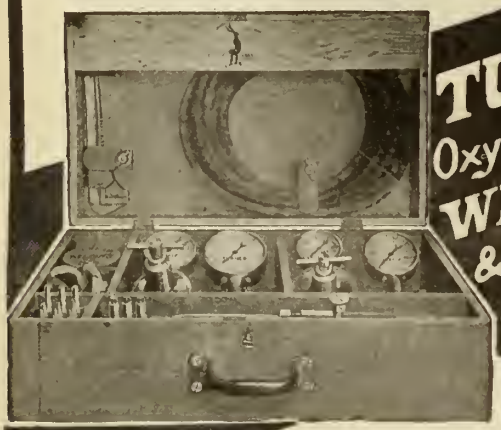

TURNER Oxy-Acetylene WELDING & CUTTING Equipment

These outfits will soon pay their cost in machine parts or tools reclaimed. The sectional extensions of the torch enable the operator to adjust it to any desired length or angle. The location of valves is such that the flame is controlled by one hand, leaving the other hand free for the work at all times.

For full particulars write

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ARMCO IRON is the standard welding wire for both electric arc and oxy-acetylene welding. It has unequalled welding qualities, due to chemical and physical uniformity; 99.84 per cent. pure iron content (minimum) guaranteed. Distributors in all industrial centres. 66

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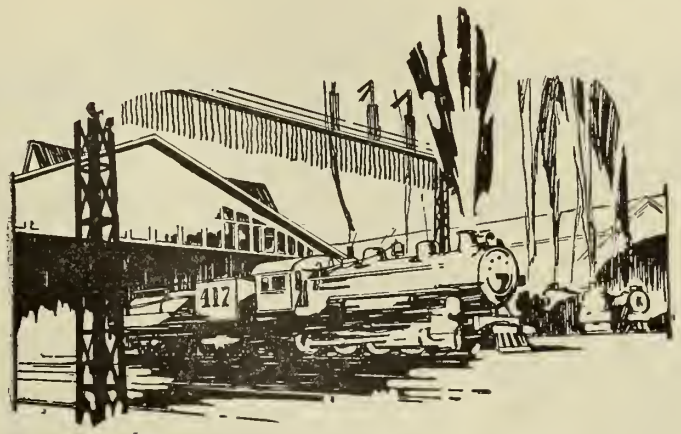

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Safe *Saves Money* *Makes Better Welds*

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"Liquid Air Service" is not a mere figure of speech, but an actuality.

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KEEP IN MIND THAT

The back of the Ox

is the part where the fibre of the hide is tightest and unaffected by the action of breathing, therefore the most suitable to produce a dead straight and practically stretchless belt.

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is made entirely from this portion of the hide.

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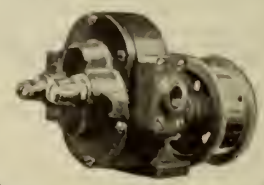
You Can Rely on the Trahern Rotary Geared Lubricating Pump to Give Superior Satisfaction.

Throws heavy stream of coolant at will of machine operator into deep cuts and bores. Has large capacity, low speed and long life—all superior essentials!



Tool manufacturers find that machines equipped with Trahern Rotary Geared Lubricating Pumps sell to better advantage. It's the ideal pump for speedy, economical and efficient production. **Write for full information.**

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Our Brands:
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There are two important things to consider in buying firebrick—**price** and **quality**. When you buy ELK BRAND FIREBRICK we take a keen, unprejudicial interest in seeing that you get the class of firebrick you need. If a moderate-priced brick fills the bill we never recommend a brick of higher quality at higher price.

We make bricks in all standard sizes and shapes.

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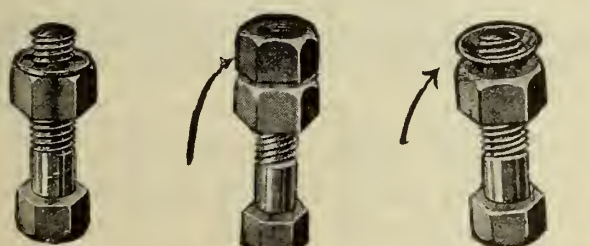
HOLD TITE NUT LOCK

See How Easily Applied



Knowing the size Bolt—use same size Nut Lock. Place over Bolt—as shown above.

Screw another Nut onto Nut Lock and Depress it — as shown above.

Remove Second Nut and Nut Lock will Look — as shown above.

The Hold Tite Nut Lock cannot come loose when it is compressed into the thread of the Bolt. Compressing will not destroy the thread.

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Branch Office: Bank of Toronto Chambers, 205 Yonge St., Room 32, Toronto, Ont.
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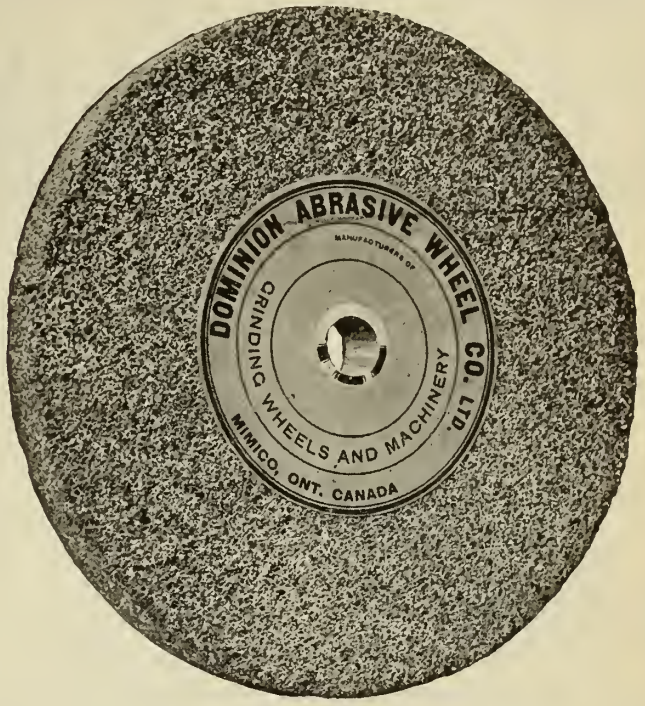

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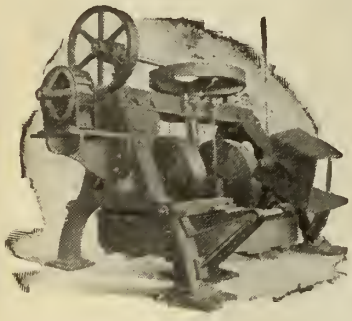

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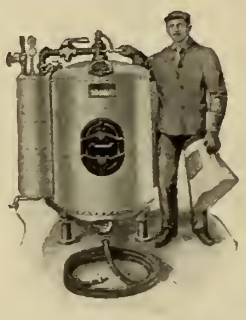

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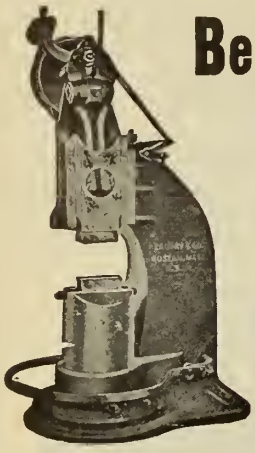

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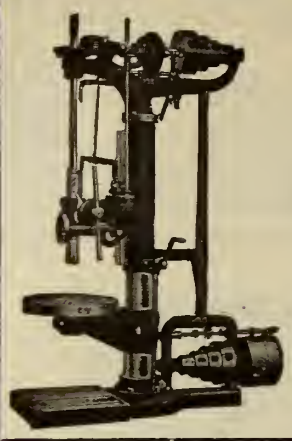

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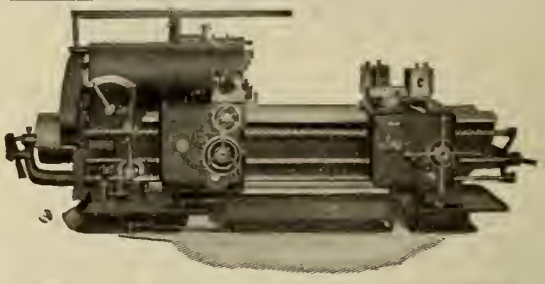

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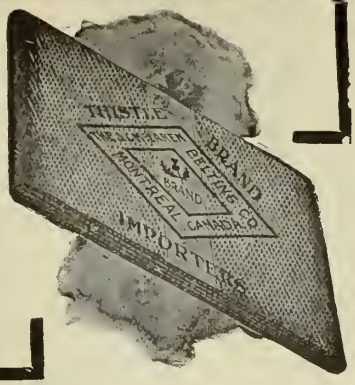

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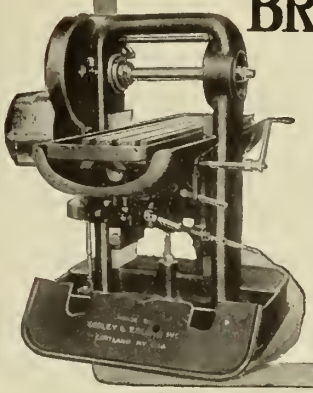

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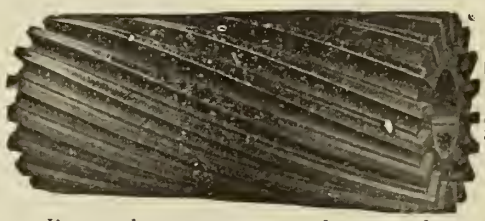

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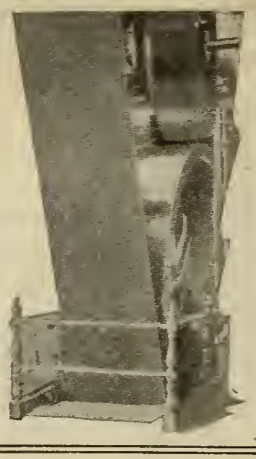

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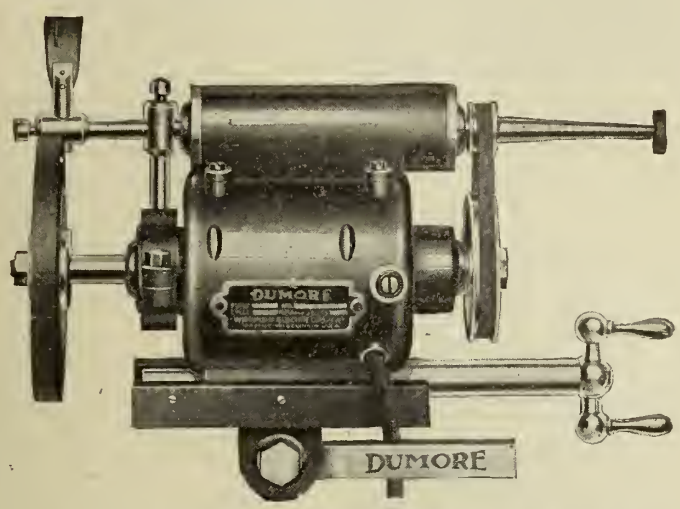
Electric Steel & Metals, Ltd., Welland.
BRASS—SHEETS, ROLLS, PLATES, and RODS
Brown's Copper and Brass Rolling Mills, New Toronto.
BRASS ALLOYS
British Smelting & Refining Co., Ltd., Montreal, Que.
BRASS AND COPPER TUBING
Lyman Tube & Supply Co., Montreal, Que.
BRASS FOUNDERS
Canada Metal Co., Toronto.
St. Lawrence Welding Co., Montreal
Tallman Brass & Metal Co., Hamilton.
BRASS GOODS
Crane, Ltd., Montreal, Que.
BRASS PIPE AND TUBE
Crane, Ltd., Montreal, Que.
BRASS WORKING MACHINERY
Barber Mchy. Co., Ltd., Toronto, Ont.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machinery Co., Toronto.
Warner & Swasey Co., Cleveland, O.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Prest-O-Lite Co., Inc., Toronto, Ont.
Wood Turret Machine Co., Brazil, Ind.
Williams Machy. Co., A. R., Toronto.
Brown's Copper and Brass Rolling Mills, New Toronto.
BRAZING EQUIPMENT
Chicago Flexible Shaft Co., Chicago, Ill.
BRICKS, FIRE
Elk Fire Brick Co., Can., Ltd., Hamilton, Ont.
BRIDGES, RLY. AND HIGHWAY
Canadian Mead-Morrison Co., Limited, Montreal, Que.
Dominion Bridge Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
BROACHING MACHINES
Strelinger Co., C. A., Windsor, Ont.
BRONZE—SHEETS, ROLLS, PLATES, and RODS
Brown's Copper and Brass Rolling Mills, New Toronto.
BRONZE, NAVAL
Canada Metal Co., Toronto.
Tallman Brass and Metal Co., Hamilton.
BRONZE COPPER
Canada Metal Co., Toronto.
BRUSHES, CARBON
Lyman Tube & Supply Co., Montreal, Que.
BUFFING AND POLISHING MACHINERY
Ford-Smith Mach. Co., Hamilton.
Foss Mchy. & S'ply Co., Geo. F. Montreal
Garlock-Walker Machinery Co., Toronto.
Petrie, Ltd., H. W., Toronto.
BUCKETS, DUMP
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
St Lawrence Welding Co, Ltd, Montreal
BUCKETS, ELEVATOR
Can. Link-Belt Co., Toronto, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
[illegible]ce Welding Co. Ltd., Montreal
BUCKETS, CLAM SHELL, CRAB, DUMP
Brown Hoisting Machinery Co., Cleveland, Ohio.
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Ltd, Walkerville.
BULLDOZERS
Bertram & Sons Co., John, Dundas.
Canada Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machinery Co., Toronto.
Lourie Manufacturing Co., Springfield, Ill
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.
BURNERS, OIL AND NATURAL GAS
Northern Crane Works, Ltd., Walkerville.
W. S. Rockwell Co., New York, N.Y.
BURRS, IRON AND COPPER
Parmenter & Bulloch Co., Gananoque,.
BUSHINGS, BRONZE
Morrow Screw & Nut Co., John, Ingersoll.
CALIPERS
Brown & Sharpe Mfg. Co., Providence, R.I.
Pangborn Corporation, Hagerstown, Md.
CABINETS, SAND BLAST
Pangborn Corporation, Hagerstown, Md.
CABLE, ELECTRIC
International Machinery & Supply Co., Ltd., Montreal, Que.
CABLES, TRANSMISSION AND TELEPHONES
Northern Electric Co., Ltd., Montreal.
CALKS, BOOT
Lufkin Rule Co., of Can., Windsor, Ont.
CANNERS' MACHINERY
Bliss, E. W. Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Can.
CANNERS' CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
CARBIDE
Carter Welding Co., Ltd., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.
Union Carbide Co., of Canada, Limited, Weland, nt.
CARBONIZING BOXES
Can. Driver-Harris Co., Ltd., Walkerville
Katie Foundry, Galt, Ont.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.
Swedish Crucible Steel Co., Windsor.
CARRIERS, PNEUMATIC TUBE
Jones & Glassco, Montreal.
CARS, INDUSTRIAL
Can. Blower & Forge Co., Kitchener, Ont
Can. Fairbanks-Morse Co., Ltd, Montreal
Elec. Steel & Metals, Welland, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.
CAR MOVERS
Holden Co., Ltd., Montreal, Que.
CASES, FILING
Economy Drawing Table Co., Adrian, Mich.
CASTINGS, ALUMINUM, BRASS BRONZE, COPPER, AND GUN METAL
Algoma Steel Corp., Sault Ste. Marie.
Franklin Mfg. Co., Syracuse, N.Y.
Canada Metal Co., Ltd., Toronto, Ont.
CASTINGS, DIE CAST
Canada Metal Co., Ltd., Toronto, Ont.
Franklin Mfg. Co., Syracuse, N.Y.
Fisher Motor Co., Ltd., Orillia, Ont.
Tallman Brass & Metals Ltd., Hamilton, Ont.
CASTINGS, STEEL—ALL KINDS
Canada Electric Castings, Ltd., Orillia, Ont.
Dominion Foundries & Steel Ltd., Hamilton, Ont.
Electric Steel & Metals Co., Welland.
Mesta Machine Co., Pittsburgh, Pa.
CASTINGS, ELECTRIC AND ALLOY STEEL
Can. Elec. Castings Co. Ltd., Orillia, Ont
Dominion Foundries & Steel Ltd., Hamilton, Ont.
CARRIERS COUPLING BOLTS
John Morrow Screw & Nut Co., Ingersoll
Alexander Fleck Ltd., Ottawa.
Tallman Brass & Metal Co., Hamilton.
CASTINGS, BENCH LEG.
Brown & Sharpe Mfg. Co., Providence, R.I.
CASTINGS, BRASS AND IRON
Algoma Steel Corp., Sault Ste. Marie.
International Machinery and Supply Co., Ltd., Montreal, Que.
CASTINGS, BUILDING
Katie Foundry, Galt, Ont.
CASTINGS, GRAY IRON
Bernard Industrial Co., A., Fortierville, Q.
Brown & Sharpe Mfg. Co., Providence, R.I.
Brown Boggs Co., Ltd., Hamilton.
Can. Elec. Castings Co, Ltd., Orillia, Ont
Alexander Fleck, Ltd., Ottawa.
Gardner & Son, Robt., Montreal
Hull Iron & Steel Foundries, Ltd., Hull
International Malleable Iron Co., Guelph
Kennedy & Sons, Ltd., Wm., Owen Sound.
Katie Foundry, Ltd., Galt, Ont.
Hamilton Co., Wm., Peterboro.
McFarlane Engineering Ltd., G. W., Paris, Ont.
CASTINGS, PLUMBERS'
Katie Foundry, Galt, Ont.
CASTINGS, NICHROME
Can. Driver-Harris Co., Ltd., Walkerville
CASTINGS, HARDWARE
Katie Foundry, Galt, Ont.
CASTINGS, STEEL CHROME AND MANGANESE STEEL
Thos. Davidson Mfg. Co., Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Hull Iron & Steel Foundries, Ltd., Hull.
Kennedy & Sons, Ltd, Owen Sound.
CASTINGS, MALLEABLE
International Malleable Iron Co., Guelph
CASTINGS, NICKEL STEEL
Hull Iron & Steel Foundries, Ltd., Hull.
CEMENT MACHINERY
Can. Fairbanks-Morse Co., Ltd., Montreal.
Gardner, Robt., & Son, Montreal.
CEMENT HANDLING MACHINERY
Can. Link-Belt Co., Toronto, Ont.
CEMENT TOOLS
Atkins & Co., E. C., Hamilton, Ont.
CENTERING MACHINES
Victoria Foundry Co., Ottawa, Ont.
CENTRE REAMERS
Bertram & Sons Co., John, Dundas.
Butterfield & Co., Inc., Rock Island, Que.
Gardner, Robt. & Son, Montreal.
Hurlburt, Rogers Mch. Co., South Sudbury, Mass.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co., of Canada, Galt, Ont.
CHAIN, WELDED COIL
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
CHAIN BLOCKS
Aikenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Ford Chain Block & Mfg. Co., Phila., Pa.
Garlock-Walker Machy. Co., Toronto.
Lyman Tube & Supply Co., Montreal, Que.
Morris Crane & HoistCo., Herbert, Niagara Falls, Ont.
Oliver Engineering Co., Montreal.
Rice Lewis & Son, Toronto, Ont.
Jones & Glassco, Montreal, Que.
CHAINS, AGRICULTURAL
Canadian Link-Belt Co., Ltd., Toronto, Ont.
Morse Chain Co., Ithaca, New York.
Renold of Canada Ltd., Montreal.
CHAINS, AUTOMOBILE ENGINE
Can. Link-Belt Co., Ltd., Toronto, Ont.
Morse Chain Co., Ithaca, New York.
Renold of Canada Ltd., Montreal.
CHAINS, BICYCLE, DRIVE AND BLOCK
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold of Canada Ltd., Montreal.
CHAINS, FOR ELEVATORS AND CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Petrie, Ltd., H. W., Toronto.
Renold of Canada Ltd., Montreal.
Williams Mchy Co., A. R., Toronto, Ont.
CHAIN, MALLEABLE, DETACHABLE AND RIVETED
Can. Link-Belt Co., Toronto, Ont.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.
CHAINS, POWER TRANSMISSION
Canadian Link-Belt Co., Ltd., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, New York.
Glasgow N.S.
Renold of Canada Ltd., Montreal.
CHAINS, SPROCKET WHEEL
Can. Link-Belt Co., Ltd., Toronto, Ont.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
CHAIN DRIVES
Can. Link-Belt Co., Toronto, Ont.
Coventry Chain Co., Coventry, England.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold of Canada Ltd., Montreal.
CHASERS
National Acme Co., Cleveland, Ohio.
Taylor, J. A. M., 318 Stair Bldg., Toronto, Ont.
CHEMISTS
Toronto Testing Laboratory, Ltd., Toronto
CHUCKS, AERO, AUTOMATIC
Garvin Machine Co., New York.
CHUCKS, CENTERING
Horgson & Pettis Mfg. Co., New Haven Conn.
CHUCKS, COLLET, AIR
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.
Smalley-General Co., Inc., Bay City, Mich
Petrie Ltd H W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.
CHUCKS, DRILL, LATHE AND UNIVERSAL
Aikenhead Hardware Co., Toronto, Ont
Bertram & Sons Co., John, Dundas.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Ltd., Brantford.
Foss Mchy. & S'ply Co., G. F., Montreal
Gardner, Robt., & Son, Montreal.
Garlock-Walker Mach'y Co., Toronto.
Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Chicago, Ill.
Herbert Ltd., Alfred, Toronto, Ont.
Jacobs Mfg. Co., Hartford, Conn.
Ker & Goodwin Machine Co., Ltd.
Knight Metal Products, Toronto.
Modern Tool Co., Erie, Pa.
Rice Lewis & Son, Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.
CHUCKS, DRILL, AUTOMATIC AND KEYLESS
Aikenhead Hardware Co., Toronto, Ont
Can. Blower & Forge Co., Kitchener.
McCrosky Tool Corp., Meadville, Pa., U. S. A.
Strelinger, Chas. A. Co., Windsor, Ont.
CHUCKS, FRICTION AND TAP
Victor Tool Co., Waynesboro, Pa.
CHUCKS, MAGNETIC
Heald Machine Co., Worcester, Mass.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co, Ltd., A. R., Montreal
CHUCKS, RING WHEEL
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.
CHUCKS, WHEEL, CAR
Hoggson & Pettis Mfg. Co., New Haven Conn.
CHUCKING MACHINES
Barber Mchy. Co., Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Garvin Machine Co., New York.
Gisholt Machine Co., Madison, Wis.
National Acme Co., Windsor, Vt.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Warner & Swasey Co., Cleveland, O.
Wood Turret Mach. Co., Brazil, Ind.
Williams Mchy Co., A. R., Toronto, Ont.
CIRCULATING SYSTEMS FOR LUBRICATING OIL
Bowser Co., Ltd., S. F., Toronto, Ont.
Williams & Co., J. H., Brooklyn, N.Y
CLAY FIRE
Elk Fire Brick Co., Can., Ltd., Hamilton, Ont.
CLEANERS, METER, WASTE, GENERAL
Oakley Chemical Co., New York, N.Y.
CLEANING COMPOUND
Oakley Chemical Co., New York.
CLOCK SPRINGS
The Dunbar Brothers Co., Bristol, Conn.
CLOCKS, WATCHMAN, PORTABLE
Gisholt Machine Co. Madison, Wis.
CLOSETS
Crane, Ltd., Montreal, Que.
CLUTCHES, CHAIN
Wright Mfg. Co., Lisbon, Ohio.
CLUTCHES, FRICTION AND PULLEY
Bernard Industrial Co., A., Fortierville, Q
Can. Link-Belt Co., Toronto, Ont.
Carlyle Johnson Mach. Co., Manchester Conn.
Positive Clutch & Pulley Wks., Aurora, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
COAL CRUSHERS
Canadian Link-Belt Co., Ltd., Toronto, Ont.
Canadian Mead-Morrison Co., Limited, Montreal, Que.
COAL HANDLING MACHINERY
Brown Hoisting Machinery Co., Cleveland Ohio.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Canadian Mead-Morrison Co., Limited, Montreal, Que.
Dominion Bridge Co., Montreal, Que.
MacGovern & Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que
Morris Crane & Hoist Co., Herbert Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont
Nova Scotia Steel & Coal Co., New
COLD ROLLED STRIP, ALL METAL COLLARS, SHAFTING
Can. Driver-Harris Co., Ltd., Walkerville
Williams & Co., J. H., Brooklyn, N.Y.
COLLECTORS, PNEUMATIC
Can. Blower & Forge Co., Kitchener
Sturtevant Co., B. F., Galt, Ont.
COLLETS
Becker Milling Machine Co., Boston.
COMPOSITION INGOT
Canada Metal Co., Toronto, Ont.
COMPOUNDS, CUTTING AND GRINDING, DRAWING, STAMPING
Oakley Chemical Co., New York, N.Y.
COMPRESSORS, AIR
Atkins & Co., E. C., Hamilton, Ont.
Can. Ingersoll-Rand Co., Sherbrooke.
Cleveland Pneumatic Tool Co., Toronto.
Curtis Pneumatic Machy. Co., St. Louis
Elliott & Whitehall, Galt, Ont.
Garlock-Walker Machy. Co., Toronto.
Holden Co., Ltd., Montreal, Que.
MacGovern & Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto.

Made of Die-Cast Parts

The most finely constructed machines can be made with die-cast parts. Die-cast parts cut costs. They require no machining, are smooth and accurate—ready to assemble.



This grinder is representative of die-cast-part construction.

Die-Casting Chart No. 20

Maximum Production! In these two words we have stated what every manufacturer is striving after, and yet—some concerns do not realize what Die-Castings could do for them. Just because a certain portion of your product has always been made of such and such a material, is no reason why it should stay that way. The man who gets ahead is the one who is willing to experiment and move with the times. Die-Castings have passed the experimental stage. They are a proven necessity and have come to stay.

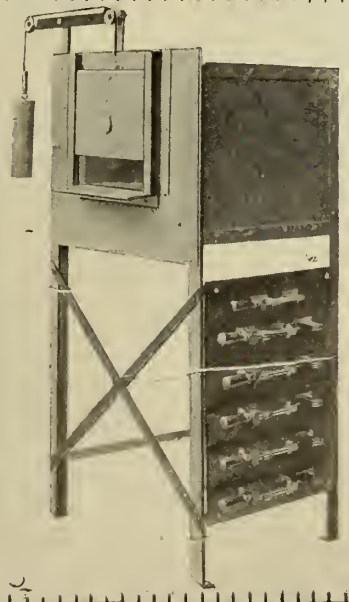
Let us tell you about them.

Largest Makers of Die-Castings in Canada

THE FISHER MOTOR CO., LIMITED

ORILLIA, ONTARIO

HOSKINS ELECTRIC FURNACES



SIMPLE

EFFICIENT

ACCURATE

ECONOMICAL

Hiram Walker & Sons Metal Products, Limited.

Walkerville, Ontario.

If interested tear out this page and place with letters to be answered.

Superior Machinery Co., London, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

CONDENSERS

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
MacGovern & Co., Montreal, Que.
Smedley-General Co., Inc., Bay City, Mich.

CONDUITS

Northern Electric Co., Ltd., Montreal Que

CONNECTING RODS

Canada Found'g & Forgings, Ltd., Welland, Ont.

CONNECTING ROD CUTTERS INTERCHANGEABLE

Eclipse Counterbore Co., Ltd., Walkerville, Ont.

CONTRACTORS' HOISTS

Canadian Mead-Morrison Co., Limited, Montreal, Que.

CONTRACT WORK

Brown Engineering Corp., Toronto.
Ford-Smith Machine Co., Hamilton, Ont.
Globe Engineering Co., Hamilton, Ont.
Homer & Wilson, Hamilton, Ont.
Katie Foundry, Ltd., Galt, Ont.
Victoria Foundry Co., Ottawa.

CONTROLLERS, MAGNETIC BRAKES, ELEC. WINCHES, MONO RAIL HOISTS

Volta Mfg. Co., Welland, Ont.

CONTROLLERS AND STARTERS

Williams Mach'y Co., A. R., Toronto.

CONTROLLING INSTRUMENTS

Taylor Instrument Co., Rochester, N.Y.

CONVERTERS, ROTARY

MacGovern & Co., Montreal, Que.
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal.

CONVEYORS—McCASLIN GRAVITY BUCKET

Canadian Mead-Morrison Co., Limited, Montreal, Que.

COOLERS, WITH DRINKING FOUNTAINS

Pure Sanitary Drinking Fountain Co., Haydenville, Mass.

COPING MACHINES

Bertram & Sons Co., John, Dundas, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machinery Co., Toronto.
Niles-Bement-Pond Co., New York.
Can. Blower & Forge Co., Kitchener.

COPPER, BUS BAR, SHEET, PATES, RODS

British Smelting & Refining Co., Ltd., Montreal, Que.
Brown's Copper and Brass Rolling Mills, New Toronto.
Brown's Copper and Brass Rolling Mills, New Toronto.

CORE OIL

Swan & Finch, Inc., 165 Broadway.

COUNTERBORES AND COUNTERSINKS

Aikenhead Hardware Co., Toronto, Ont.
Cleveland Twist Drill Co., Cleveland
Eclipse Counterbore Co., Ltd., Walkerville.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
McCrosky Tool Corp., Meadville, Pa., U. S. A.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.

COUNTERSINKS, INTERCHANGEABLE

Eclipse Counterbore Co., Ltd., Walkerville, Ont.

COUNTERBORES, INVERTED, INTERCHANGEABLE

Eclipse Counterbore Co., Ltd., Walkerville, Ont.

COUNTERSHAFTS

Almond Mfg. Co., Ashburnham, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Grey Ball Bearing Co., Ltd., Toronto.
Baird Machine Co., Bridgeport, Conn.
Ford-Smith Machine Co., Hamilton, Ont.
Foster Machine Co., Elkhart, Ind.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co, Ltd., A. R., Montreal
Williams Mchy Co., A. R., Toronto, Ont.

COUPLINGS, FRICTION

Bernard Industrial Co., The A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

COUPLINGS, RAPID HOSE

Int. Machinery & Supply Co., Ltd., Montreal, Que.

COILING MACHINERY, WIRE AND SPRING

Garlock-Walker Machinery Co., Toronto.

COKE AND COAL

Hanna & Co., M. A., Cleveland, O.

COUPLINGS PLAIN, FLEXIBLE AND CUT OFF

Cleveland Pneumatic Tool Co., of Canada, Toronto.

CRANES, OVERHEAD, HAND AND

Gardner, Robt. & Son, Montreal.
Independent Pneumatic Tool Co., Chicago

CRANES, LOCOMOTIVE

Can. Link-Belt Co., Toronto, Ont.
Northern Crane Works, Walkerville.

ELECTRIC

Volta Manufacturing Co., Welland, Ont.

CUPS, OIL

Can. Winkley Co., Ltd., Windsor, Ont.

COVERS, OIL HOLE

Can. Winkley Co., Ltd., Windsor, Ont.

CRANES, GANTRY

Brown Hoisting Machinery Co., Cleveland, Ohio.
Can. Link-Belt Co., Toronto, Ont.
Canadian Mead-Morrison Co., Limited, Montreal, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.

CRANE RUNWAYS

MacKinnon Steel Co., Sherbrooke, Que.

CRANES, JIB

Brown Hoisting Machinery Co., Cleveland, Ohio.

CRANES, LOCOMOTIVE

Brown Hoisting Machinery Co., Cleveland, Ohio.
Holden Co., Ltd., Montreal, Que.

CRANES, GOLIATH, PNEUMATIC AND PORTABLE

Brown Hoisting Machinery Co., Cleveland, Ohio.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Morris Crane and Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Petrie, Ltd., H. W., Toronto.

CRANES, PILLAR

Brown Hoisting Machinery Co., Cleveland, Ohio.

CRANES, TRAVELLING, ELECTRIC AND HAND POWER

Brown Hoisting Machinery Co., Cleveland, Ohio.
Can. Link-Belt Co., Toronto, Ont.
Curtis Pneumatic Machy. Co., St. Louis
Dominion Bridge Co., Montreal.
Hepburn, John T., Ltd., Toronto.
Lyman Tube & Supply Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Niles-Bement-Pond Co., New York.
Northern Crane Works, Walkerville.
Oliver Engineering Co., Montreal.

CRANK SHAFTS

Canada Found'g & Forgings Ltd., Welland
Williams & Co., J. H., Brooklyn, N.Y.

CRANES, PORTABLE

Aikenhead Hardware Co., Toronto, Ont.
Brown Hoisting Machinery Co., Cleveland, Ohio.
Can. Link-Belt Co., Toronto.
Lyman Tube & Supply Co., Montreal, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Rice Lewis & Son, Toronto, Ont.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

CRIMPS, LEATHER

Graton & Knight Mfg. Co., Worcester, Mass.

CRUSHERS

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Elec. Steel & Metals, Welland, Ont.

CUPOLAS

Can. Blower & Forge Co., Kitchener.
Northern Crane Works, Walkerville.

CURB PUMPS FOR OIL, GASOLINE

Bowser Co., Ltd., S. F., Toronto, Ont.

CURRENT TRANSFORMERS

Volta Manufacturing Co., Welland, Ont.

CUT-OFF COUPLINGS, FRICTION

Petrie, Ltd., H. W., Toronto.

CUTTERS, BOLT

See Bolt Cutters.

CUTTERS, GEARS

Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Fellows Gear Shaper Co., Springfield, Vt.

CUTTERS, FLUE

Cleveland Pneumatic Tool Co., Toronto.

CUTTER HEADS

Oliver Machinery Co. Grand Rapids, Mich

CUTTERS, PIPE (See Pipe Cutters)

CUTTERS, MILLING

Becker Milling Mach. Co., Boston, Mass.
Butterfield & Co., Rock Island, Que.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Cleveland Twist Drill Co., Cleveland.
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garvin Machine Co., New York.
Illinois Tool Works, Chicago, Ill.
Ingersoll Machs. Co., Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Toronto, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Whitney Mfg. Co., Hartford, Conn.
Wilt Twist Drill Co. Walkerville, Ont.

CUTTER RELIEVING MACHINES

Cleveland Milling Machine Co., Cleveland.

CUTTING-OFF MACHINES

Armstrong Bros., Tool Co., Chicago.
Atkins & Co., E. C., Hamilton, Ont.
Bertram & Sons Co., John, Dundas.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co. Ltd., Montreal
Foss Mchy & S'ply Co., Geo. F., Montreal
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hurlburt, Rogers Machy. Co., South Sudbury, Mass.
Kennedy & Sons, Wm., Owen Sound.
Lyman Tube & Supply Co., Montreal, Que.
Niles-Bement-Pond Co., New York, N.Y.
Pratt-O-Lite Co., Inc., Toronto, Ont.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Tabor Mfg. Co. Philadelphia, Pa.
Wells Bros. of Can., Galt, Ont.
Williams Tool Corp. of Can. Ltd., Brantford, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

CUTTING COMPOUND AND CUTTING OIL

Cataract Refining Co., Ltd., Toronto.
Swan & Finch, Inc., New York.

CUTTING OIL, RECLAIMING SYSTEM

Bowser Co., Ltd., S. F., Toronto, Ont.

CUTTING AND WELDING PLANTS

Davis-Bournonville Co., Jersey City, N.J.
Prest-O-Lite Co., Inc., Toronto, Ont.
Welding & Supplies Co., Montreal, Que.

CYANIDE AND LEAD BATH POTS

Swedish Crucible Steel Co., Windsor.

CYLINDERS, AIR

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Ford-Smith Machine Co., Hamilton, Ont.
Smalley General Co., Inc., Bay City, Mich

CYLINDERS, AUTOMATIC REBORING JIGS AND REAMERS

Kelley Reamer Co., Cleveland, O.

DEHUMIDIFYING

B. F. Sturtevant Co, Galt, Ont.

DERRICKS

Aikenhead Hardware Co., Toronto, Ont.
Dominion Bridge Co., Montreal.
Hepburn Co., Ltd., J. T., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

DERRICK HOISTS

Canadian Mead-Morrison Co., Limited, Montreal, Que.

DIAMOND (BORTZ)

Furniss, Clarke & Co., Montreal, Que.

DIAMOND TOOLS

Can. Desmond-Stephan Mfg. Co., Hamilton
Ford-Smith Machine Co., Hamilton, Ont.
Furniss, Clarke & Co., Montreal, Que.
Joyce-Koehel Co., Inc., New York City.
Wheel Truing Tool Co., Detroit.
Petrie, Ltd., H. W., Toronto.

DIAMONDS, CARBON AND BORTZ

Joyce Koehel Co., Inc., New York, N.Y.
Wheel Truing Tool Co., Detroit.

DIAMONDS, BLACK AND ROUGH

Joyce, Koebel & Co., Inc., New York.
Wheel Truing Tool Co., Windsor, Ont.

DIE CASTINGS

Fisher Motor Co., Ltd., Orillia, Ont.
Tallman Brass & Metals Ltd., Hamilton, Ont.

DIE HEADS, AUTOMATIC

Greenfield Tap & Die Corp., Greenfield Mass.
Wells Bros. of Can., Galt, Ont.
Petrie, Ltd., H. W., Toronto.

DIES, BRASS PRINTING, EMBOSSING AND LETTERING

Matthews, Jas. H., & Co., Pittsburgh, Pa

DIES FOR BIT BRACE USE

Butterfield & Co., Rock Island, Que.
Crescent Mche. Co., Ltd., Montreal, P.Q.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Wells Brothers Co., of Canada, Galt.

DIES AND DIE STOCKS

Ackworthie Ltd., J., Birmingham, Eng.
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Rock Island, Que.
Brown, Boggs Co., Hamilton, Ont.
Crescent Mche. Co., Ltd., Montreal, P.Q.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardner, Robt. & Son, Montreal.
Herbert Ltd., Alfred, Toronto, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Jones & Lamson, Springfield, Vt.
Landis Machine Co., Waynesboro, Pa.
Marshall, Son & Bunney, Toronto.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Acme Co., Cleveland, Ohio.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Rickert-Shafer Co., Erie, Pa.
Stoll Co., Inc., D. H., Buffalo, N.Y.
Strelinger, Chas. A. Co., Windsor, Ont.
Wells Brothers of Canada, Galt, Ont.
Williams Mchy Co. A. R., Toronto, Ont.

DIES, HAMMERED

Kimber & Hillier Mfg., Co., St. Catharines, Ont.

DIES, DROP FORGE.

Kimber & Hillier Mfg., Co., St. Catharines, Ont.

DIES, METAL STAMPING

Ackworthie Ltd., J., Birmingham, Eng.
Crescent Mche. Co., Ltd., Montreal, P.Q.
Elliott & Whitehall, Galt, Ont.

DIES, PIPE THREADING

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A. B. Jardine & Co., Ltd., Hespeler, Ont.
Crescent Mche. Co., Ltd., Montreal, P.Q.
Landis Machine Co., Waynesboro, Pa.

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Ackworthie Ltd., J., Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Crescent Machine Co., Ltd., Montreal.
Greenfield Tap & Die Corp., Greenfield Mass.
Wells Bros. of Can., Galt, Ont.

DIE SINKERS

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Becker Milling Machine Co., Boston
Garvin Machine Co., New York.
Kimber & Hillier Mfg., Co., St. Catharines, Ont.
Pratt & Whitney Co., Dundas, Ont.
Walcott Lathe Co., Jackson, Mich

DIES FOR MACHINES

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Aikenhead Hardware Co., Toronto Ont.
Butterfield & Co., Rock Island, Que.
Firth & Sons, Thos., Montreal, Que.
Landis Machine Co., Waynesboro, Pa.
Wells Brothers Co. of Canada, Galt.

DIE HEADS

Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Canada, Galt, Ont.

DIES, SELF-OPENING

Geometric Tool Co., New Haven.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Wells Brothers Co. of Can., Galt, Ont.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.

DIE FILING MACHINES

Oliver Mach. Co., Grand Rapids, Mich.

DIE STEEL, HOT AND COLD WORK

Armstrong-Whitworth of Can., Montreal
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall, Son & Bunney, Toronto.
Firth & Sons, Thos., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.

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Ackworthie Ltd., J., Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Wells Bros. Co. of Can., Galt, Ont.

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Globe Engineering Co., Hamilton, Ont.
Stoll Co., D. H., Buffalo, N.Y.

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Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
National-Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros., Co., of Can., Galt, Ont

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Pratt & Whitney Co., Dundas, Ont.
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DRAWING OFFICE SUPPLIES

Hughes, Owens Co., Ltd., Montreal, Que.

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Petrie, Ltd., H. W., Toronto.
Wheel Truing Tool Co., Windsor, Ont

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W. F. & John Barnes Co., Rockford.
Can. Blower & Forge Co., Kitchener.
Canada Machinery Corp., Galt, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal
Garlock-Walker Machinery Co., Toronto
Garvin Machine Co., New York.
A. B. Jardine & Co., Ltd., Hespeler, Ont
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
U. S. Mach. Tool Co., Cincinnati, Ohio.
A. R. Williams Machinery Co., Toronto

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Marshall, Son & Bunney, Toronto.
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Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal
Garlock-Walker Mach. Co., Toronto.
Garvin Machine Co., New York.
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Strelinger, Chas. A. Co., Windsor, Ont.
Whitman & Barnes Mfg. Co., Akron, O.
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Wilt Twist Drill Co. of Can., Walkerville

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Cleveland Twist Drill Co., Cleveland.
Morrow Screw & Nut Co., John, Ingersoll
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Petrie, Ltd., H. W., Toronto.
Rice Lewis & Son, Toronto, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
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Niles-Bement-Pond Co., New York.
Pilot Steel & Tool Co., Montreal, Que.
Prest-O-Lite Co., Inc., Toronto, Ont.
Strelinger Co., C. A., Windsor, Ont.
U. S. Electrical Tool Co., Cincinnati, O.
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Wilkinson & Kompass, Hamilton, Ont.
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Geo. F. Foss Mch. & S'ply Co. Montreal
Herbert, Ltd., Alfred, Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Marshall, Son & Bunney, Toronto.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
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Pratt & Whitney Co., Dundas, Ont.
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Strelinger Co., Chas. A., Windsor, Ont.
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Ford-Smith Mach. Co., Hamilton, Ont.
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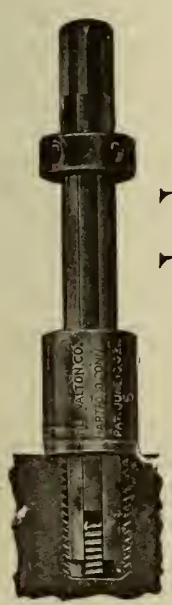

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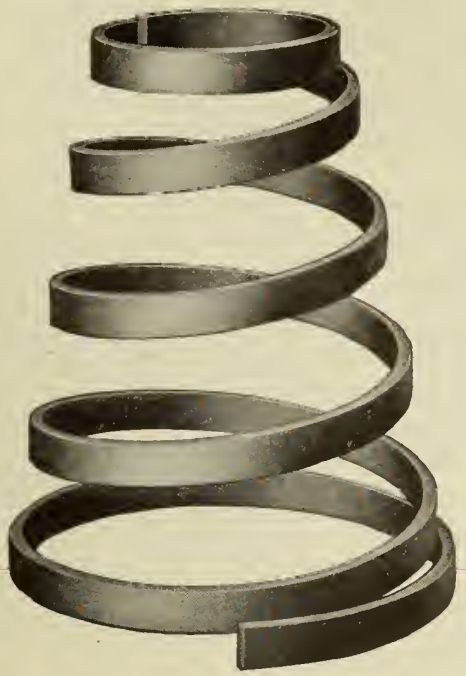

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Jardine & Co., A. B., Hespeler, Ont.
Niles-Bement-Pond Co., New York, N.Y
Petrie, Ltd., H. W., Toronto.
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Toledo Machine & Tool Co., Toledo.
United Hammer Co., Boston, Mass.
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Independent Pneumatic Tool Co., Chicago.
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HAMMERS, MARKING
Matthews & Co., Jas. H., Pittsburgh, Pa.

HAMMERS, NAIL MACHINE
Rice Lewis & Son, Toronto, Ont.
United Hammer Co., Boston, Mass.

HAMMERS, POWER
Nazel Eng. & Mach. Wks., Philadelphia

HAMMERS, STEAM
Canada Machinery Corp., Galt, Ont.
Niles-Bement-Pond Co., New York.

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Oliver Mchry. Co., Grand Rapids, Mich.

HAND PLANING AND JOINTING MACHINERY
Oliver Engineering Co., Montreal, P.Q.

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Graton & Knight Mfg. Co., Montreal.

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Diamond State Fibre Co., Bridgeport, Pa.

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Brown & Sharpe Mfg. Co., Providence, R.I
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Chapman Double Ball Bearing Co., Toronto.
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Jones & Glassco, Montreal.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co, Ltd., A. R., Montreal

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Shore Instrument & Mfg. Co., New York

HEAT TREATING EQUIPMENT
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Strong, Kennard & Nutt Co., Cleveland

HIGH SPEED STEEL
See Steel.

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Butterfield & Co., Inc., Rock Island, Que.
London Bolt & Hinge Wks., London, Ont

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Pratt & Whitney Co., Dundas, Ont.
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Can. Ingersoll-Rand Co., Ltd., Sherbrooke
Holden Co., Ltd., Montreal, Que
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

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Can. Ingersoll-Rand Co., Montreal, Que.
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Northern Crane Works, Walkerville, Ont
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Wright Mfg Co., Lisbon, Ohio.
Williams Mchy Co, Ltd., A. R., Montreal

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A. Leatty & Sons, Ltd., Welland, Can.
Oliver Engineering Co., Montreal.
Volta Mfg. Co., Welland, Ont.

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Can. Link-Belt Co., Toronto, Ont.
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Electric Steels & Metals Ltd., Welland
Kennedy & Sons, Owen Sound, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co, Ltd., A. R., Montreal

HOLDERS, ADJUSTABLE LENGTH
Eclipse Counterbore Co., Ltd., Walkerville, Ont.

HOLDERS, STEEL DIE FOR MARKING
Matthews & Co., Jas. H., Pittsburgh, Pa.

HOLDERS, ELECTRIC
Electric Steels & Metals, Ltd., Welland

HOOKS, BELT LACING
Clipper Belt Lacer Co., Grand Rapids.

HOPPERS
MacKinnon Steel Co., Ltd., Sherbrooke.
Dominion Bridge Co., Montreal, Que.
William Hamilton Co., Peterboro, Ont.
Toronto Iron Works, Ltd., Toronto, Ont.

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Quaker City Rubber Co, Philadelphia, Pa
International Mach. Sply, Ltd., Montreal

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Garlock-Walker Machinery Co., Toronto.
Gutta Percha & Rubber, Ltd., Toronto.
Independent Pneumatic Tool Co., Chicago.
Quaker City Rubber Co., Philadelphia, Pa.
Wells Bros. Co. of Canada, Galt, Ont.

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Gutta Percha & Rubber, Ltd., Toronto.
Quaker City Rubber Co, Philadelphia, Pa
International Mach. Sply, Ltd., Montreal
Dunlop Tire & Rubber Goods Co., Ltd., Toronto.

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Pangborn Corporation, Hagerstown, Md.
Goodyear Tire & Rubber Co. of Can., Ltd. Toronto
Quaker City Rubber Co., Philadelphia, Pa.
Intern'l. Machine Tool Co., Indianapolis.

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Sturtevant Co., B. F., Galt, Ont.

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Dom. Steel Products Co., Ltd., Brantford
Eastern Production Co., Detroit, Mich.
Garlock-Walker Machinery Co., Toronto.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Metalwood Mfg. Co., Detroit, Mich.
Niles-Bement-Pond Co., New York.
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Victoria Foundry Co., Ottawa.

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Can. Ingersoll-Rand Co., Ltd., Sherbrooke,

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Atkins & Co., E. C., Hamilton, Ont.
Brown & Sharpe Mfg. Co., Providence.
Starrett Co., L. S., Athol, Mass.

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Ford-Smith Machine Co., Hamilton, Ont.
Garvin Machine Co., New York.
Petrie, Ltd., H. W., Toronto.

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Can. Kron Scale Co., Montreal.

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City of St. Johns, Quebec.

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Thomas Moore & Son, Montreal.

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Electric Steel & Metals Co., Welland.

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Swedish Steel & Impt. Co., Ltd., Montreal

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Can. Fairbanks-Morse Co., Montreal.
The Engineering Co.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Norton, A. O., Coaticook, Que.
Rice Lewis & Son, Toronto, Ont.
Petrie, Ltd., H. W., Toronto.

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Lyman Tube & Supply Co., Montreal, Que.
Northern Crane Works, Walkerville.

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Dom. Steel Products Co., Ltd., Brantford.
Skinner Chuck Co., New Britain, Conn.

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Gisholt Machine Co., Madison, Wis.
Globe Engineering Co., Ltd., Hamilton.
Horner & Wilson, Hamilton, Ont.
Jones & Lamson, Springfield, Vt.
Toronto Tool Co., Toronto, Ont.

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Canada Foundries & Forgings, Welland.
Dominion Foundries & Steel Ltd., Hamilton, Ont.

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Garvin Machine Co., New York.
Morton Mfg. Co., Muskegon Heights, M.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Machy. Co., A. R., Toronto.

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Williams & Co., J. H., Brooklyn, N.Y.

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General Combustion Co., Ltd., Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
Sturtevant Co., B. F., Galt, Ont.

KNIVES, MACHINE
Atkins & Co., E. C., Hamilton, Ont.

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Matthews & Co., Jas. H., Pittsburgh, Pa.

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Williams & Co., J. H., Brooklyn, N.Y.

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Wood Turret Machine Co., Brazil, Ind.

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Betts Mach. Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.

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Bridgeford Mach. Tool Works, Rochester.
Canada Machinery Corp., Galt, Ont.
Lodge & Shipley, Cincinnati, O.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.

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Petrie, Ltd., H. W., Toronto.
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Seneca Falls Mfg Co., Seneca Falls, N.Y.
Strelinger Co., C. A., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

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Hardinge Bros., Chicago, Ill.
Wood Turret Machine Co., Brazil, Ind.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

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Canadian Fairbanks-Morse Co., Montreal.
Cisco Machine Tool Co., Cincinnati, O.
G. F. Foss, Mchy. & S'ply Co., Montreal
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Kennedy & Sons, Wm., Owen Sound, Ont.
Lehman Mach. Co., St. Louis, Mo.
R. McDougall Co., Galt.
Niles-Bement-Pond Co., New York.
Perfect Machine Co., Galt, Ont.
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Standard Equipment & Tool Wks. Montreal, P.Q.
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Strelinger Co., C. A., Windsor, Ont.
Walcott Lathe Co., Jackson, Mich.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
Rae Mach. Tool Co., Hamilton.
A. R. Williams Machy. Co., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

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Can. Machinery Corp., Galt.
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Canada Machinery Corp., Galt, Ont.
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Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Hepburn Ltd., John T., Toronto, Ont.
Lehman Machine Co., St. Louis, Mo.
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Rae Mach. Tool Co., Hamilton.
Seneca Falls Mfg. Co., Seneca Falls, N.Y.
Strelinger Co., C. A., Windsor, Ont.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
Williams Machy. Co., A. R., Toronto.
Wood Turret Machine Co., Brazil, Ind.

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Bliss Co., E. W., Brooklyn, N.Y.

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Knight Metal Products, Toronto.
Lehman Machine Co., St. Louis, Mo.
Rae Mach. Tool Co., Hamilton.
Seneca Falls Mfg. Co., Seneca Falls, N.Y.
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LEATHER STRAPPING
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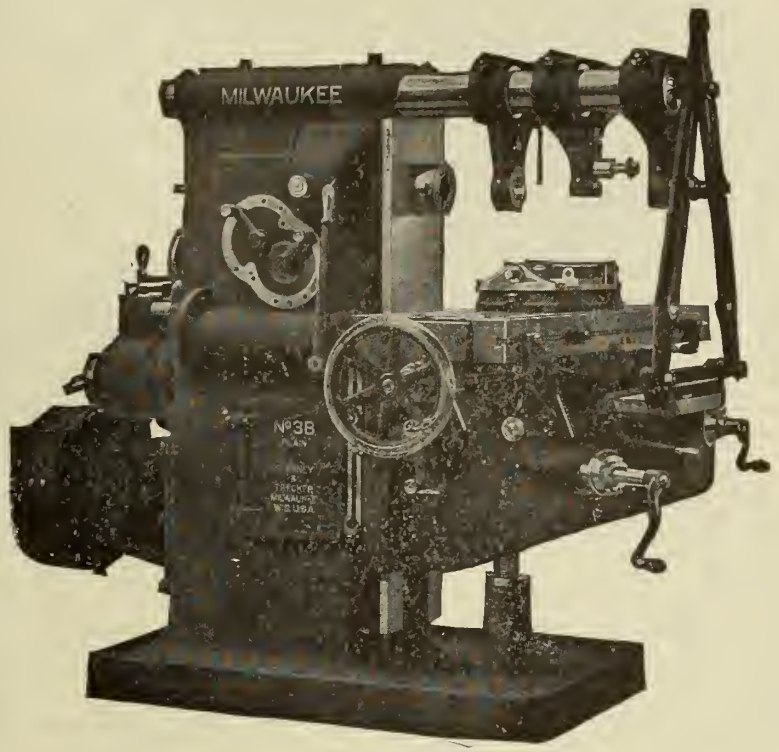
Milwaukee Milling Machines



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MACHINERY GUARDS (See Guards)

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Deloro Smelting & Refining Co., Ltd, Toronto, Ont.
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Foss Mchy. & S'ply Co. G. F., Montreal
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Hendey Mach. Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis.
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Rice Lewis & Son, Toronto, Ont.
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Petrie, Ltd., H. W., Toronto.
Standard Equipment & Tool Wks., Montreal, P.Q.

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Kearney & Trecker Co., Milwaukee, Wis.
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Canada Machinery Corp., Galt, Ont.
Cleveland Milling Machine Co., Cleveland.
Cincinnati Milling Machine Co., Cincinnati
Ford-Smith Mach. Co., Hamilton, Ont.
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Garlock-Walker Machy. Co., Toronto, Ont.
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Kempsmith Mfg. Co., Milwaukee, Wis.
Knight Metal Products, Toronto.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Standard Equipment & Tool Wks., Montreal, P.Q.
Strelinger, Chas. A. Co., Windsor, Ont.

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Garlock-Walker Machy. Co., Toronto, Ont
Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

MILLING TOOLS

Aikenhead Hardware Co., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence.
Ford-Smith Mach. Co., Hamilton, Ont.
Geometric Tool Co., New Haven, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
Rice Lewis & Son, Toronto, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

MINE CARS

Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Dominion Bridge Co., Montreal, Que.
Elec. Steel & Metals, Welland, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.

MINING MACHINERY

Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Elec. Steel & Metals, Welland, Ont.
Holden Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto.
Williams Machy. Co., A. R., Toronto.
Williams Machy. Co., A. R., Toronto, Ont

MIXERS, SAND

Frost Mfg. Co., Chicago, Ill.

MORTISING CHAINS

Renold of Canada Ltd., Montreal.

MORTISING MACHINES

Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Toronto, Ont
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Taft-Peirce Mfg. Co., Woonsocket, R.I.

MILLING MACHINES, AUTOMATIC

Bilton Mach. Tool Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Betts Machine Co., Rochester, N.Y.
Petrie, Ltd., H. W., Toronto.
Standard Equipment & Tool Wks., Montreal, P.Q.

MILLING CUTTERS

Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Milling Machine Co., Cleveland.
Deloro Smelting & Refining Co., Ltd, Toronto, Ont.
Herbert, Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Marshall, Son & Bunney, Toronto.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

MILLING MACHINES, HAND

Bristol Machine Tool Co., Bristol, Conn.

MILLING MACHINES, THREAD

Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Inc., Chicago, Ill.
Gray Ball Bearing Co., Ltd., Toronto.
United States Mach. Tool Co., Cincinnati.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Smalley Gen. Co., Inc., Bay City, U.S.A.
Standard Equipment & Tool Wks., Montreal, P.Q.
Strelinger, Chas. A. Co., Windsor, Ont.

MILLING MACHINES, HORIZONTAL AND VERTICAL

Barber Mchy. Co., Ltd., Toronto, Ont.
Becker Milling Machine Co., Boston, Mass
Bristol Machine Tool Co., Bristol, Conn.
Brown & Sharpe Mfg. Co., Providence.
Bertram & Sons Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Cochrane-Bly Co., Rochester, N.Y., U.S.A.
Ford-Smith Mach. Co., Hamilton, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Knight Metal Products, Toronto.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Rockford Milling Mach. Co., Rockford, Ill
Strelinger, Chas. A. Co., Windsor, Ont.
United States Mach. Tool Co., Cincinnati.
Whitney Mfg. Co., Hartford, Conn.
Williams Machy. Co., A. R., Toronto.

MILLING MACHINES, PLAIN, BENCH AND UNIVERSAL

Barber Mchy. Co., Ltd., Toronto, Ont.
Becker Milling Machine Co, Boston, Mass.
Bilton Mach. Tool Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence.
Canada Machinery Corp., Galt, Ont.
Cleveland Milling Machine Co., Cleveland.
Cincinnati Milling Machine Co., Cincinnati
Ford-Smith Mach. Co., Hamilton, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Garvin Machine Co., New York.
National Machy. Co., Tiffin, Ohio.
Gooley & Eduud, Inc., Cortland, N.Y.
Hardinge Bros., Inc., Chicago, Ill.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Knight Metal Products, Toronto.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Standard Equipment & Tool Wks., Montreal, P.Q.
Strelinger, Chas. A. Co., Windsor, Ont.

MILLING MACHINES, PROFILE

Barber Mchy. Co., Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal
Garlock-Walker Machy. Co., Toronto, Ont
Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

MILLING TOOLS

Aikenhead Hardware Co., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence.
Ford-Smith Mach. Co., Hamilton, Ont.
Geometric Tool Co., New Haven, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
Rice Lewis & Son, Toronto, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

MINE CARS

Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Dominion Bridge Co., Montreal, Que.
Elec. Steel & Metals, Welland, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.

MINING MACHINERY

Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Elec. Steel & Metals, Welland, Ont.
Holden Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto.
Williams Machy. Co., A. R., Toronto.
Williams Machy. Co., A. R., Toronto, Ont

MIXERS, SAND

Frost Mfg. Co., Chicago, Ill.

MORTISING CHAINS

Renold of Canada Ltd., Montreal.

MORTISING MACHINES

Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Toronto, Ont
Gray Ball Bearing Co., Ltd., Toronto.

MOTORS, ELECTRIC

Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
Lincoln Electric Co. of Canada, Ltd., Toronto, Ont.
MacGovern & Co., Montreal, Que.
Northern Elec. Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Sturtevant Co., B. F., Galt, Ont.
U. S. Ordnance, Toronto, Ont.
Volta Mfg. Co., Welland, Ont.
Williams Mach'y Co., A. R., Toronto.

MOTOR SPRINGS

The Dunbar Brothers Co., Bristol, Conn.

MOTORCYCLE FRAME AND FORK

The Dunbar Brothers Co., Bristol, Conn.

MOTORS, PNEUMATIC

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto.
Holden Co., Ltd., Montreal, Que.

MOULDS, RUBBER

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

MULTIPLE INDEX CENTRES

Garvin Machine Co., New York.
Graton & Knight Mfg. Co., Worcester M.

MULTI-DRILLING, MULTI-BORING, MULTI-TAPPING MACHINERY,

Nat. Automatic Tool Co., Richmond, Ind.

MUNICIPALITIES

City of St. John, Quebec.

NAIL SETS

Morrow Screw & Nut Co., J., Ingersoll, Ont

NAME PLATES, BRONZE, ETCHED AND STAMPED

Matthews & Co., Jas. H., Pittsburgh, Pa
Turner Brass Works, Sycamore, Ill.

NICHROME CASTINGS

Can. Driver-Harris Co., Ltd., Walkerville.

NICKEL

Pilot Steel & Tool Co., Montreal, Que.

NICKEL STEEL

See Steel.

NICKEL SILVER—SHEETS, ROLLS, PLATES and RODS

Brown's Copper and Brass Rolling Mills, New Toronto.

NIPPLE THREADING MACHINES

Landis Machine Co., Waynesboro, Pa
Williams Tool Corp. of Can. Ltd., Brantford, Ont.

NITROGEN

Carter Welding Co., Toronto, Ont.

NUTS, STEEL, CASTELLATED AND COLD PRESSED

Galt Machine Screw Co., Ltd., Galt, Ont
Morrow Screw & Nut Co., J., Ingersoll Ont
Williams & Co., J. H., Brooklyn, N.Y

NUTS, SEMI-FINISH AND FINISHED

Galt Machine Screw Co., Galt, Ont
National-Acme Co., Cleveland, Ohio.
Wilkinson & Kompass, Hamilton.

NUT LOCKS

Edw. W. Robinson Co., Ltd., Montreal.

NUT BURRING AND NUT MACHINES (HOT)

National Machy. Co., Tiffin, Ohio.

NUT FACING AND BOLT SHAVING MACHINES

Garvin Machine Co., New York.
National Machinery Co., Tiffin, Ohio.
Petrie, Ltd., H. W., Toronto.
Victor Tool Co., Waynesboro, Pa

NUT TAPPERS

Bertram & Sons Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont
Garvin Machine Co., New York.
Jardine & Co., A. B., Hespeler.
Landis Machine Co., Waynesboro, Pa
National Machinery Co., Tiffin, Ohio
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Tool Corp. of Can. Ltd., Brantford, Ont.

OILERS

All-Way Oiler Mfg. Co., Toronto, Ont.

OIL SEPARATORS

Can. Fairbanks-Morse Co., Montreal.

OIL STONES

Aikenhead Hardware Co., Toronto, Ont.
Carborundum Co., Niagara Falls, N.Y.
Norton Co., Worcester, Mass.
Rice Lewis & Son, Toronto, Ont.

OIL STONE GRINDERS

Oliver Machy. Co., Grand Rapids, Mich

OIL STORAGE SYSTEMS

Bowser Co., Ltd., S. F., Toronto, Ont.
St. Lawrence Welding Co., Ltd., Montreal.

OPENING DIE HEADS

Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

OPTICAL SUPPLIES

Consolidated Optical Co., Toronto, Ont.

ORE HANDLING EQUIPMENT

Brown Hoisting Machinery Co., Cleveland, Ohio.
Canadian Link-Belt Co., Ltd., Toronto, Ont.
Canadian Mead-Morrison Co., Limited, Montreal, Que.

OSCILLATING VALVE GRINDERS (PNEUMATIC)

Cleveland Pneumatic Tool Co. of Canada, Toronto.

OVENS FOR BAKING, BLUING DRYING, ENAMELING, JAPANNING AND LACQUERING

Brantford Oven & Rack Co., Brantford

OVEN TRUCKS, STEEL

Brantford Oven & Rack Co., Brantford.
MacKinnon Steel Co., Sherbrooke, Que.

OVENS FOR DRYING, TEMPER AND OXYGEN, ELECTROLYTIC CELLS UNDER TRUCKS

Welding & Supplies Co., Montreal, Que.
Brantford Oven & Rack Co., Brantford.

OXY-ACETYLENE WELDING AND CUTTING AND OUTFITS

Carter Welding Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
L'Air Liquide Society, Toronto, Ont.
Prest-o-Lite Co., Inc. Toronto, Ont.
Davis-Bournonville Co., Toronto, Ont.

OXYGEN

Carter Welding Co., Ltd., Toronto, Ont.
Dominion Oxygen Co., Ltd., Toronto, Ont.
Nat. Electro Products Ltd., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.

OXYGEN PLANTS (ELECTROLYTIC)

Davis-Bournonville Co., Toronto, Ont.

PACKINGS, ASBESTOS

Cleveland Wire Spring Co., Cleveland.

PACKING, ROD AND SHEET

Dunlop Tire & Rubber Goods Co., Ltd. Toronto.
Goodyear Tire & Rubber Co., Can., Ltd. Toronto
Gutta Percha & Rubber, Ltd., Toronto.
International Mach. Spls., Ltd., Montreal
Petrie, Ltd., H. W., Toronto.
Quaker City Rubber Co., Philadelphia, Pa

PANS, WET AND DRY

Frost Mfg. Co., Chicago, Ill.

PAPER MILL CONVEYORS AND DRIVES

Bertrams, Ltd., Edinburgh, Scotland.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Gutta Percha & Rubber, Ltd., Toronto.
MacKinnon Steel Co., Sherbrooke, Que.

PARTITIONS, WIRE

See Guards

PAPER MILL MACHINERY

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Machinery Co., Toronto.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

PATTERN SHOP EQUIPMENT

Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Oliver Machy. Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.

PATTERN MAKERS' LATHES

See Lathes.

PATENT SOLICITORS

Budden, Hanbery A., Montreal.
Fetherstonhaugh & Co., Ottawa.
Marion & Marion, Montreal.
Ridout & Maybee, Toronto.

PECK CARRIERS FOR POWER PLANTS

Can. Link-Belt Co., Toronto, Ont.

PENSTOCKS

William Hamilton Co., Peterboro, Ont.

PERFORATED METALS AND ORNAMENTAL IRON GOODS

Canada Wire & Iron Goods Co., Hamilton

PHOSPHOR TIN, COPPER AND BRONZE

British Smelting & Refining Co., Ltd., Montreal, Que.

PHOTOSTATS

Commercial Camera Co., Providence, R.I.

PIG IRON

Hanna & Co., M. A., Cleveland, O.
Steel Co. of Canada, Ltd., Hamilton, Ont.

PINS, TAPER

Morrow Screw & Nut Co., J., Ingersoll, Ont

PINS, BELT-LACING

Clipper Belt Lacer Co., Grand Rapids.

PIPE, BLACK & GALVANIZED

Crane, Ltd., Montreal, Que.

PIPE FITTINGS, MALLEABLE AND CAST IRON

International Malleable Iron Co., Guelph.

PIPE CUTTING AND THREADING MACHINES

Barber Mchy. Co., Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Curtis & Curtis Co., Bridgeport, Conn.
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
McDougall Co., R., Galt.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Wells Bros. Co. of Canada, Galt, Ont.
Williams Tool Co., Erie, Pa.
Williams Machy. Co., A. R., Toronto.
Williams Tool Corp. of Can. Ltd., Brantford, Ont.

PIPE, JOINT COMPOUNDS

Crane, Ltd., Montreal, Que

PIPE RIVETED STEEL

Toronto Iron Works, Ltd., Toronto.
William Hamilton Co., Peterboro, Ont.

PIERCING

Oliver Machy. Co., Grand Rapids, Mich.

PIPE CUTTERS, ROLLING

Curtis & Curtis Co., Bridgeport, Conn.
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. Co. of Canada, Galt, Ont.
Williams Tool Corp. of Can. Ltd., Brantford, Ont.

Screw Machine Products -

to specifications

SPECIAL

Screw machine product up to 2¼" diameter to customers' specifications.

STANDARD

V., U.S.S. and S.A.E. Cap Screws
V. and U.S.S. Set Screws
S.A.E. Plain and Castellated Nuts
V. and U.S.S. Semi-finished Nuts

Owing to the market shortage of raw material, it is to the customers' advantage that they anticipate requirements as far ahead of use as possible.

THE NATIONAL ACME COMPANY

MONTREAL, P. Q.

De Courcelles G. T. R.

PIPE TOOLS AND DIES
Ackworthie Ltd., J., Birmingham, Eng.
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PIPE CUTTERS AND REAMERS
Greenfield Tap & Die Corp., Greenfield.
Strelinger, Chas. A. Co., Windsor, Ont.
Wells Bros. of Canada, Galt, Ont.

PIPE STOCKS AND THREADERS
Greenfield Tap & Die Corp., Greenfield.
Strelinger, Chas. A. Co., Windsor, Ont.
Wells Bros. of Canada, Galt, Ont.

PIPE TAPS AND VISES
Ackworthie Ltd., J., Birmingham, Eng.
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PIPE WRENCHES
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PISTON AND PISTON RING MACHINES
National Acme Co., Windsor, Vt.

PLANER BOLTS
Atkins & Co., E. C., Hamilton, Ont.
Morrow Screw & Nut Co., J., Ingersoll, Ont

PLANER JACKS
Armstrong Bros. Tool Co., Chicago.

PLANERS, STANDARD AND ROTARY
Betts Machine Co., Rochester, N.Y.
Barber Mchy. Co., Ltd., Toronto, Ont.
Bertram & Sons Co., John, Dundas.
Oliver Machy. Co., Grand Rapids, Mich.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal
Gardner & Son, Robt., Montreal.
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Herbert Ltd., Alfred, Toronto, Ont.
Morton Mfg. Co., Muskegon Heights, Mich
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
Standard Equipment & Tool Wks., Montreal.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.

PLANING AND SHAPING MACHINERY
Barber Mchy. Co., Ltd., Toronto, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal
Garlock-Walker Machinery Co., Toronto
Garvin Machine Co., New York.
Niles-Bement-Pond Co., New York.
Ohio Mach. Tool Co., Kenton, Ohio.
Perrin, Ltd., William, Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co. Ltd., A. R., Montreal

PLANER-SHAPER, COMBINED OPEN SIDE
Lynd-Farquhar Co., Boston.
Petrie, Ltd., H. W., Toronto.

POWER HAMMERS
Quickwork Co., St. Marys, Ohio.

PLANING MILL EXHAUSTERS
Can. Blower & Forge Co., Kitchener, Ont.
MacGovern & Co., Montreal, Que.
Niles-Bement-Pond Co., New York.
Sturtevant Co., B. F., Galt, Ont.

PLATES, Q.M., SHEARED AND CHEQUERED
Peckovers, Ltd., Toronto, Ont.

PLATING, PLANTS & SUPPLIES
Can. Hanson Van Winkle Co., Ltd. Toronto, Ont.

PLIERS
Aikenhead Hardware Co., Toronto.
Can. Billings & Spencer, Ltd., Welland.
Rice Lewis & Son Toronto, Ont

PNEUMATIC CYLINDERS
Holden Co., Ltd., Montreal, Que.

PNEUMATIC EQUIPMENT
Strelinger Co., C. A., Windsor, Ont.

PNEUMATIC TOOLS
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland P'matic Tool Co., Can., Toronto.
Curtis Pneumatic Machy. Co., St. Louis
Garlock-Walker Machy. Co., Toronto.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool Co., Chicago
Int. Mach. & Supply Co., Ltd., Montreal.
Strelinger, Chas. A. Co., Windsor, Ont.

POWER CRANES, HAND
MacKinnon Steel Co., Sherbrooke, Que.

POLISHING MACHINES
Ackworthie Ltd., J., Birmingham, Eng.
Brown & Sharpe Mfg. Co., Providence, R.I.
Ford-Smith Machine Co., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto.

POLISHING PLATES
Greenfield Tap & Die Corp., Greenfield.
Petrie, Ltd., H. W., Toronto.
Wells Bros. of Canada, Galt, Ont.

POLISHING PAPER
H. H. Barton & Son Co., Philadelphia.

POTS AND KETTLES, CAST STEEL
Elec. Steel & Metals, Welland, Ont.

POWER HOUSE CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

PORTABLE MACHINERY
Hastins & Co., R. C., Chicago, Ill.

POWER TRANSMISSION MCHY.
Canadian Link-Belt Co., Ltd., Toronto, Hamilton Co., Ltd., Wm., Peterborough, Ont.
Petrie, Ltd., H. W., Toronto

PRECISION MACHINES
Herbert Ltd., Alfred, Toronto, Ont.

PRESSED STEEL PARTS
Ackworthie Ltd., J., Birmingham, Eng.
Gray Ball Bearing Co., Ltd., Toronto.

PRESSERS, ARBOR
Atlas Press Co., Kalamazoo, Mich.
Metalwood Mfg. Co., Detroit, Mich.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
Lourie Manufacturing Co., Springfield, Ill.

PRESSES, BROACHING, FORGING AND FLANGING
Atlas Press Co., Kalamazoo, Mich.
Bliss Co., E. W., Brooklyn, N.Y.
Dom. Steel Products Co., Ltd., Brantford.
Eastern Production Co., Detroit, Mich.
Metalwood Mfg. Co., Detroit, Mich
Petrie, Ltd., H. W., Toronto.
Toledo Machine & Tool Co., Toledo.
Stoll Co., D. H., Buffalo, N.Y.
Williams Mchy Co., Ltd., A. R., Montreal

PRESSES, CAM, TOGGLE, EYELET
Baird Machine Co., Bridgeport, Conn.
Bliss Co., E. W., Brooklyn N.Y.
Toledo Machine & Tool Co., Toledo.
Stoll Co., D. H., Buffalo, N.Y.

PRESSES, FILTER
Perrin, Ltd., William R., Toronto.
Smalley-General Co., Inc., Bay City, Mich.

PRESSES, PNEUMATIC
Dom. Steel Products Co., Ltd., Brantford.
Eastern Production Co., Detroit, Mich.
Metalwood Mfg. Co., Detroit, Mich.
Toledo Machine & Tool Co., Toledo.

PRESSES, DROP AND FORGING
Barber Mchy. Co., Ltd., Toronto, Ont.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs Co, Ltd., Hamilton.
Can. Fairbanks-Morse Co., Montreal.
Niles-Bement-Pond Co., New York.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co, Toledo.

PRESSES, HYDRAULIC
Barber Mchy. Co., Ltd., Toronto, Ont.
Bertram & Sons Co., John, Dundas.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Dom. Steel Products Co., Ltd., Brantford.
Eastern Production Co., Detroit, Mich.
Lourie Manufacturing Co., Springfield, Ill.
Metalwood Mfg. Co., Detroit, Mich.
Niles-Bement-Pond Co., New York.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.
Toledo Machine & Tool Co., Toledo.
Stoll Co., Inc., D. H., Buffalo, N.Y.
Williams Mchy Co. A. R., Toronto.

PRESSES, HYDRAULIC, HORIZONTAL
Eastern Production Co., Detroit, Mich.

PRESSES, HYDRAULIC, VERTICAL
Eastern Production Co., Detroit, Mich.

PRESSES, HYDRO-PNEUMATIC
Eastern Production Co., Detroit, Mich.

PRESSES, BALING
Perrin, Ltd., William R., Toronto.

PRESSES, POWER
Baird Machine Co., Bridgeport, Conn.
Barber Mchy. Co., Ltd., Toronto, Ont.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machinery Co., Toronto.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy. Co. A. R., Toronto.

PRESSES, SPRING FOOT
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Ont.
Toledo Machine & Tool Co., Toledo.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., Ltd., A. R., Montreal

PRESSES, SCREW
Barnes & Co., W. F. & Jno., Rockford, Ill
Bliss Co., E. W., Brooklyn, N.Y.
Manhattan Machine & Tool Co., Grand Rapids, Mich.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.

PRESSES, TIRE
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,

PRESSES, TRIMMING
Bliss Co., E. W., Brooklyn, N.Y.
Canada Machinery Corp., Galt, Ont.
Petrie, Ltd., H. W., Toronto.
Stoll Co., D. H., Buffalo N.Y.

PROFILING MACHINES
Herbert Ltd., Alfred, Toronto, Ont.

PROJECTORS, FLOOD LIGHTING
Holden Co., Ltd., Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que

PROPELLERS
Kennedy & Sons, Wm., Owen Sound.

PROTECTIVE COATINGS
H. H. Robertson, Ltd., Sarnia, Ont.

PSYCROMETERS, SLING
Taylor Instrument Co., Rochester, N.Y.

PULLEYS
Algoma Steel Corp., Sault Ste. Marie, Ont
American Pulley Co., Philadelphia.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., Fortierville, Que.
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Diamond State Fibre Co., Bridgeport, Pa.
Ford-Smith Machine Co., Hamilton, Ont.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Kennedy & Sons, Ltd., W., Owen Sound.
Positive Clutch & Pulley Works Ltd., Toronto.
Petrie Ltd., H. W., Toronto.

PULLEYS, STEEL SASH, STEEL BELT
American Pulley Co., Philadelphia, Pa.

PULLEYS, FRICTION, CLUTCH
American Pulley Co., Philadelphia, Pa.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., A., Fortierville, Q
Can. Link Belt Co., Toronto, Ont.
Carlyle Johnson Mch. Co., Manchester, Ct.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Jones & Glassco, Montreal.
Positive Clutch & Pulley Works, Toronto.
Petrie, Ltd., H. W., Toronto.

PULP MILL MACHINERY
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Hamilton Co., Ltd., Wm., Peterborough, Ont.
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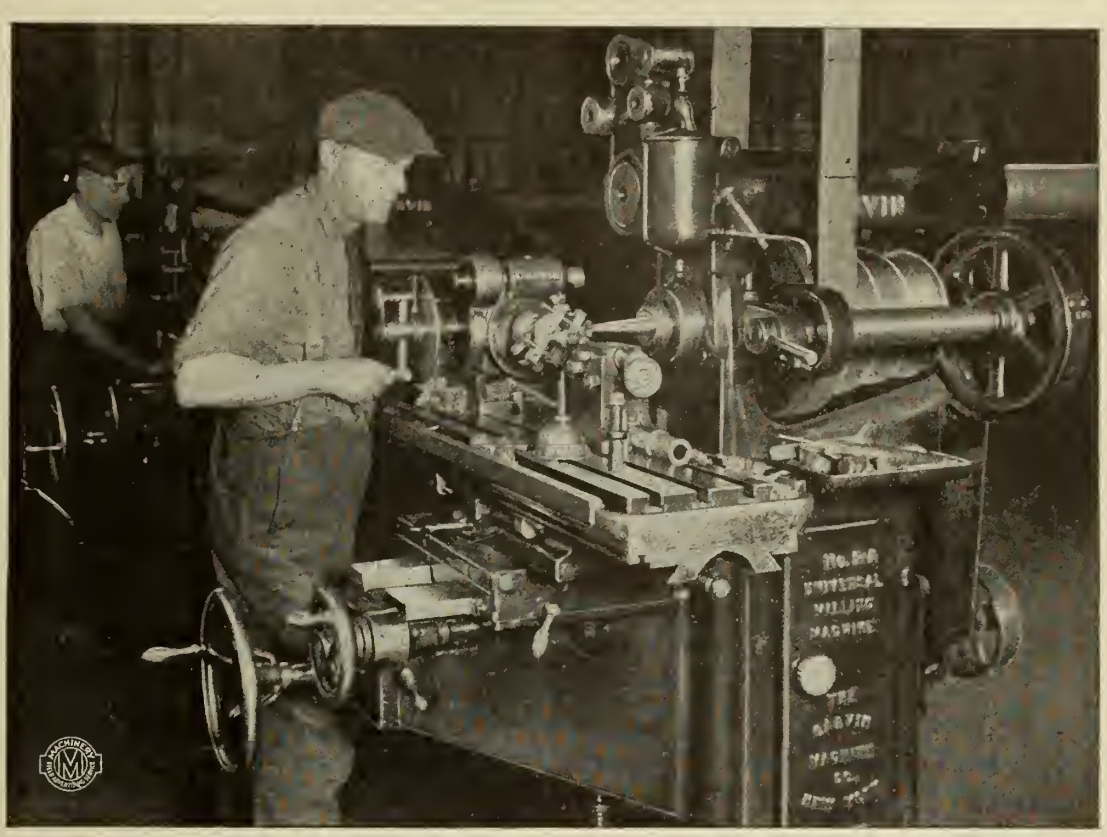

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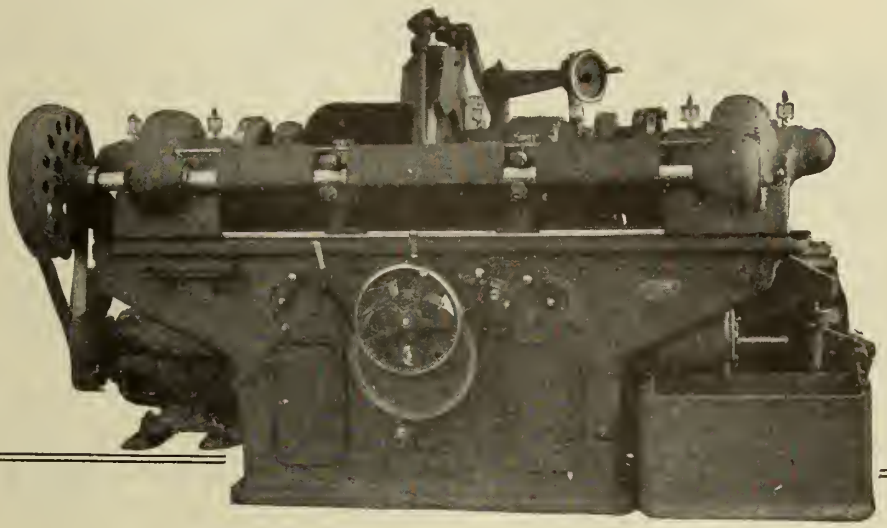

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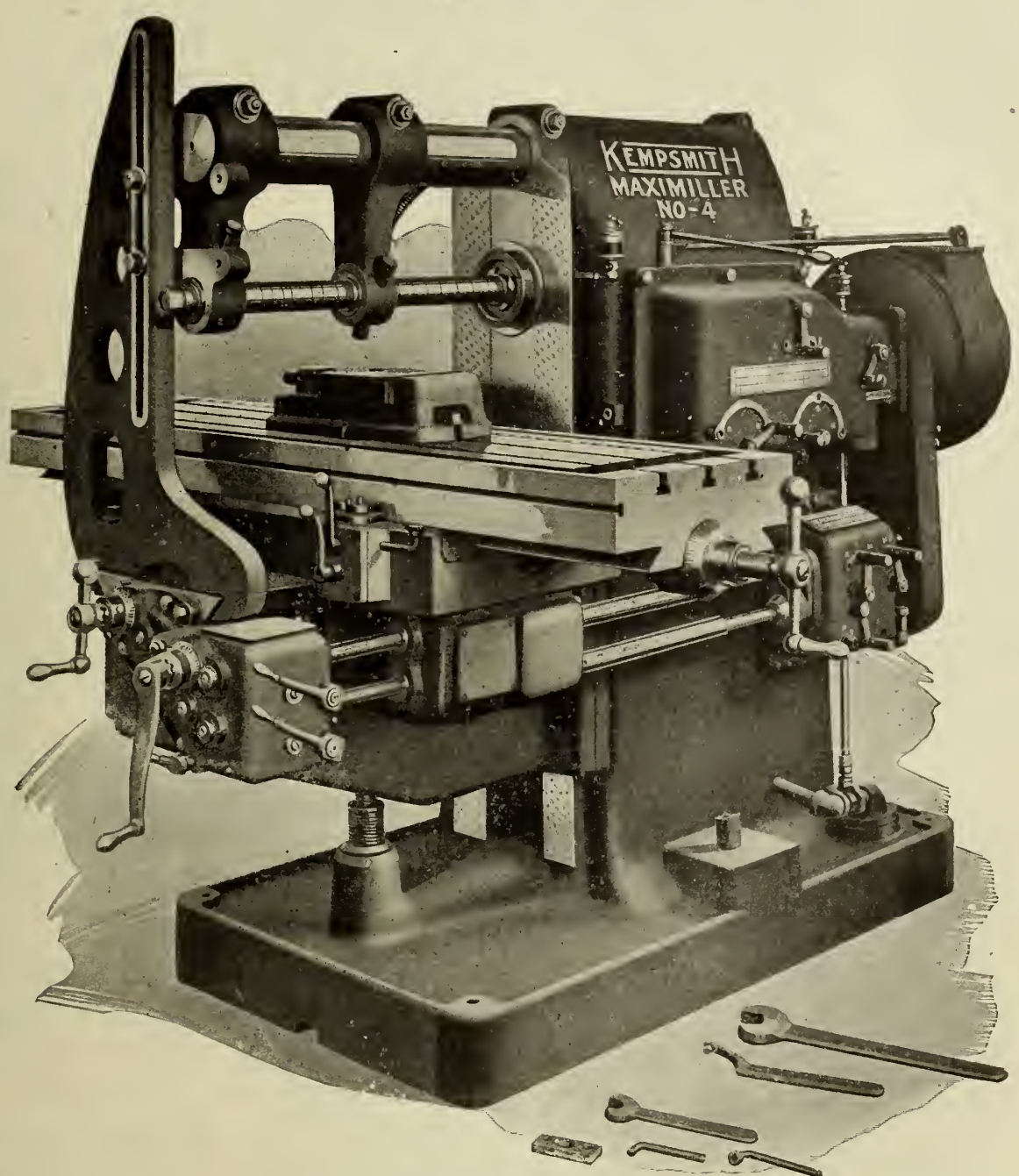

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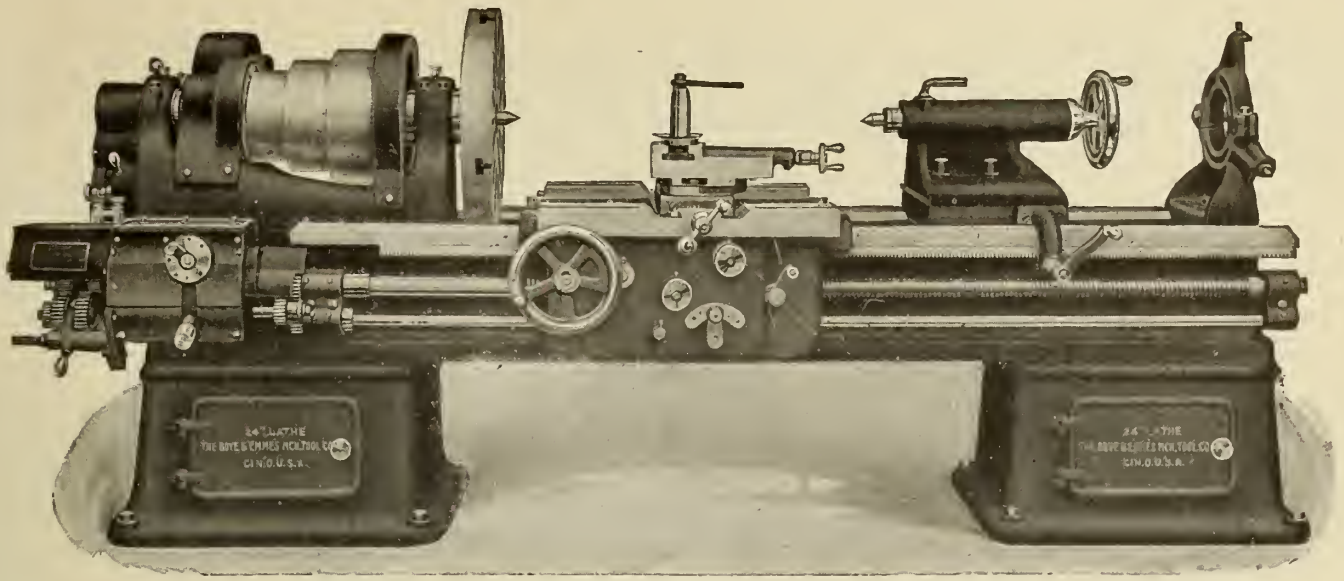

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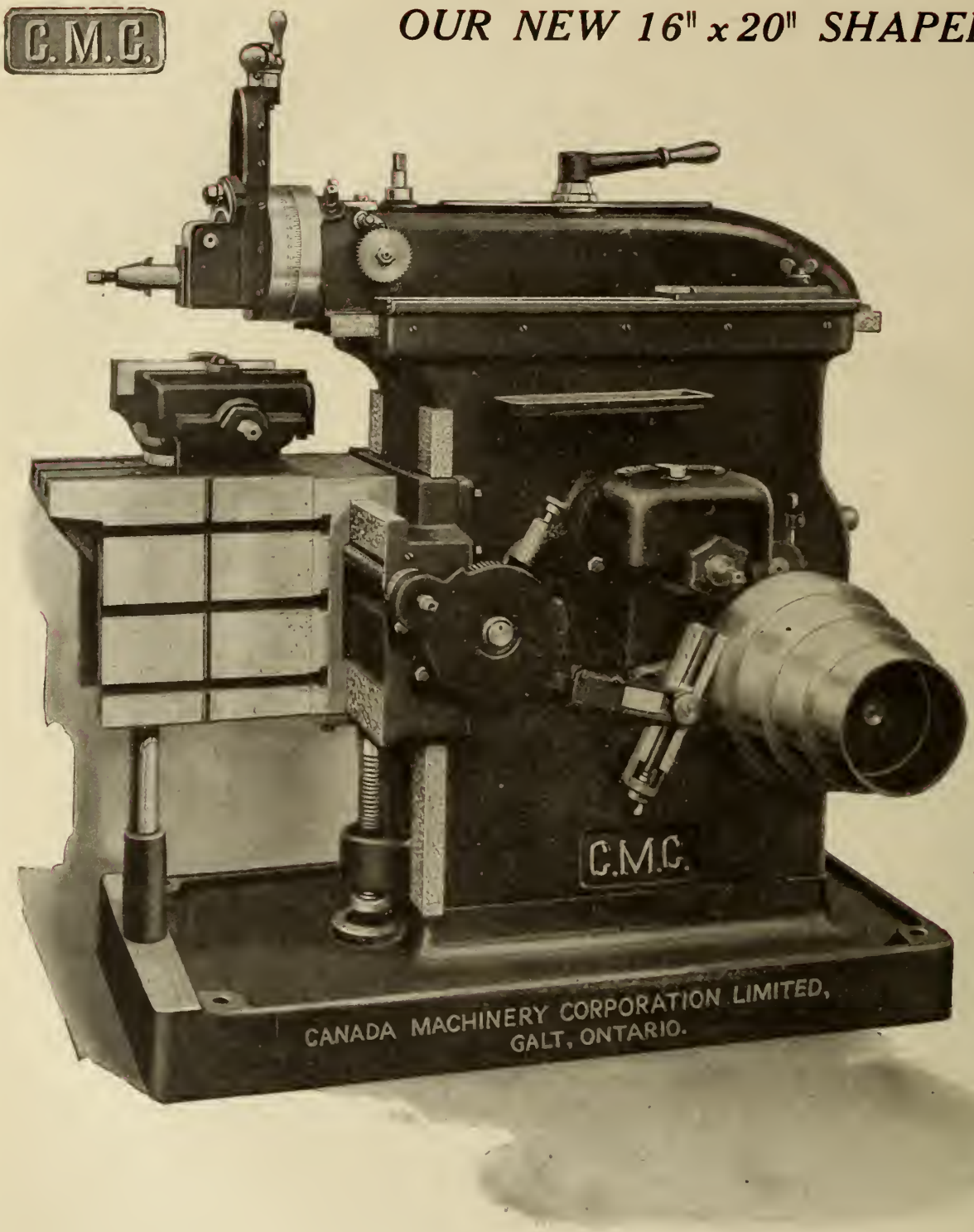

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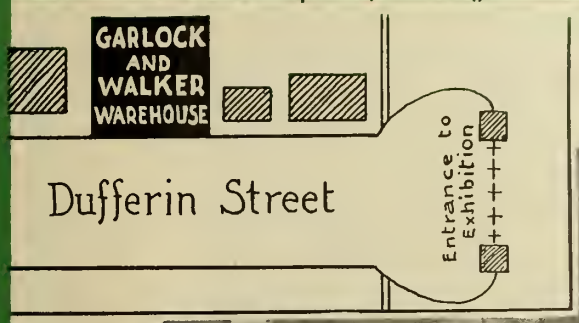

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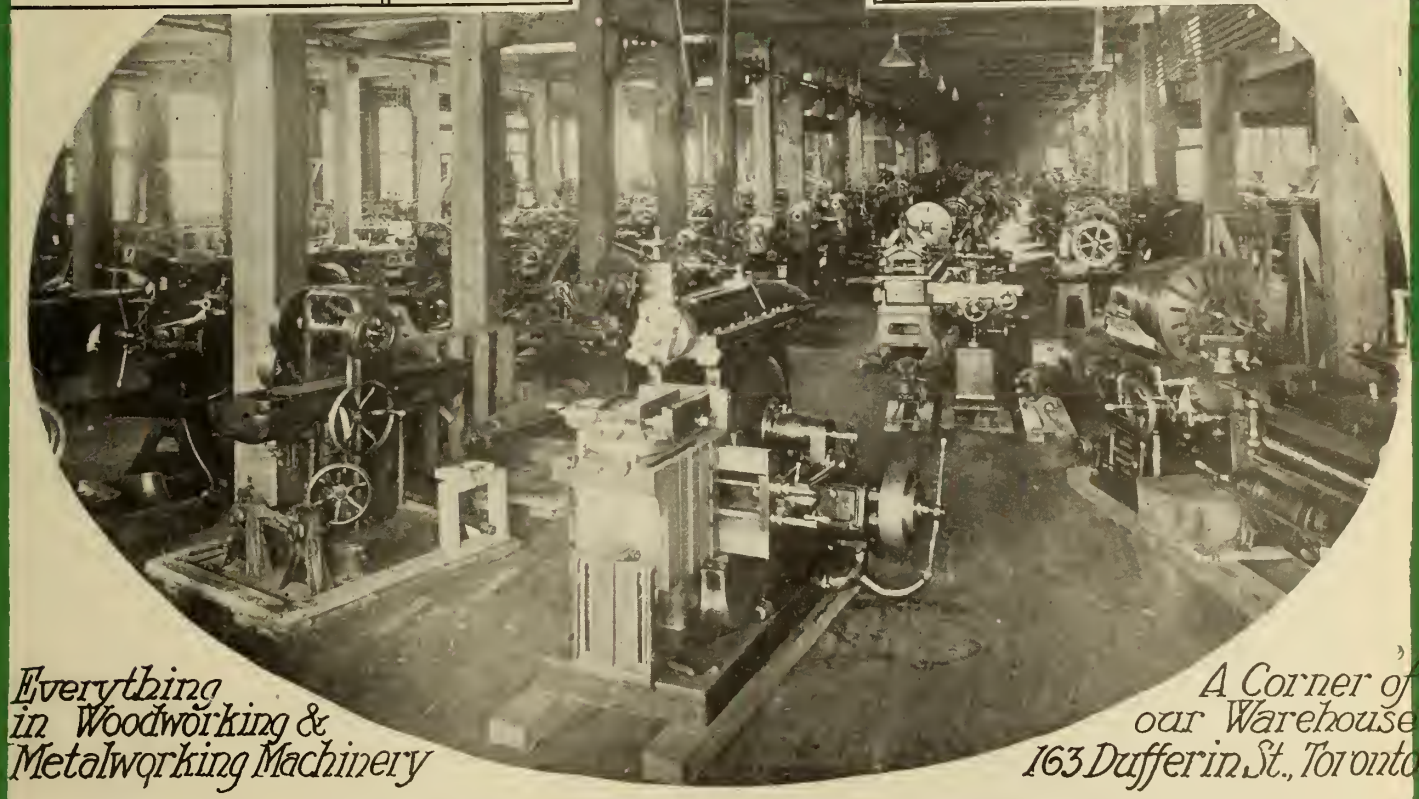

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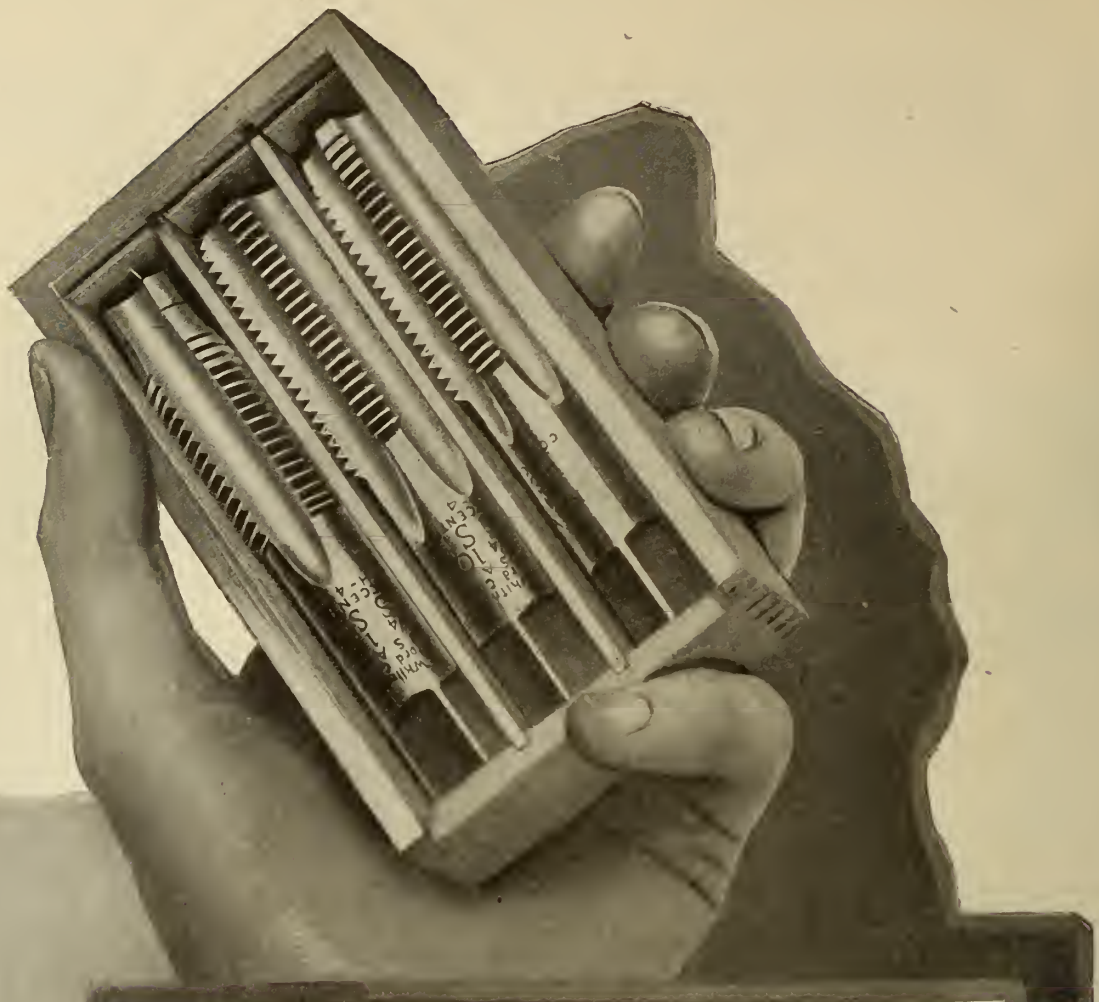

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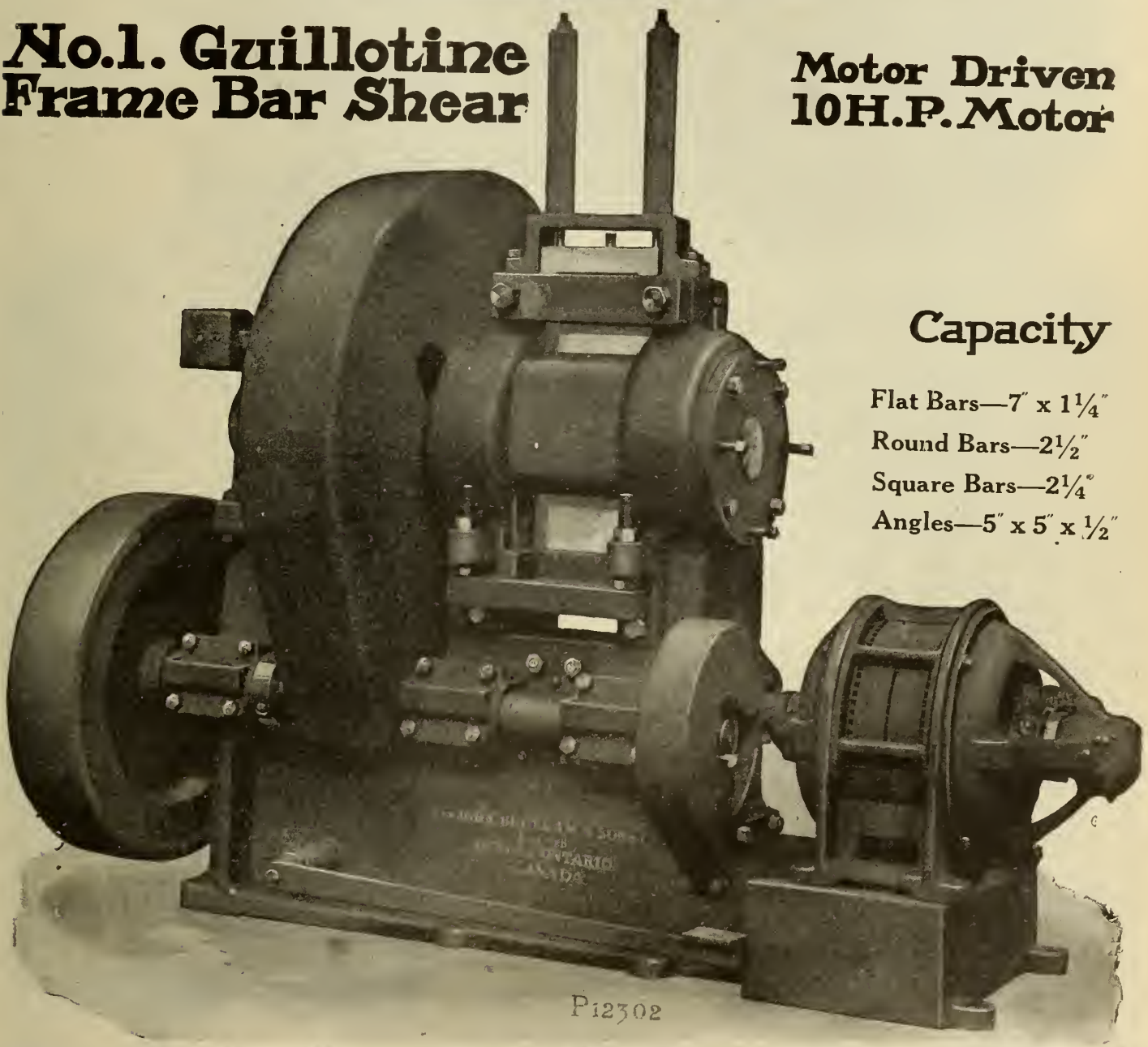
Motor Driven 10 H.P. Motor



Capacity

Flat Bars—7″ x 1¼″
Round Bars—2½″
Square Bars—2¼″
Angles—5″ x 5″ x ½″

The John Bertram & Sons Co., Limited

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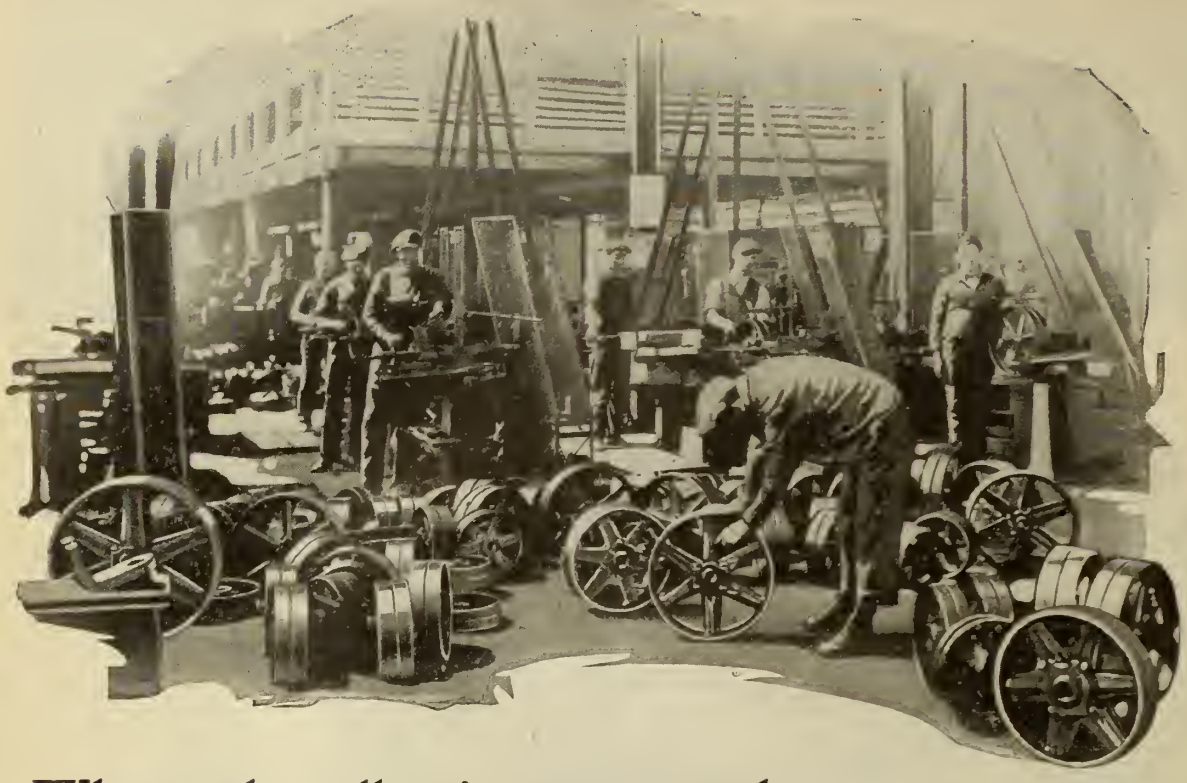
Canadian Machinery and Manufacturing News, August 19th, 1920. Vol. 24, No. 8. Published weekly at 143-153 University Avenue, Toronto, Canada. Subscription price in Canada, $4; United States, $4.50. Entered as second class matter at the Post Office Department, Ottawa, Canada. Entered as second-class matter July 1, 1912, at the Post Office Department at Buffalo.



Why each pulley is guaranteed —What it may mean to you

IN the beginning when the American Steel Split Pulley idea was new, our guarantee was a matter of necessity. Today it is a matter of pride. For so many "Americans" have been installed (over five million) and the preference for "American" Pulleys has gained such momentum that it is doubtful whether the guarantee sells any more pulleys or not.

If you do not know the "American" Pulley, this simple guarantee may help you to consider it with greater confidence:

Guarantee—**"American" Pulleys failing in service from any defect in material or manufacture within five years will be replaced without charge.**

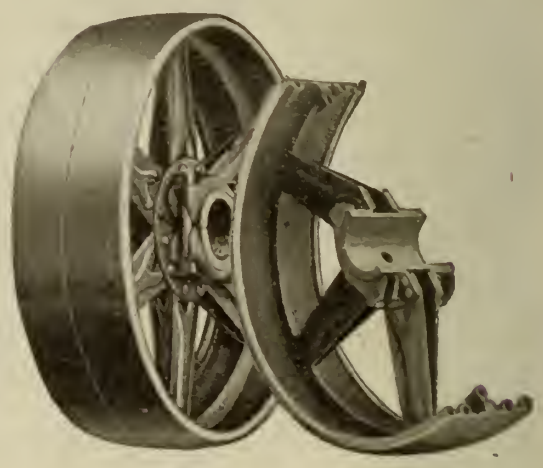
But more significant than the guarantee itself is that careful records for more than a dozen years show the number of "Americans" replaced have amounted to just a trifle over one-tenth of one per cent of the pulleys sold.

You will perhaps better understand *all* pulleys if you will obtain a copy of the book, "Getting Maximum Pulley Efficiency." We'll send it free, of course. Will you tell us where?

For name and address of nearest Dealer, see Donnelley's Red Book. On file at all leading libraries, national banks and hotels.

The American Pulley Co.
Philadelphia, Pa.

AMERICAN STEEL SPLIT PULLEYS



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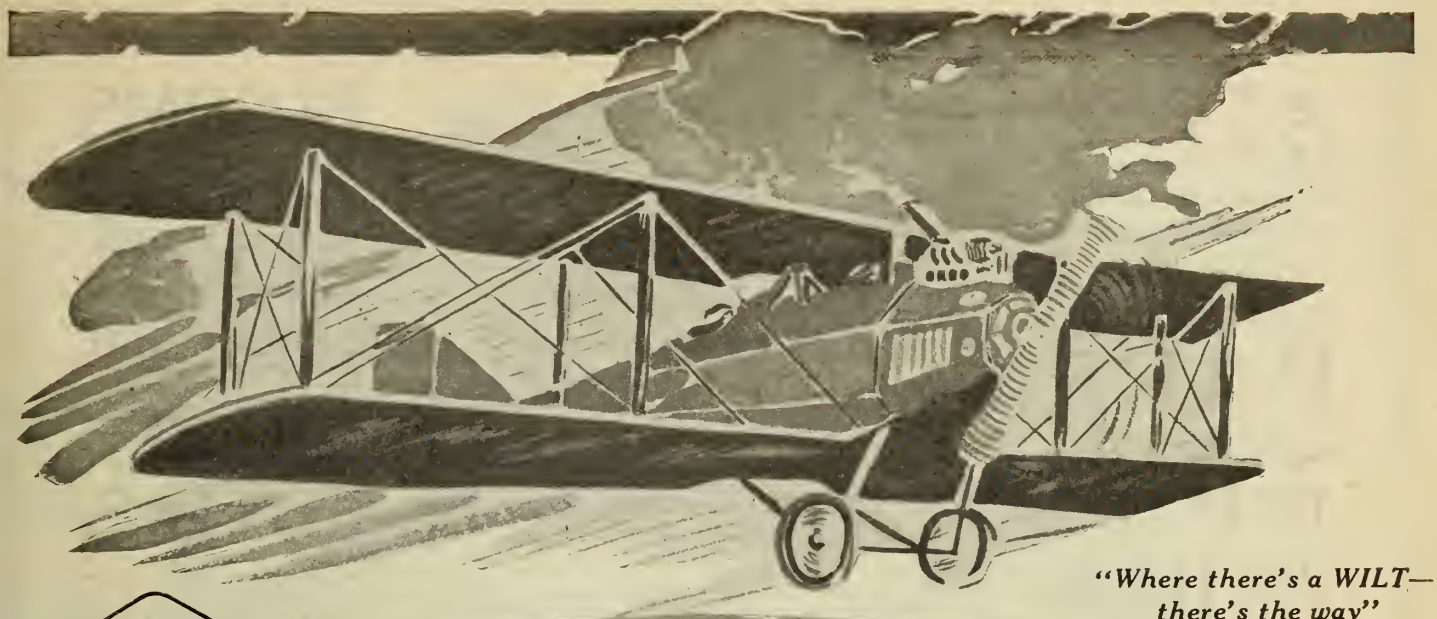
"A wheel with a broad rim transmitting power from or imparting power to machinery, or changing the direction of motion by means of a flat belt."

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.



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"Where there's a WILT—there's the way"

Achievement through Quality

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The aeroplane is representative of highest quality in mechanical construction. Every bolt, nut and screw—every part—is typical of quality. Hundreds of drilled holes are contained in every flying machine. These holes must be accurately drilled—quality drills for quality work! That's why WILT Drills are numbered among the tools selected for the best class of work both in Canada and Great Britain.

Whether it be High Speed or Carbon Twist Drills, Milling Cutter or Reamer, you can depend upon Wilt for Quality.

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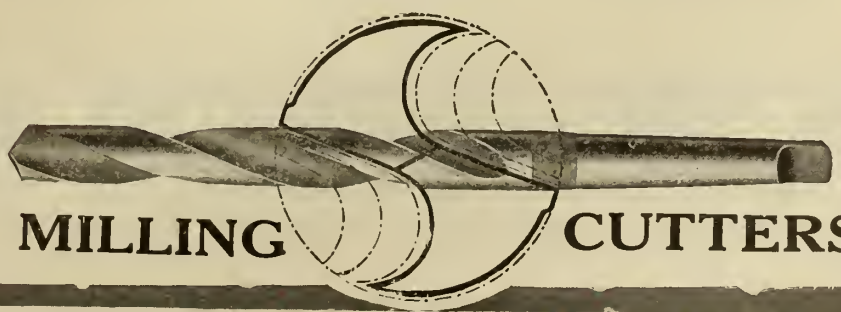
"Made in Canada"



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STEEL RAILS
Open Hearth Quality
(All Sections from 12 lbs to 100 lbs per yard)

SPLICE BARS

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PIG IRON
BASIC, FOUNDRY-
MALLEABLE

SULPHATE OF AMMONIA

MARK OF ALGOMA O.H. QUALITY

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OPEN HEARTH
ALLOY STEELS

Chrome-Vanadium
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All of these Steels we supply in HOT ROLLED BARS. We also furnish in BLOOM, BILLET and SLAB form.

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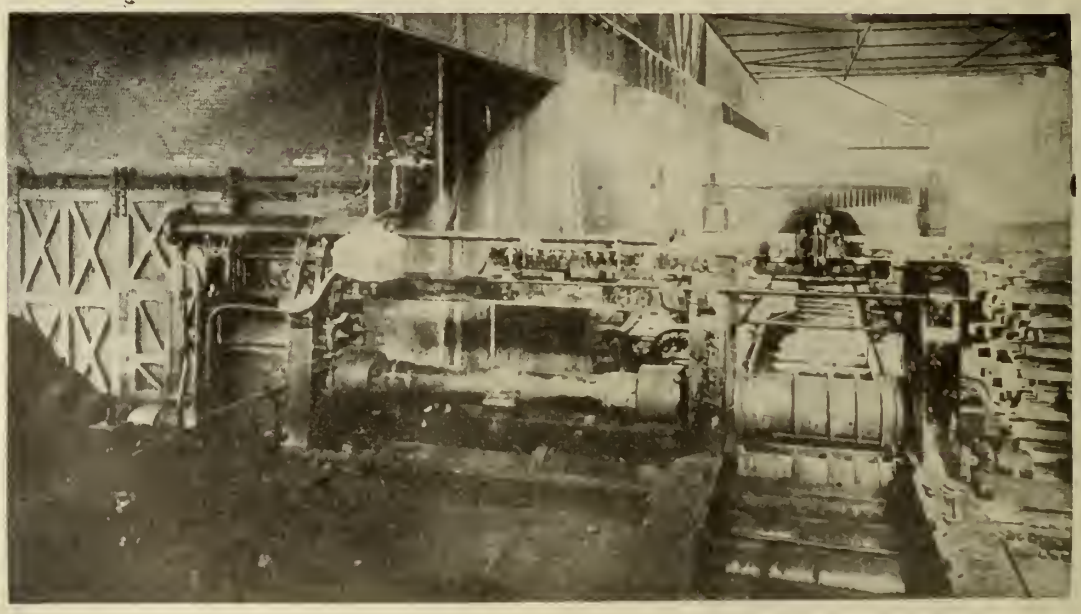

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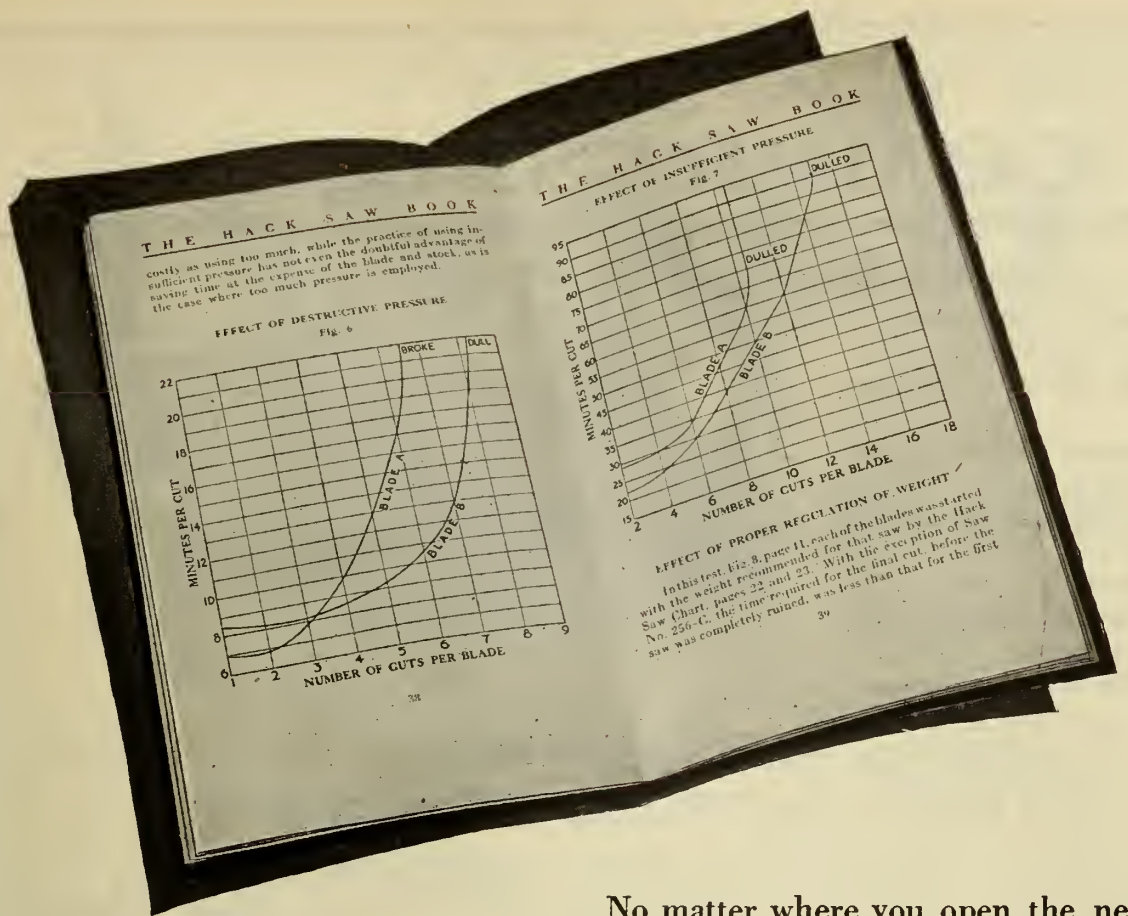
THE HACK SAW BOOK
costly as using too much, while the practice of using insufficient pressure has not even the doubtful advantage of saving time at the expense of the blade and stock, as is the case where too much pressure is employed.
EFFECT OF DESTRUCTIVE PRESSURE
Fig. 6
BROKE
DULL
MINUTES PER CUT
NUMBER OF CUTS PER BLADE
BLADE A
BLADE B
38
THE HACK SAW BOOK
EFFECT OF INSUFFICIENT PRESSURE
Fig. 7
DULLED
MINUTES PER CUT
NUMBER OF CUTS PER BLADE
EFFECT OF PROPER REGULATION OF WEIGHT
In this test, Fig. 8, page 11, each of the blades was started with the weight recommended for that saw by the Hack Saw Chart, pages 22 and 23. With the exception of Saw No. 256-C, the time required for the final cut, before the saw was completely ruined, was less than that for the first
39

The Book of Hack Saw Economy

No matter where you open the new Starrett book, "Hack Saws and Their Use", you'll get a pointer on lowering cutting costs.

Cutting speeds and proper blades to use with various materials, pressure, lubrication, composition and tempering of hack saw steel, set, shape and pitch of the teeth—every factor in the economical use of blades is dealt with in its 64 pages.

If you use hack saws you need "Hack Saws and Their Use",—a practical book. Write for a free copy.

THE L. S. STARRETT COMPANY

The World's Greatest Toolmakers
Mfrs. of Hack Saws Unexcelled

ATHOL, MASS.

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Use Starrett Blades

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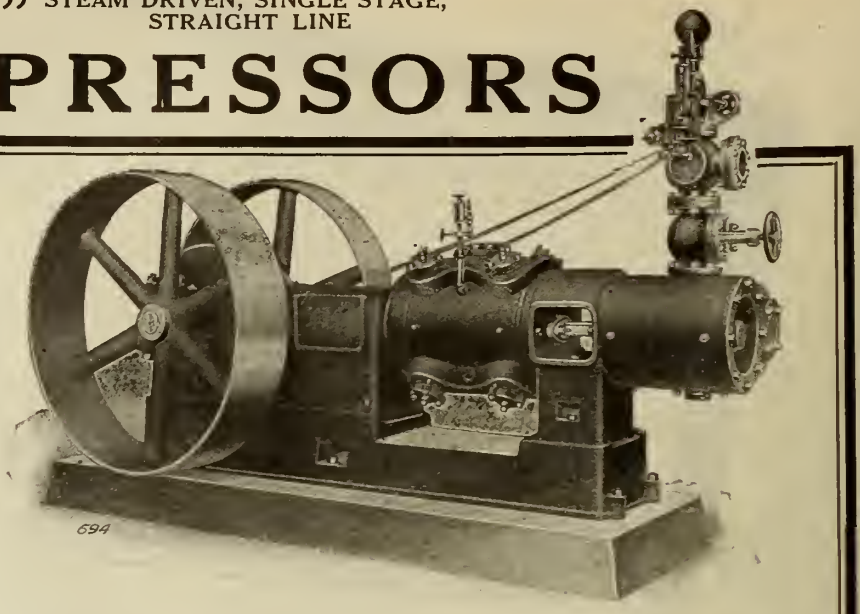
CLASS "FL-1" STEAM DRIVEN, SINGLE STAGE, STRAIGHT LINE

AIR COMPRESSORS

Here are a few F L-1 Features:

Noiselessness in operation
Accessibility of all parts
Enclosed dustproof construction
Simple, compact and rigid design
Automatic lubrication at all speeds
High compression efficiency
Low cost of installation, operation and repairs
Convertibility to belt or motor drive and vice versa when desired

Bulletin K-302-A describing these machines is now on the press. Write our nearest branch for your copy.



These machines are built in six sizes with capacities of 64 to 464 cubic feet. The two smallest machines have plain slide valves and the larger sizes are fitted with balanced piston valves.

Air valves of the "Circo" Silent Leaf type require no lubrication, allow the freest possible admission and discharge of air, and are easily removed and cheaply replaced when necessary.

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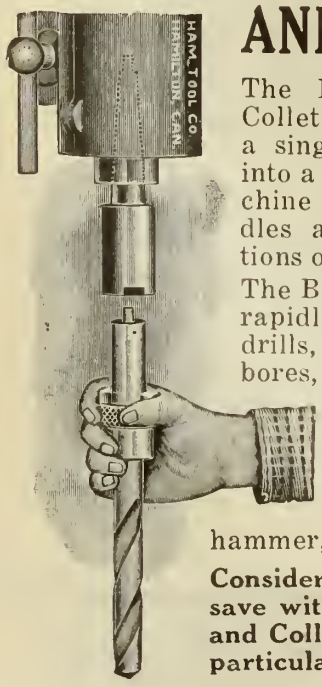
THE BEAVER CHUCK AND COLLET



The Beaver Chuck and Collet practically converts a single spindle machine into a multiple spindle machine with as many spindles as you have operations on any piece of work. The Beaver enables you to rapidly interchange your drills, reamers, counterbores, etc., **without stopping the machine.** A self-contained device releases the collet and tool instantly, withut the use of hammer, tool or key.

Consider the time you can save with the Beaver Chuck and Collet and write for full particulars.

The Hamilton Tool Company, Ltd.
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Manufacturers:

The Sheffield Twist Drill & Steel Co.
LIMITED
Works: Summerfield St., Sheffield

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LONDON OFFICE: Suffolk House, 5, Laurence Pountney Hill, London, E.C. 4.

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We are manufacturing SPECIALISTS—Carry large STOCKS—Give PROMPT deliveries, and rely upon our products for REPEATS.

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"WACO"

THE HIGH-SPEED STEEL

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Crucible
AND
Open Hearth Steel
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"ARGO" BRAND *HIGH-SPEED* STEEL

The John Illingworth Steel Co.
1856

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RALPH B. NORTON, AGENT
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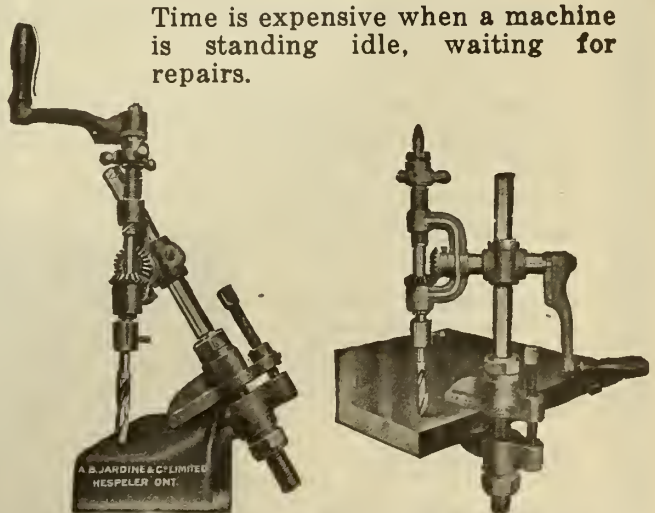
Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.



On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, $26.50 net.
Sold by all Machinery and Supply Houses

A. B. JARDINE & CO., Limited
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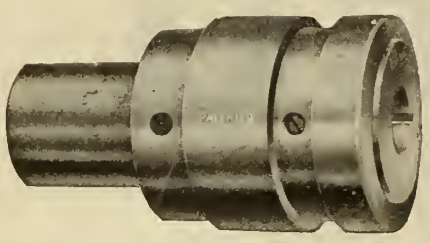
THE JOHNSON FRICTION CLUTCH



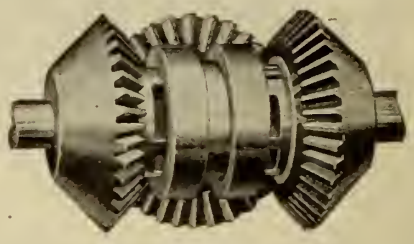
Single Clutch

Better Clutch Service
And More Of It

There is one big reason for the wide adoption of the Johnson Clutch—that is, its record of dependable service. Other features recommend it for many situations. In compactness, simplicity and adaptability it is unequalled. But what appeals to its users more than anything else is its superior durability.

The Johnson Clutch is made in eight sizes, from ½ to 4 H.P. per 100 R.P.M. For overhead transmission it offers a compact clutch of excellent quality, perfectly balanced for any speed. No other type is so readily adaptable to special conditions. The Johnson Clutch in special designs is serving on all types of machinery. Our booklet, "Clutches as Applied to Machine Building," shows many of its possibilities.

Write for our Yellow Catalog.



Double Clutch Between Bevel Gears

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We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

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MANGANESE STEEL TRACKWORK

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Manufacturers of Balkwill Articulated Manganese-Steel Crossings

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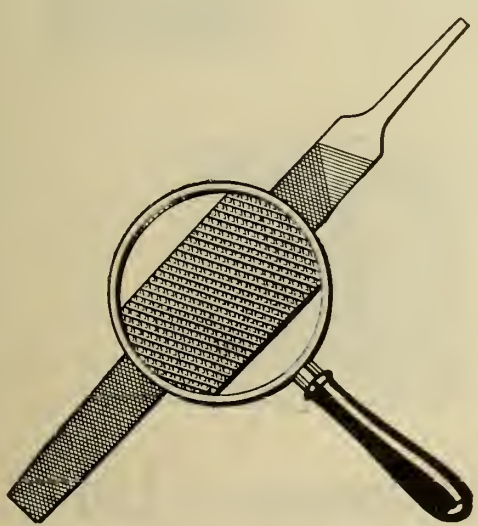

How Long Should A File Last?

That will depend partly upon the work it is called on to do.

But one thing is sure—the minute a file has lost its original sharpness, it should be discarded. New files cost less than the time and temper of your workmen.

Famous Five Files retain their keen edge till they have given full value in service. Special steel, accurate cutting and thorough hardening ensure that.

These Famous Five brands are the standard of file efficiency:

KEARNEY & FOOT
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AMERICAN
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Made in Canada by

Nicholson File Company

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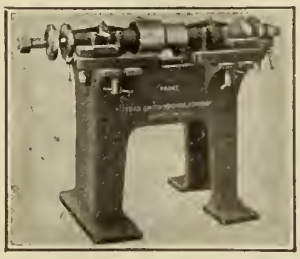
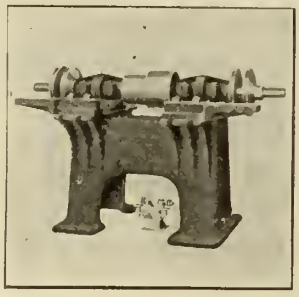
Ford-Smith

Machine Tools of Quality, Canadian Made

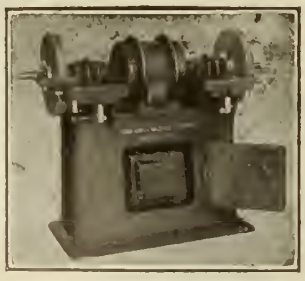


Many manufacturing operations show possibilities of exceptional economies by the use of grinding processes. Have one of our engineers call and see just what saving grinders would effect on your work.

Every ordinary requirement of the modern shop can be successfully cared for by some machine in the wide range of style and size of the Ford-Smith line. And for your unusual work, our long experience enables us to give complete satisfaction in the construction of special machinery.



Full particulars of all Ford-Smith grinders will be found in our catalog. A copy will be sent upon request.



The Ford-Smith Machine Company, Ltd.

HAMILTON - ONTARIO - CANADA

Foreign Selling Agents:—

W. E. Storey, London, England
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This Mark is a Guarantee of Merit

Look for this mark on the Sheet-Metal Workers' Tools you purchase. It is a guarantee that they conform in every respect to the Brown-Boggs standard of quality

"B-B" quality and service pave the way to economical production. Years of exhaustive experiment and manufacture have resulted in many improvements in the various designs of the "B-B" products. Every article is manufactured with great care by thoroughly competent workmen, and is rigidly tested before leaving the factory.

Make sure of the Brown-Boggs trade-mark—it means *reliable service!*

1,000 lb. Board Lift Drop Hammer

The latest type "B-B" hammers have many exclusive features which add greatly to their efficiency and durability.

The old-fashioned, noisy gears have been eliminated entirely, the hammer being lifted by friction exerted by a powerful eccentric motion under perfect control of the operator at all times.

Catalogue upon request.

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Manufacturers of Sheet Metal Working Machinery, Presses, Shears, Rolls, etc.

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"MEAD-MORRISON" Electric Car Puller

Made in Canada

Mounted alongside the track, it will pull one loaded and one empty coal car easily.

How do you get the empties back on the siding?

Requires only ONE man to operate.

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CANADIAN MEAD-MORRISON CO
LIMITED
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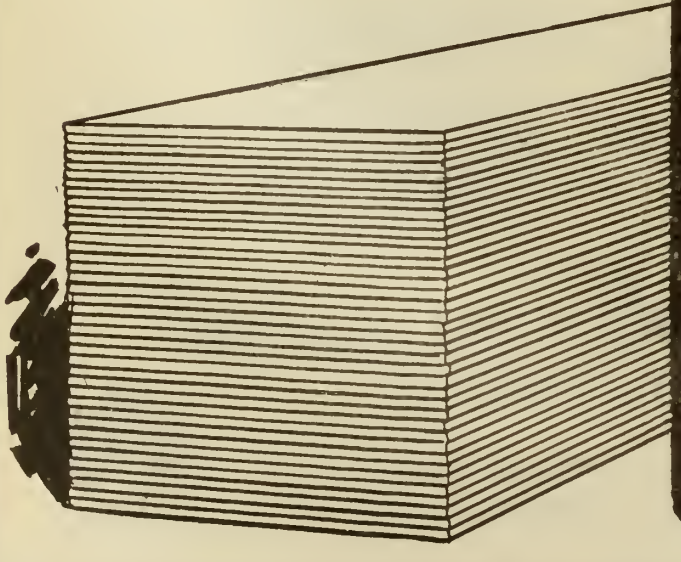
WORKS: WELLAND ONT.

Get along without the Switching Locomotive.

Deep Drawing Plate



WE manufacture plates of various drawing qualities for such work as

AUTOMOBILE FRAMES
CRANK CASES
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and
PRESSED STEEL PARTS
of all descriptions

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LIONROYAL
ALLOYED UNDER THE STANLEY PROCESS
BABBITT METAL
is a low cost bearing alloy in both price per pound and cost per year.
For General Service

BRITISH SMELTING & REFINING Co. Limited.
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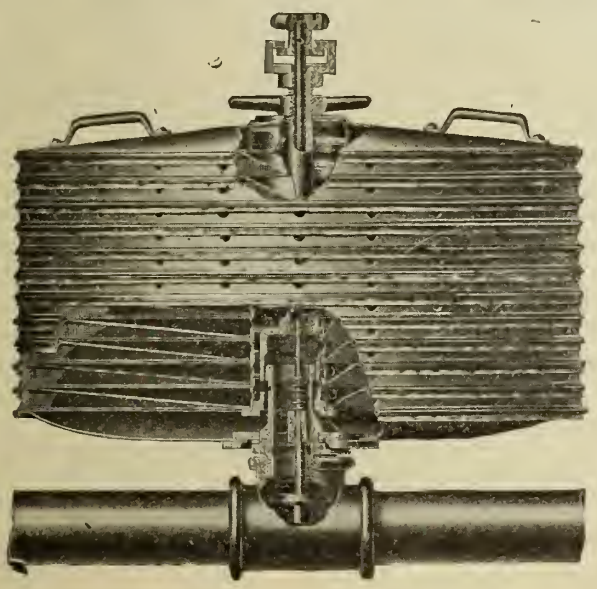
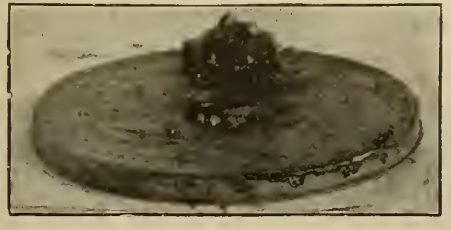


No. 1—Sectional View of Bowser Filter Section Assembled.



No. 2—Filter Disc with dirt filtered from oil.

It Gets The Dirt
It's A BOWSER Oil Filter

The pictures shown illustrate the Bowser Filter Section as used in the Bowser Oil Filter.

No. 1 shows the Filter Section assembled, ready for use. No. 2 shows one of the Filter discs with dirt that the Filter has collected from used oil. This pile of dirt is about 6 in. in diameter and from 2 in. to 3 in. high.

There are twelve of these filter discs and cloths in a Bowser filter section, each as effective as the one you see pictured. As many complete Filter Sections as needed are furnished in the Bowser System.

Bowser Systems are applicable to any size and type of power producing and transmitting machinery.

We will be glad to send literature and explain to you how the Bowser principle of Oil Filtration can be applied to your power plant.

S. F. BOWSER COMPANY, Limited

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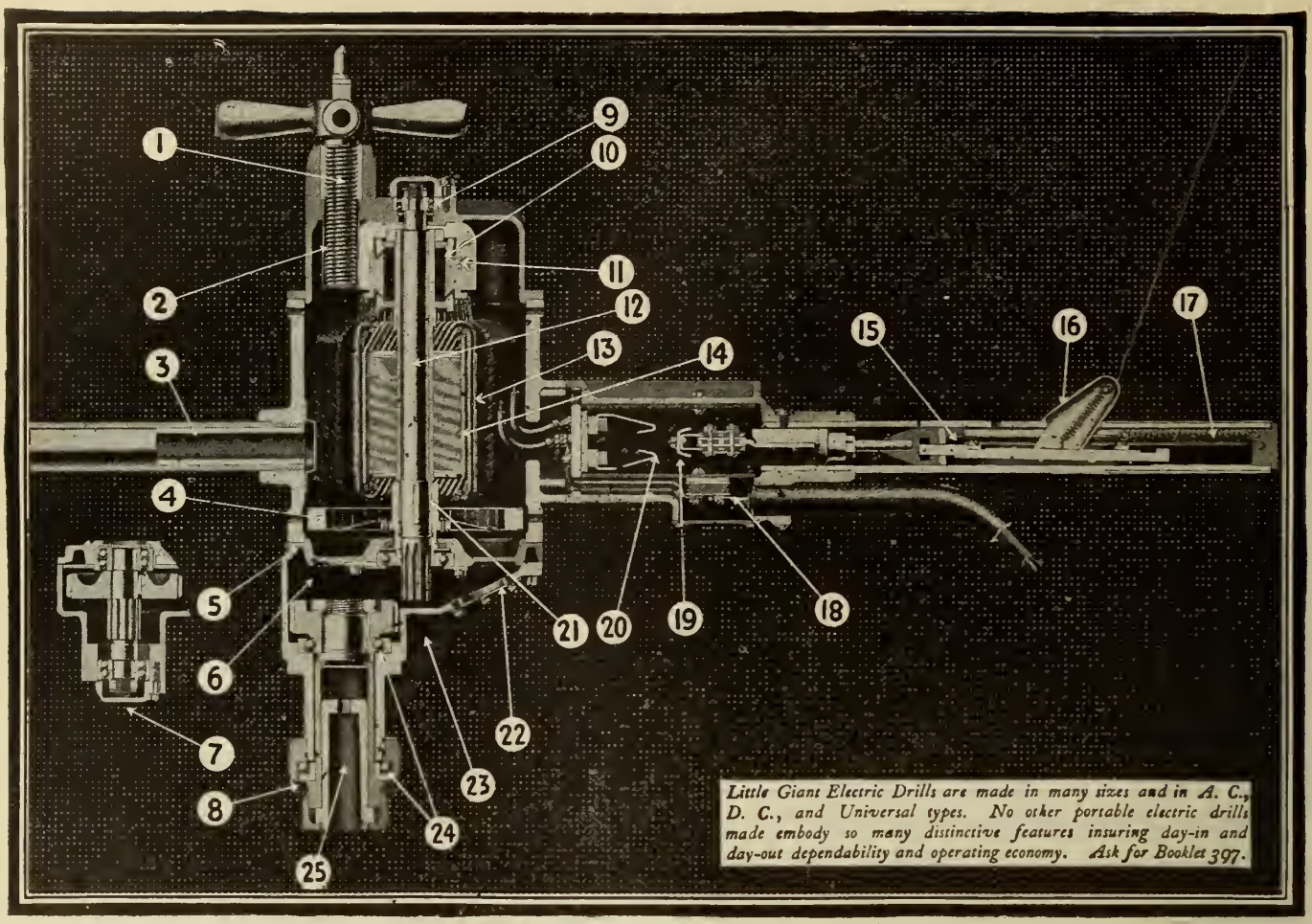
Offices in Principal Cities of the World



Little Giant Electric Drills are made in many sizes and in A. C., D. C., and Universal types. No other portable electric drills made embody so many distinctive features insuring day-in and day-out dependability and operating economy. Ask for Booklet 397.

Inside Information

why Little Giant Electric Drills accomplish results

1 Long feed screw entering into body of supporting bracket, thus giving same results as telescopic feed.
2 Protecting sheath, preventing entrance of dirt into drill if feed screw is removed.
3 Dead handle reinforced at point of greatest strain.
4 Sheet steel fan, carefully balanced and reinforced, providing thorough ventilation.
5 Solid transfer plate or diaphragm preventing grease or oil in gear case from entering windings.
6 Liberal grease compartment for providing reliable lubrication of gears and ball bearings.
7 Section thru intermediate gears. Note wide *double* row of ball bearings at each end of gear shaft (used on large drills). Pinion and gears made of special alloy steel carefully heat-treated.
8 Dust protector for excluding dust from lower thrust ball bearing.
9 Ball bearing easily accessible for lubrication and inspection.
10 Commutator of sturdy design and construction, thoroughly insulated with mica.
11 Large opening with well secured and readily removable cover plates providing easy access to brushes and commutator.
12 One-piece armature shaft and pinion of tool steel, hardened and ground, insuring perfect alignment of pinion at all times. On large size drills armature shaft is removable from the armature core and commutator, which are mounted jointly on a quill or spider.
13 Laminated pole pieces, minimizing pole face losses (used on large drills).
14 Armature coils form wound, heavily insulated, and carried in insulated slots in armature core. After winding and connecting to commutator, coils and armature are again dipped in insulating varnish and baked.
15 Quick acting control switch, making slow break impossible and preventing destructive burning of contacts.
16 Conveniently located trigger for operating switch.
17 Safety return spring for automatically opening switch when operator removes hand from switch handle (used on large drills).
18 Terminal block for cable, permitting ready removal of cable without disturbing other connections.
19 Cover plates on each side of switch, providing easy access to switch contacts.
20 Double pole, double break switch. Rugged contacts are readily removable.
21 Long fan-hub of high grade steel, hardened and ground. Press fit on shaft with long key insures permanent rigidity.
22 Cover plate quickly removable for inserting grease in gear case.
23 Reinforcing rib on gear case, insuring proper strength and rigidity.
24 Combined annular and thrust bearing at each end of spindle.
25 Removable socket inserted in spindle. Driving lugs on socket milled from the solid.

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354-356 St. James Street, Montreal, Canada

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Canadian Factory: Canadian Pneumatic Tool Company, Montreal

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LITTLE GIANT

Electric Tools

Another New Link-Belt Data Book

Enables you to select Roller Chain Drives for Industrial Drives,—Tractor and Truck Drives

FOR years the power transmission engineer had his Link-Belt Silent Chain Data Book, which enabled him to select the correct silent chain drive for his purpose and figure its cost. This is the recognized authority on silent chain drive practice.

And now comes this new hand-book of roller chain practice. It shows how to figure drives, determine prices, gives information on care and upkeep, and a wealth of other information on this whole subject which will prove invaluable to the engineer and others interested in roller chain.

The subject of wheels is also gone into very thoroughly. (The chain is the standard and the wheels must be made to fit it, to assure their working together properly.)

In short it is a complete handbook of roller chain application and design. It is not merely a catalog.

Send for it today. Use the coupon.

CANADIAN LINK-BELT COMPANY, LTD.
WELLINGTON AND PETER STREETS
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Link-Belt Company, 910 S. Michigan Ave., Chicago, Ill.

Please send me a copy of your New Roller Chain Data Book No. 257.

*Name*_____ *Firm*_____

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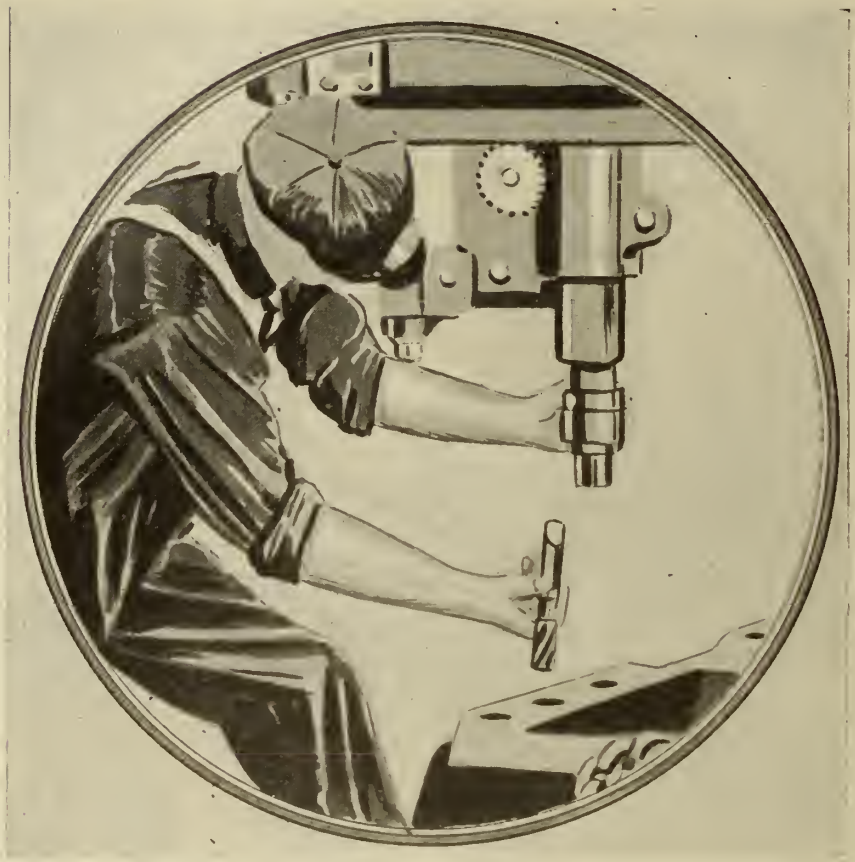
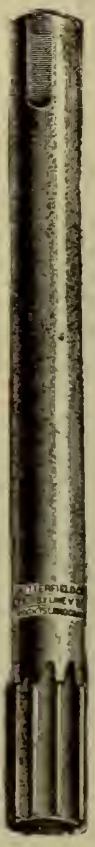
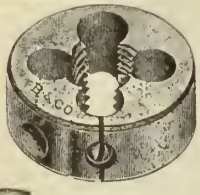
Butterfield







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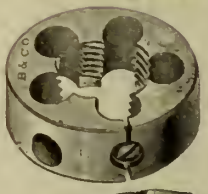

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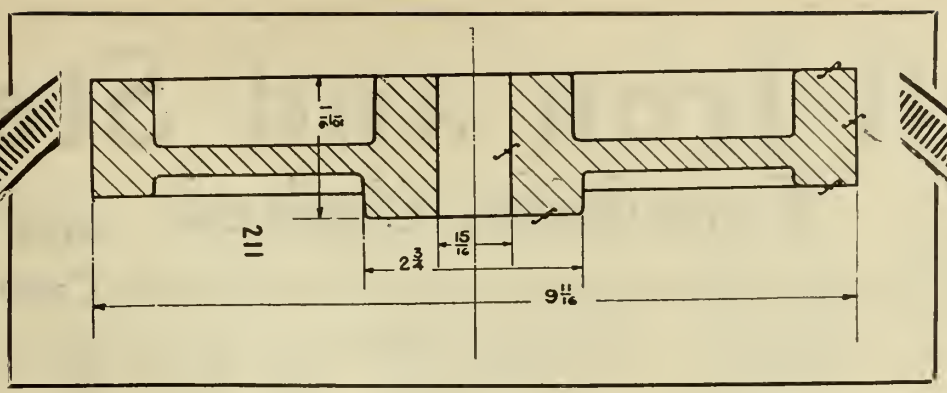

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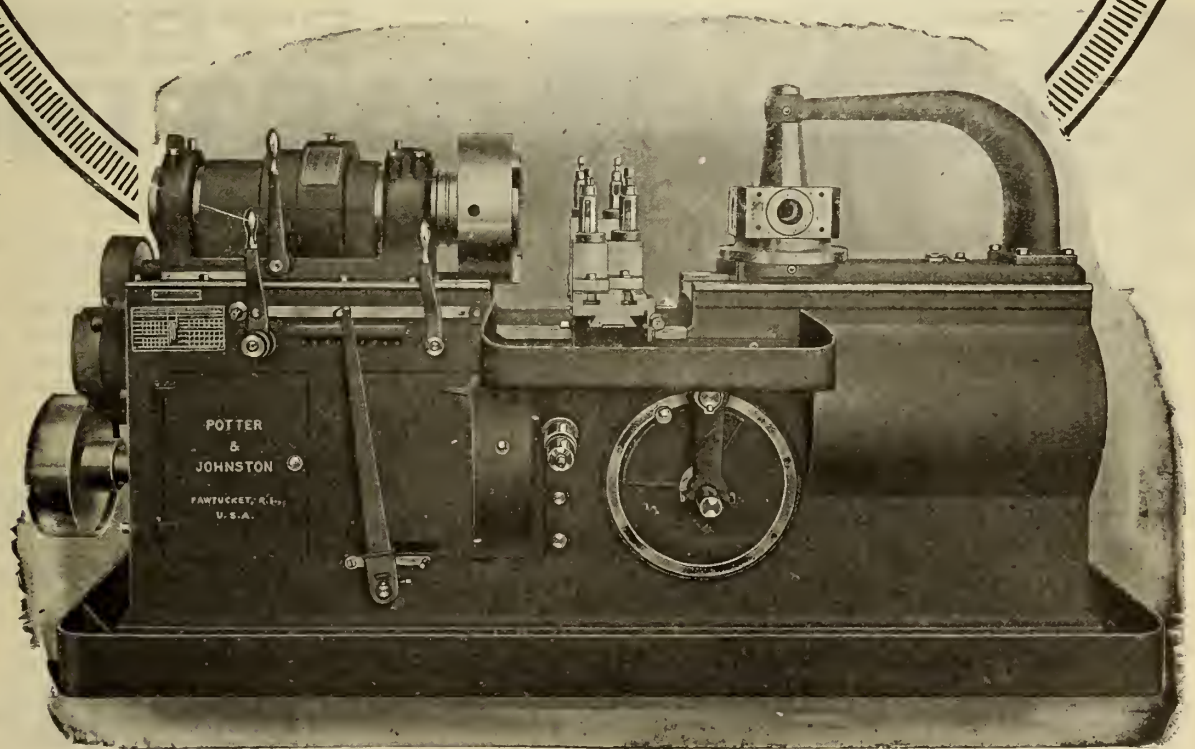

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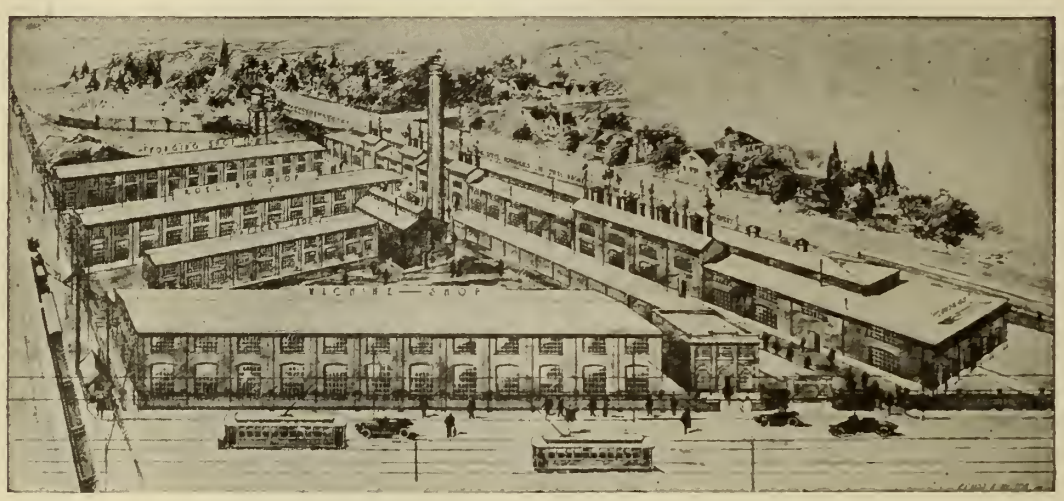

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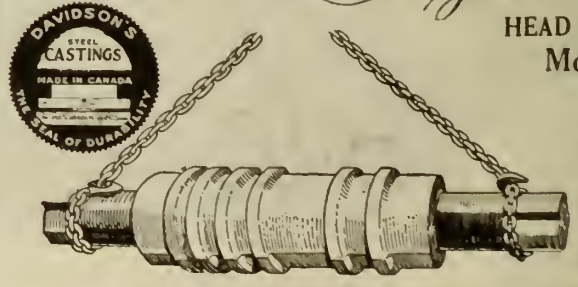

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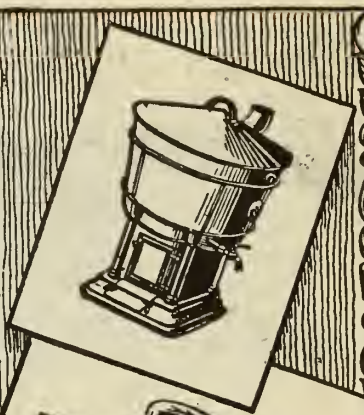
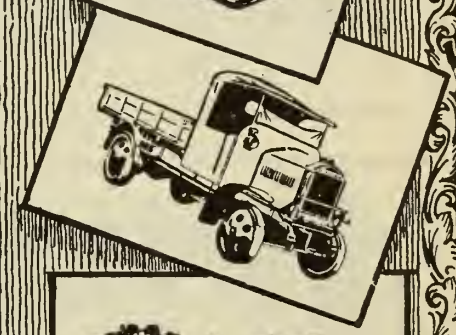
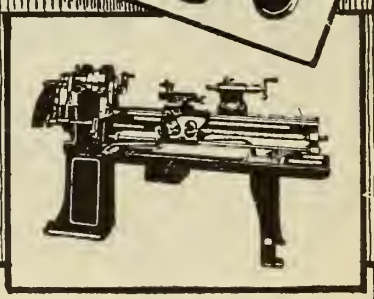
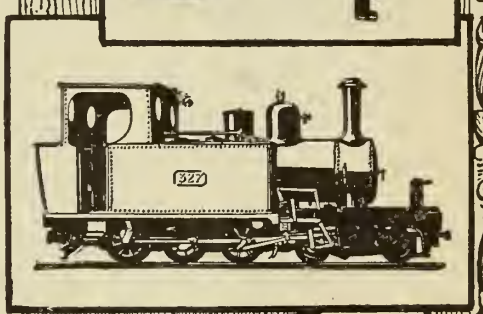

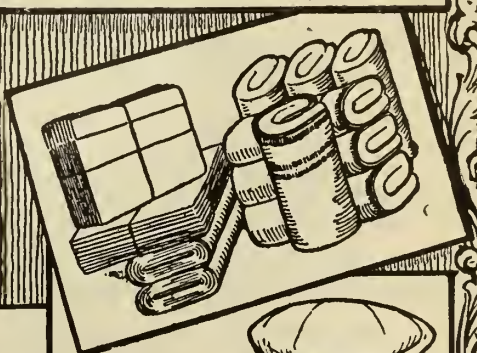

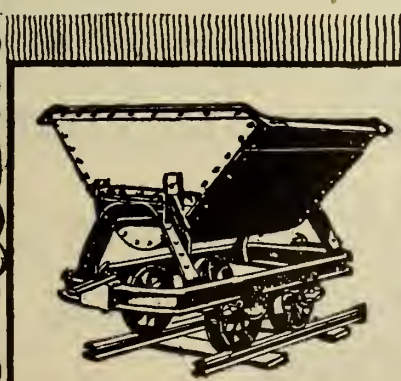
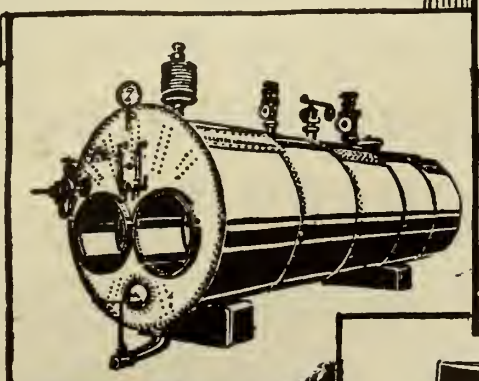

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Planers, Presses, Derricks, Steam Pumps, Brick Machinery, Gear Cutting, Grey Iron Castings, Blacksmith Work.

A Decided Saving

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TYPE "R"

HARTNESS AUTOMATIC DIES

FOR REVOLVING SPINDLES

The No. 4 Type R Hartness Automatic Die has been designed for use on revolving spindles, either Vertical or Horizontal.

THREE TYPES OF CONTROLS

Outside button coming into contact with some set stop on the machine.

Regular knock-off by carriage coming to a stop while chasers, which are carried along by the revolving thread, pull the body away from the latch pin.

Sleeve control enable chasers to be released or locked at any time.

The Hartness Automatic Dies are the only automatic dies made that will, without the aid of lead screws, cut threads rivaling in lead accuracy those cut by the best engine lathes.

Jones & Lamson Machine Company

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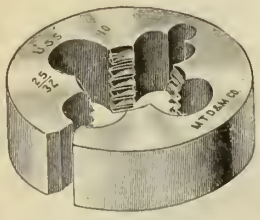

"MORSE" DIES Will Give It

Being made of tough material they stay right on the job, cutting

Clean, Accurate Threads

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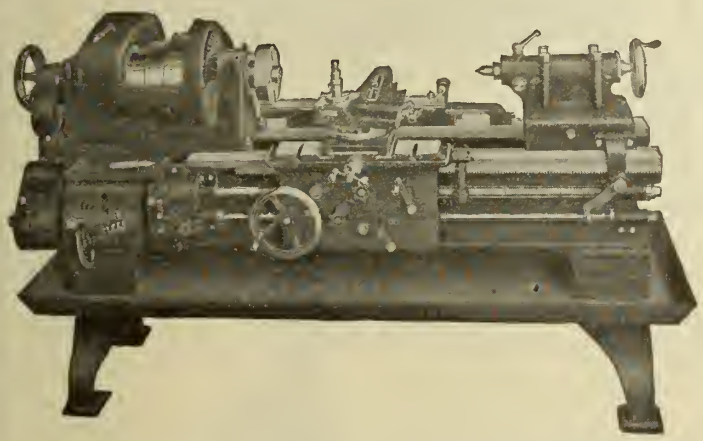
Silent Chain Drive

"LEHMANN LATHES"

Will Put the Same Degree of Efficiency Into *Your* Shops as They Have in Many Others



TWO SIZES—16", Swing 18¼" and 18", Swing 20¼"

Because they are constructed "right" of the best material, workmanship and design, and therefore are adaptable to all conditions, whether it be work requiring accuracy to the highest standards or for the heavy duty where power, strength and rigidity are required.

Convince yourself of these facts! Let us send you complete specifications of this superior lathe and the names of some of the larger concerns who are using "LEHMANN LATHES" for better results.

We know you are interested, so don't put off writing us. Do it to-day. Now!

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Machine shops the world over, for more than a quarter of a century, have recognized Armstrong Lathe Tools to be by far the Best in lathe tool equipment.

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THE WORLD'S STANDARD LATHE AND PLANER TOOLS

By using Armstrong Tool Holders in your shop you will make one pound of High Speed Steel do the work of ten pounds in forged tools, save all forging and 70% of grinding.

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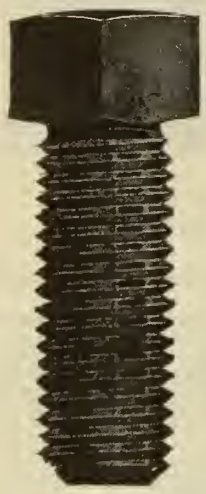

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Complications in the construction of our High Speed Hydro-Pneumatic Press are so few that its operation is more readily understood than that of a more intricate machine.

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Particularly adapted for straightening cam, crank, pinion and wheel shafts, axle tubes, pinion tubes, assembling differential housings, assembling bearings in hubs, bushings in spindles and wheel rims, testing springs front and rear, broaching brake levers.

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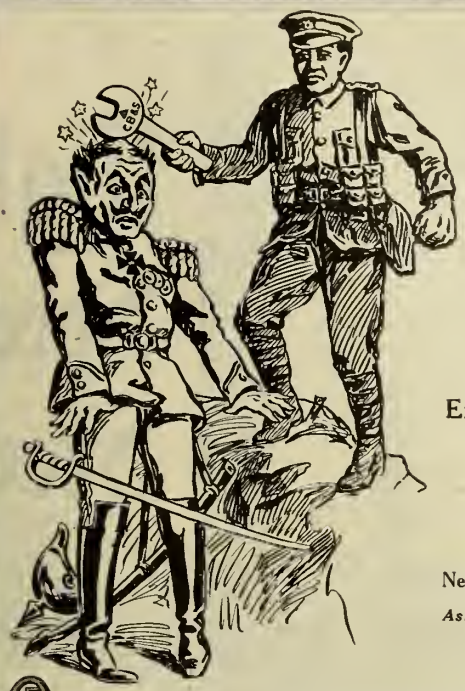

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Endurance Brand

Never Wear Out

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WELLAND, ONTARIO

Harris Heavy Pressure

The Babbitt Metal that's at the Front in Efficiency and Economy

Order a Box from our nearest Factory

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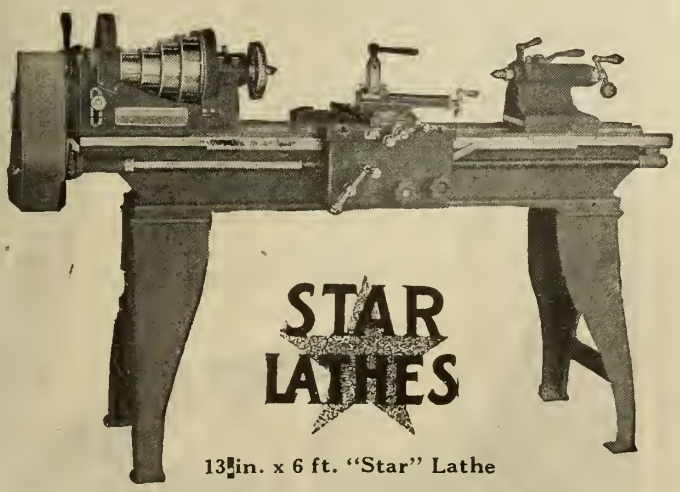
For Small, Accurate Work Use "STAR" Lathes

Great care is devoted to the design and construction of "Star" Lathes. Every detail is scrupulously guarded against imperfection.
This care, backed by 36 years' experience in the building of lathes, is why every "Star" which leaves the factory gives such accurate, durable service.

9 in. x 4 ft. "Star" Lathe



13 in. x 6 ft. "Star" Lathe

Concentrate!

Get lathes which will efficiently take care of each part of your work. "Star" Lathes give better service on small work than larger, more expensive ones. They save power and floor space and free the big machines for the big jobs.
Send for the "Star" catalog. It explains fully why you should bear the value of "Star" Lathes in mind when considering the purchase of lathes for small work.

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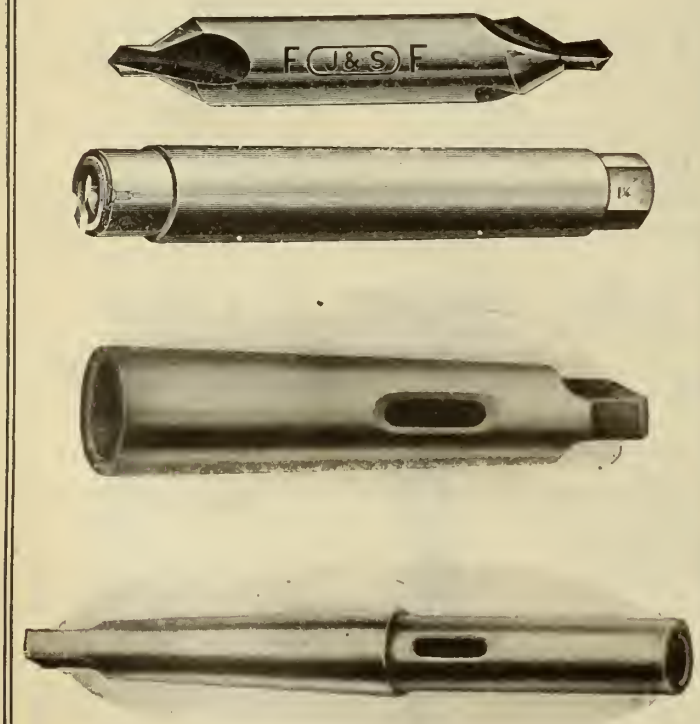
Examined from all points of view, and tested as to practical working value, the "J. & S." line of Tools for Engineers and Machinists is a long way ahead of any other make.



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Jones & Shipman LIMITED
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Electrite

Electric furnaces, automatically regulated, the most modern methods, and the introduction of Uranium — make this a steel of truly remarkable cutting properties.

We know "Electrite" cannot be bettered — and stand ready to prove it to you.

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DUNBAR SPRINGS

ACCURACY ASSURED

You can always depend upon Dunbar Springs being accurate. Before proceeding with any order the first few springs are carefully tested and checked up for this very purpose.

Seventy-two years' experience making flat and spiral springs of every description enables us to furnish you with springs of the highest quality, that can be depended upon under all conditions.

Send blue prints for estimates.

The Dunbar Brothers Co.
BRISTOL, CONN.

We wanted something original—this is what we got

"BOTH of these operations and half another — I'll show you later—completed in the time our old taps took to do one; that, I guess, is why we continue to use your Victor Collapsible Taps."

It was the often-heard story of time saved, of costs lowered, of all threads clean and smooth. And it was pleasant to hear.

Victor Tool Company
Waynesboro, Pa.
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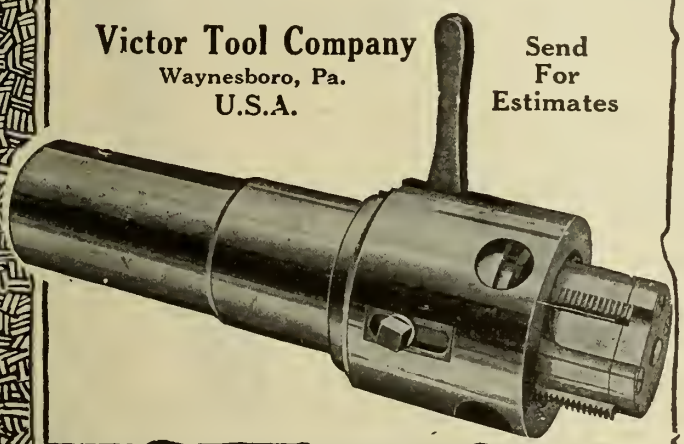
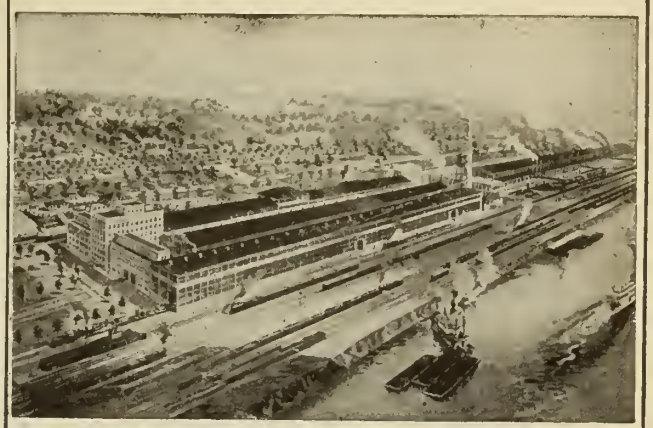
Send For Estimates



Here is a Close Up

showing a 4-spindle, 20", Independent Column Barnes Gang Drill equipped with a TRAHERN Coolant Pump.
TRAHERN Rotary Geared Coolant Pumps are furnished as regular equipment on dozens of makes of machine tools. Manufacturers appreciate TRAHERN superiority and standardize on them.
May we send you a sample pump for trial?

TRAHERN PUMP DIV.
Geo. D. Roper Corp.
Rockford, Ill., U.S.A.



MESTA MACHINE COMPANY
General Office and Works: Pittsburgh, Pa., U.S.A.

GAS AND STEAM ENGINES

for
Blast Furnaces, Rolling Mills
Power Plants
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Air Compressors Vacuum Pumps

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Blooming Mills	Tin Plate Mills
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SPECIAL MACHINERY

Steam Hydraulic Forging Presses
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Large Engine Shafts—Piston Rods
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Carbon Steel—Alloy Steel—Bronze
Air Furnace Iron Castings
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Write for Bulletins

MESTA MACHINE CO.
Pittsburgh, Pa. U. S. A.

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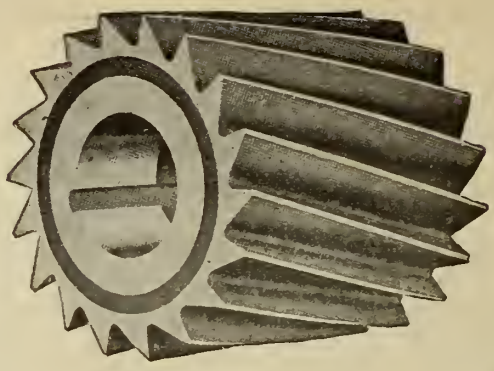

AN automobile—the light shimmering from its brightness of enamel and metal, gliding slowly forth from its birthplace. An attractive picture truly!

Quickly the wear and tear of modern traffic removes that first shining newness. Then the real merit of the car is demonstrated. It's the stuff under the paint that counts—the quality of design, of materials, of workmanship. Its ability to endure determines its soundness!

In the production of high-class automobiles Imco tools play an important part. These cars and Imco tools are good for the same reason; their makers will use nothing but the best. Machinery, materials and brains are bought, not on price, but on quality.

Catalog of Imco 3 and 4-lip drills, reamers and milling cutters upon request.

Look for
This Name
On Your Tools

IMCO
TOOLS

Ingersoll Machine & Tool Co., Limited
Ingersoll, Ontario

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ELECTRIC STEEL AND ENGINEERING, LIMITED *Head Office:* Welland, Ont.

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Steel Castings

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Carbon, Manganese, Nickel, Chrome and Forging Ingots, etc.

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Iron Castings, Crushers, Rolls, Tanks, Pumps, etc.

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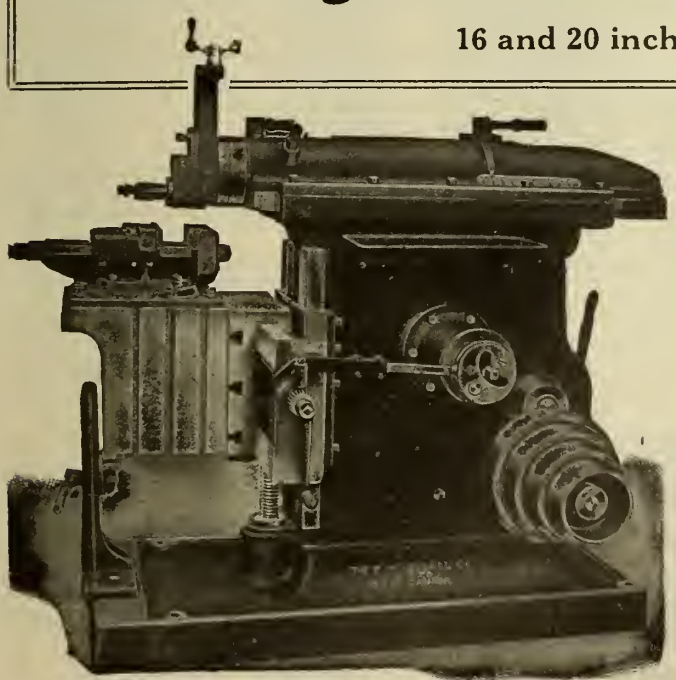
Turbine Water Wheels

Pumps for pulp and paper mills, Pumping Engines for municipal purposes, Centrifugal Pumps.

McDougall Crank Shapers

16 and 20 inch

ARE-MAC-DEE IS A GUARANTEE



A Bigger Day's Work—

is made possible with McDougall Crank Shapers than with any ordinary Shaper because the McDougall is built on lines especially for this purpose. It embodies the most approved features of the most practical shapers on the market and care has been taken to exclude all non-essential parts.

The column is massive in construction, well braced and reinforced internally. Exceptional strength is also seen in the ram, which is semi-circular in form and of box type. It can be set forward by crank conveniently arranged.

Slides are square, accurately fitted and with broad bearing surfaces.

Have us explain the other salient points of this finely-constructed machine. Full details on request.

THE R. McDOUGALL COMPANY, LIMITED, Galt, Ont., Can.

The Canadian Fairbanks-Morse Company, Limited
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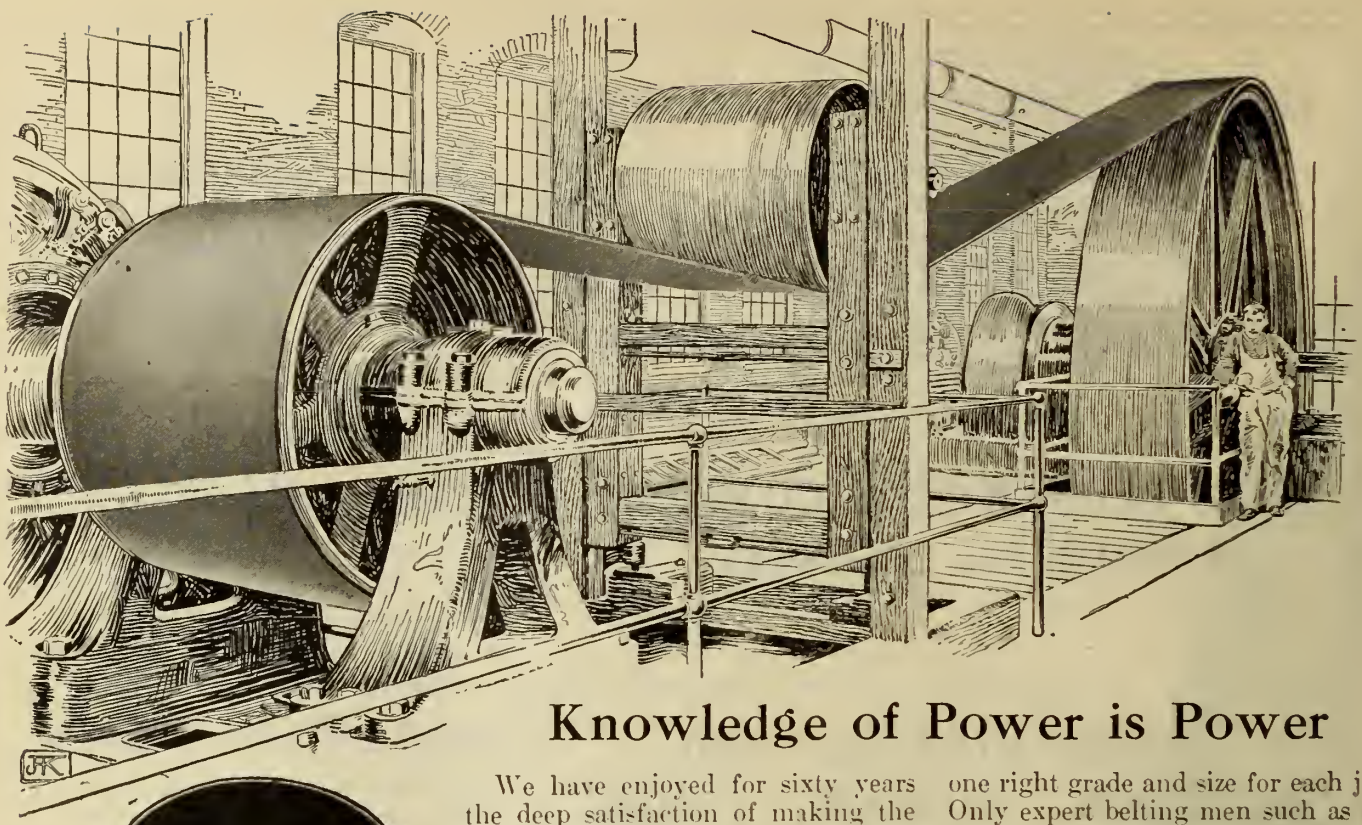

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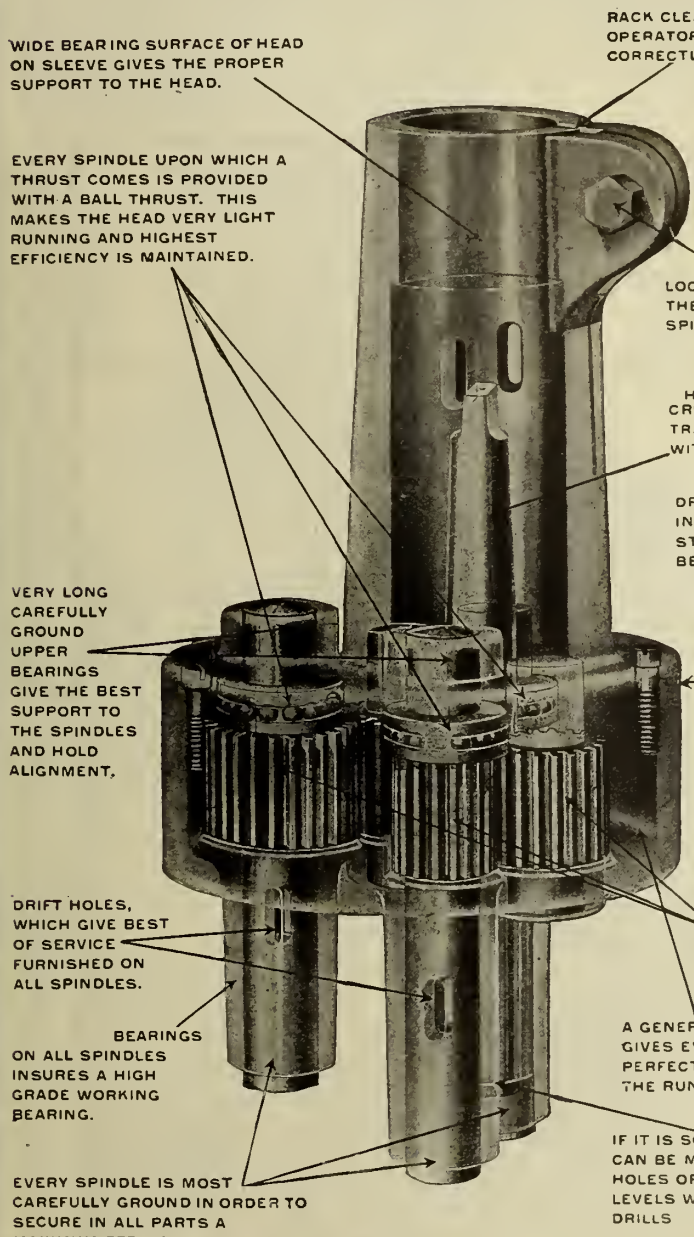
WIDE BEARING SURFACE OF HEAD ON SLEEVE GIVES THE PROPER SUPPORT TO THE HEAD.
RACK CLEARANCE SLOT ENABLES OPERATOR TO PUT HEAD ON CORRECTLY EVERY TIME.
EVERY SPINDLE UPON WHICH A THRUST COMES IS PROVIDED WITH A BALL THRUST. THIS MAKES THE HEAD VERY LIGHT RUNNING AND HIGHEST EFFICIENCY IS MAINTAINED.
LOCKING SCREW CLAMPS THE HEAD SOLIDLY TO THE SPINDLE SLEEVE.
HEAVY TAPER DRIVER OF CRUCIBLE STEEL TRANSMITS AMPLE POWER WITHOUT STRAIN.
DRIVING GEAR CUT INTEGRAL WITH CRUCIBLE STEEL SHANK GIVES BEST SERVICE.
VERY LONG CAREFULLY GROUND UPPER BEARINGS GIVE THE BEST SUPPORT TO THE SPINDLES AND HOLD ALIGNMENT.
BODY TURNED WITH OFFSET AND PROPERLY DOWELLED CANNOT SLIP BUT KEEPS ALL BEARINGS IN PROPER ALIGNMENT FOR EASY RUNNING.
SPECIALLY WIDE FACED HEAVY PITCH GEARS CUT INTEGRAL WITH THEIR SHAFTS ARE A FEATURE OF ALL OUR HEADS ASSURING MAXIMUM DURABILITY.
DRIFT HOLES, WHICH GIVE BEST OF SERVICE FURNISHED ON ALL SPINDLES.
BEARINGS ON ALL SPINDLES INSURES A HIGH GRADE WORKING BEARING.
A GENEROUS OIL TIGHT BODY GIVES EVERY OPPORTUNITY FOR PERFECT LUBRICATION OF ALL THE RUNNING PARTS.
IF IT IS SO DESIRED SPINDLES CAN BE MADE TO HANDLE OFFSET HOLES OR HOLES AT DIFFERENT LEVELS WHEN USING STANDARD DRILLS
EVERY SPINDLE IS MOST CAREFULLY GROUND IN ORDER TO SECURE IN ALL PARTS A MAXIMUM EFFICIENCY.

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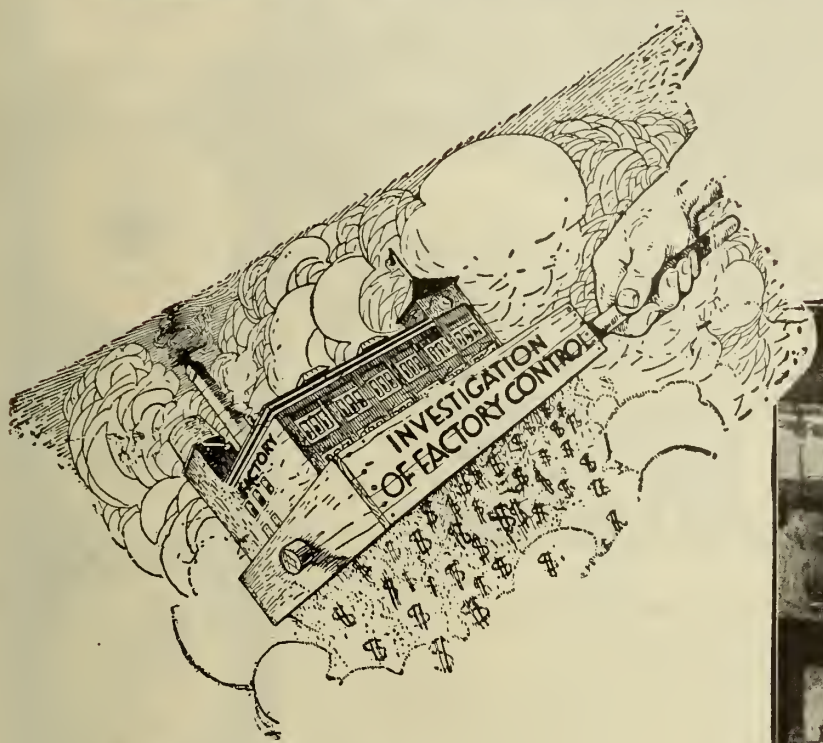

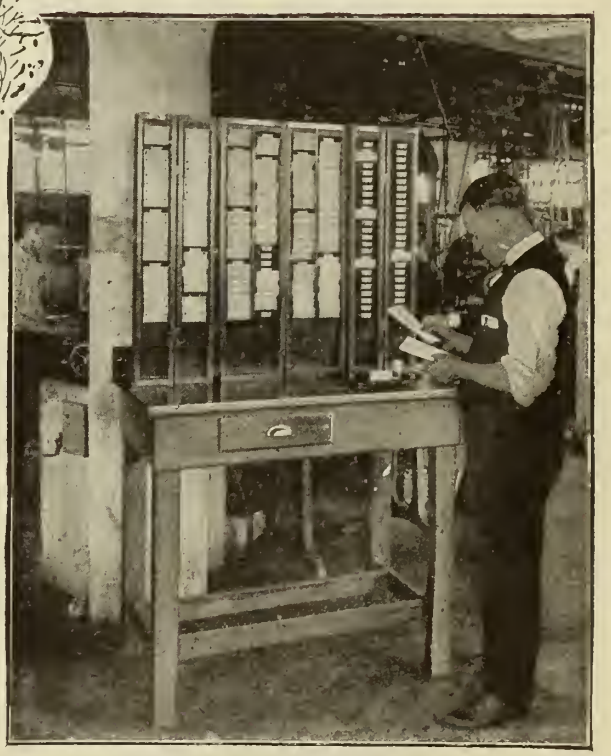

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CANADIAN MACHINERY
AND
MANUFACTURING NEWS

Vol. XXIV. No. 8 August 19, 1920

The Construction of Spindle Ends for Millers

The Practice of Cutter and Arbor Driving on Milling Machines Offers in Itself an Interesting Study—Herein Are Contained Methods as Adopted by Various Concerns

By FRED HORNER

THE construction of spindle ends to suit them for driving the various classes of cutters, arbors, and shank ends, offers an interesting study. Practice is more varied here than it is in the case of drilling machine spindles. The majority of the latter are confined to the standard Morse taper hole, with a slot to receive the tang of the drill, or the chuck arbor, as the case may be. Only in recent years has any modification been effected, and that is in the direction of substituting a clutch drive for the usual tang fitting, the nose of the spindle being mortised out to embrace flats milled on the drill shoulder, thus providing the strongest form of drive. In one or two instances also a special type of key drive is adopted, the key engaging in a groove milled in the tapered shank.

The common tang drive is also employed for light milling cutters, though the Brown & Sharpe taper is used instead of the Morse. The Morse is chiefly brought into requisition when collets are made to

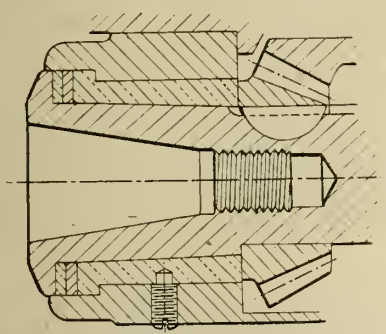


FIG. 1 (UPPER VIEW)—TAPERED AND SCREWED TANG FOR SMALL MILLS.

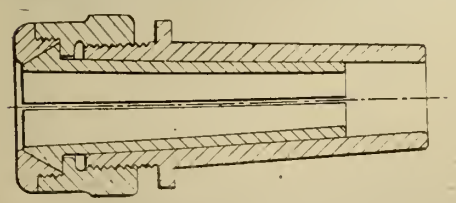


FIG. 3 (LOWER VIEW)—SPLIT COLLET FORM OF CHUCK FOR SMALL TAPER MILLS.

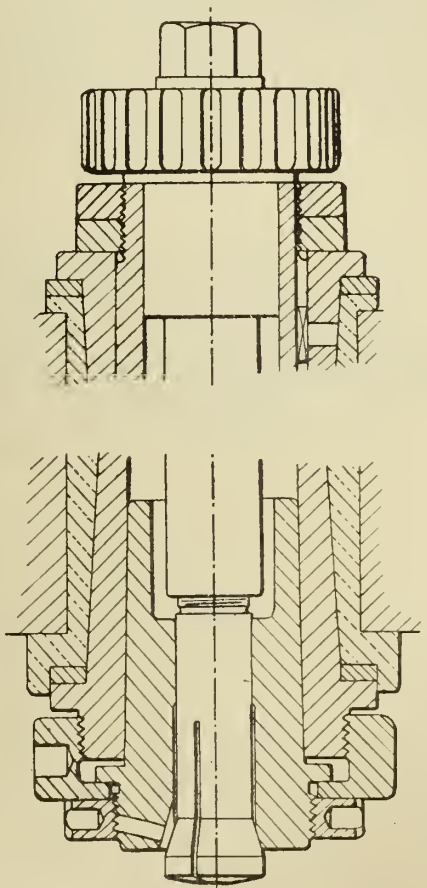


FIG. 2—SPLIT-CHUCK MODE OF HOLDING SMALL MILLS.

fit spindles, and receive various tools as desired, comprising drills, etc., in which event it is more convenient to have a Morse taper collet. On the class of cuts for which the end mills are used, there is sometimes a difficulty that arises from the tendency of spiral teeth to draw into the work, and pull the shank out of the hole, as well as giving rise to chatter. When this is found to happen, a mill should be chosen with handing opposite to the direction of rotation—this is, a left-hand spiral for a right-hand cutter, and a right-hand spiral for a left-hand cutter. A convenient device for small mills, especially those employed in attachments for vertical and angular cutting, is the screwed shank, the cutter being made with a steep taper to match that in the spindle nose, Fig. 1, and being loosened when removed has to be effected by a wrench on flats. For convenience of making, a good many small mills have parallel shanks, especially those for experimental purposes, or odd ones quickly turned out to special shapes. When held in an ordinary taper hole spindle, a collet is generally fitted, having spring or divided jaws, to grip on the shank. But regular small machines, such as the bench millers, and some of those for light work, with swivelling or universal heads, are constructed with spring chucks.

Thus the Van Norman machine takes a spring chuck in the manner illustrated by Fig 2, tightened with a knob at the rear end. In instances where taper shanks are driven without a tang, the class of collet fitting shown in Fig. 3, may be adopted with advantage, since it affords the means of firmly gripping the shank, and of readily releasing it with-

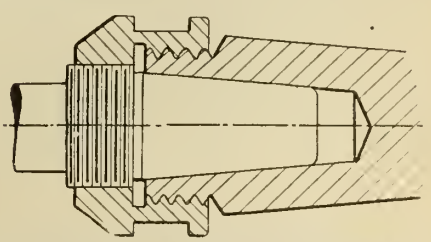


FIG. 4 (UPPER VIEW)—SCREWED COUPLING TO LOCK SHANK IN SPINDLE.

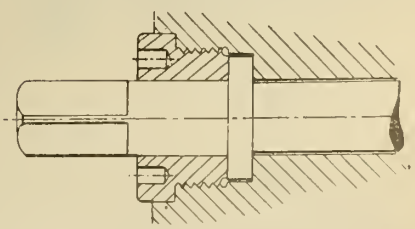


FIG. 6 (LOWER VIEW)—DOUBLE-THRUST DRAW-BOLT.

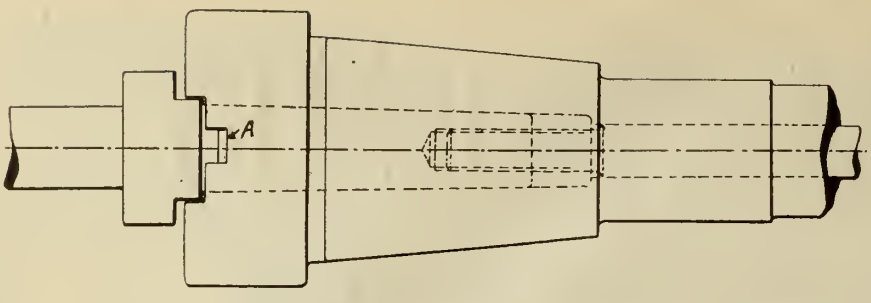


FIG. 5—MODE OF DRIVING ARBOR WITH CLUTCH.

out hard driving on the tail. A similar principle is met with in the threaded coupling device for larger cutters, the spindle nose having a coarse thread, Fig. 4, on which a flatted nut is run, and forces the taper shank into the spindle.

The Shoulder Clutch

Where neither of the foregoing methods of rotation is sufficiently powerful or is not otherwise convenient, the shoulder clutch transmission comes in. This gives a very strong drive, there is no tang to twist off, and the trouble of releasing is only that of disengaging the fit of the taper shank. The spindle nose is slotted across, such as seen in Fig. 5, and the collar on the arbor or shank clutches therewith, being kept up to position by the draw-bolt passed through the spindle.

A slot is seen cut out at A in this example, for the purpose of driving in a cotter to separate the fit. But more usually the draw-bolt is arranged to furnish a means of ejection as well, by taking its thrust in each direction, for instance in the way represented in Fig. 6. The lay-out of a long spindle and arbor on a plano-miller is illustrated in Fig. 7, the clutch drive, draw-bolt, and the spindle drive being visible. The front head, A, has a lateral adjustment to bring the cutters to the desired position, hence the spindle, B, is splined to pass through the driving gear sleeve, C.

The trouble of reaching to the end of the spindle to get at the draw-bolt is not of much moment in horizontal-spindle machines, though sometimes a collar run on the threaded nose is used for retaining, Fig. 8. Vertical spindles are rather a nuisance, from the necessity of getting up to the height at the top, and a good many designs of fastenings are in use with the object of enabling the locking to be performed at the bottom. The methods comprise chiefly the application of screwed caps, and of cotters, examples of each being here shown. The cotter fastening necessitates a free space above the bearing, as in Fig. 9, and an upper cotter way is cut for the purpose of extraction. The same mode of fitting is also met with in some horizontal spindles.

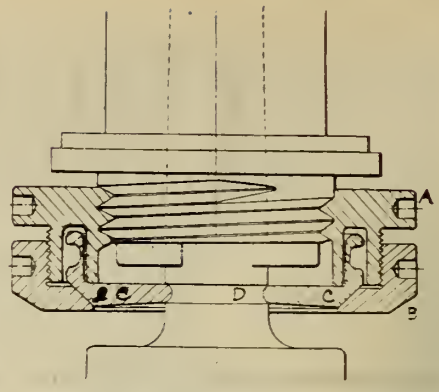


FIG. 10—BECKER DRAW-IN DEVICE.

The Becker collar fitting, Fig. 10, consists of a chuck body, A, a cap-collar, B, and a collar cut in two so as to form half jaws, CC. The cap-collar serves first to adjust these half jaws to catch in the groove on the neck of the shank, D, following which the chuck A, is screwed up on the coarse threads of the nose, forcing the shank tightly into the spindle taper. An ingenious device is used on the range of vertical-spindle machines manufactured by Kendall & Gent, Ltd., of Manchester (England). A cotter is utilised in conjunction with a screwed collar, in the manner depicted in Figs. 11 and 12. The first view shows an external view of the spindle end, with a full size arbor held in position, and the second view a section through a similar fastening, but having a smaller size arbor contained, involving the addition of an adapter or collet. The threaded collar A, has a central space bored out to allow of revolution around the cotter, B, which passes through the slot in the shank (and the collet in the second view).

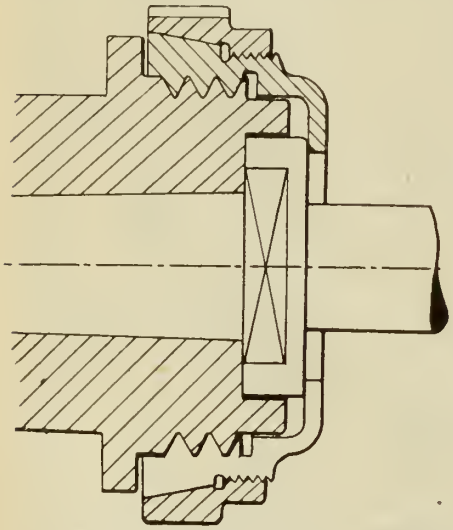


FIG. 8—RETAINING COLLAR FOR ARBOR.

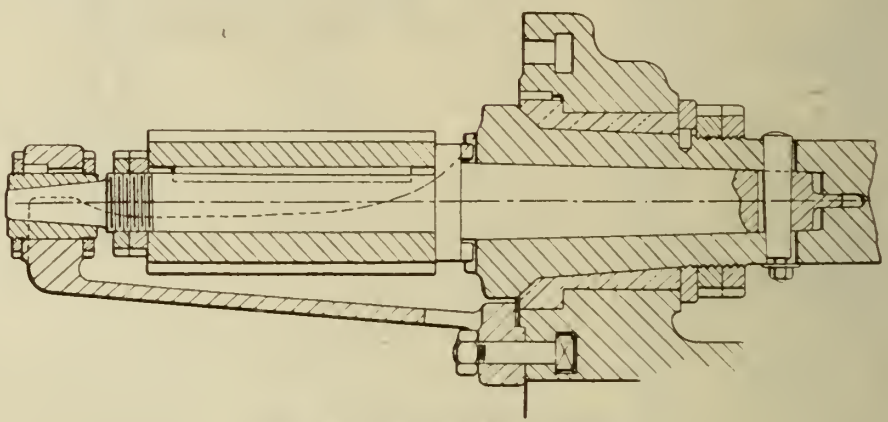


FIG. 9—COTTER DRAW-IN FITTING.

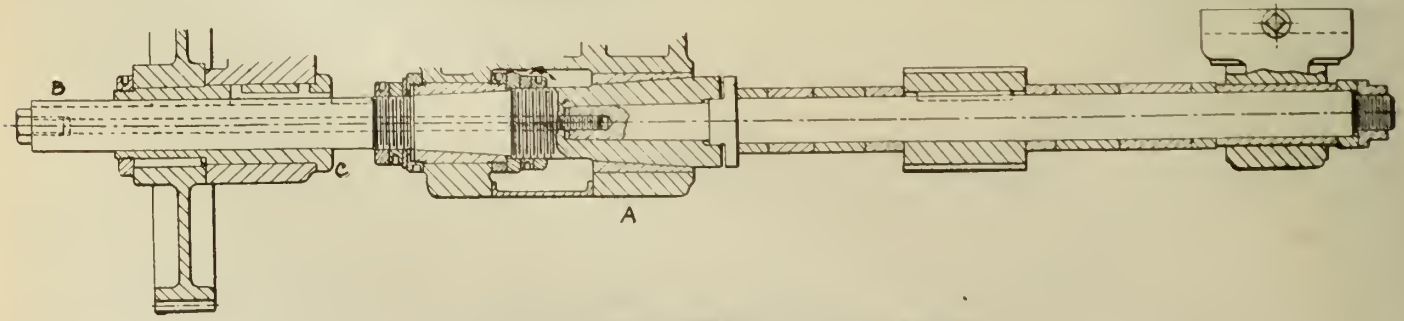
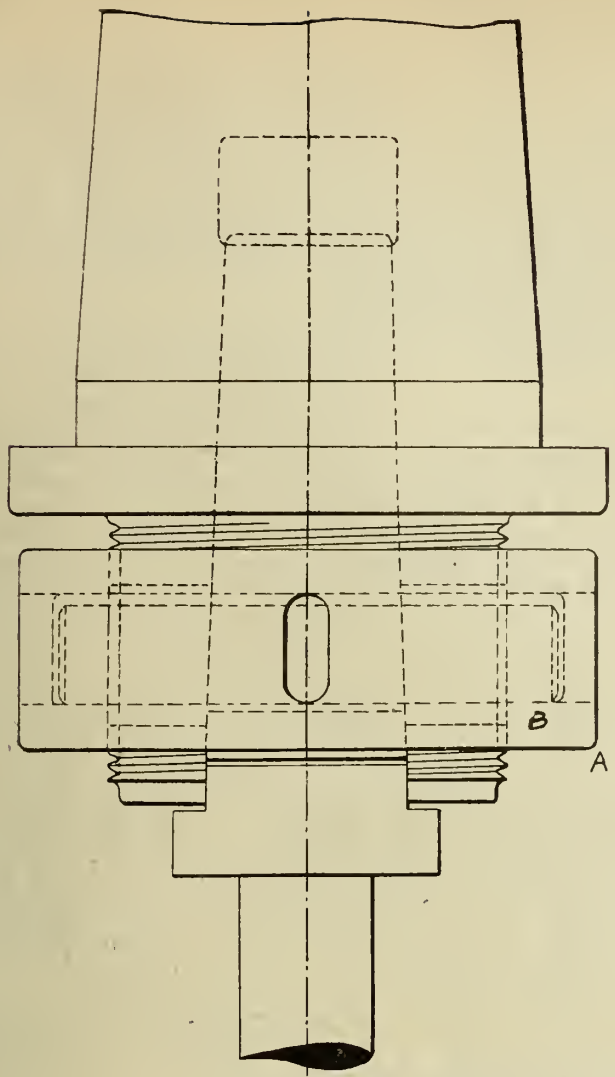


FIG. 7—SPINDLE ARRANGEMENTS OF PLANO-MILLER.



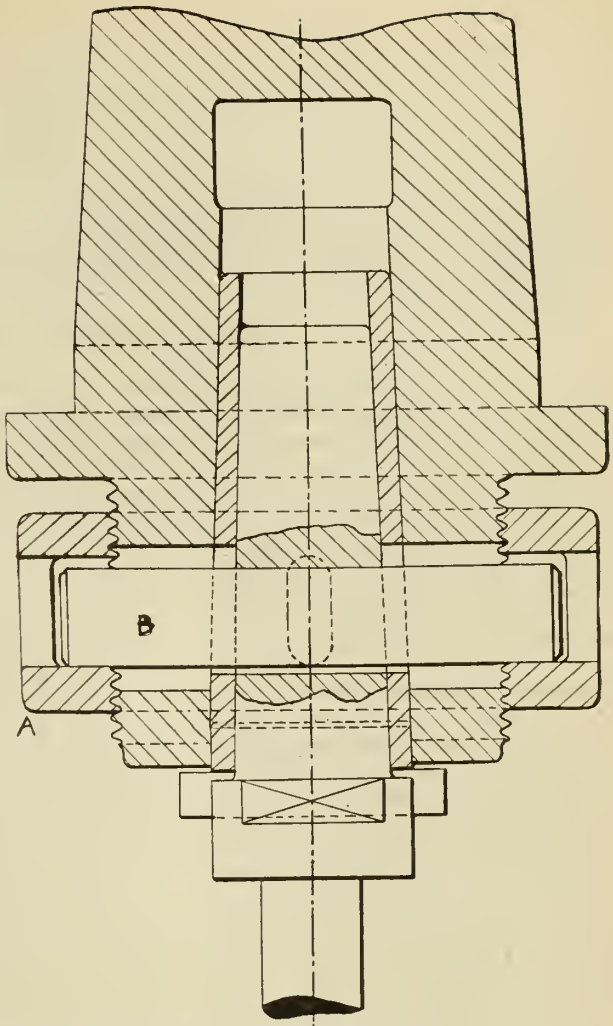


FIG. 11 (LEFT VIEW)—KENDALL & GENT RING-NUT AND COTTER DRAW-IN DEVICE.
FIG. 12 (RIGHT VIEW)—THE SAME, SECURING SMALLER SHANK, WITH COLLET.

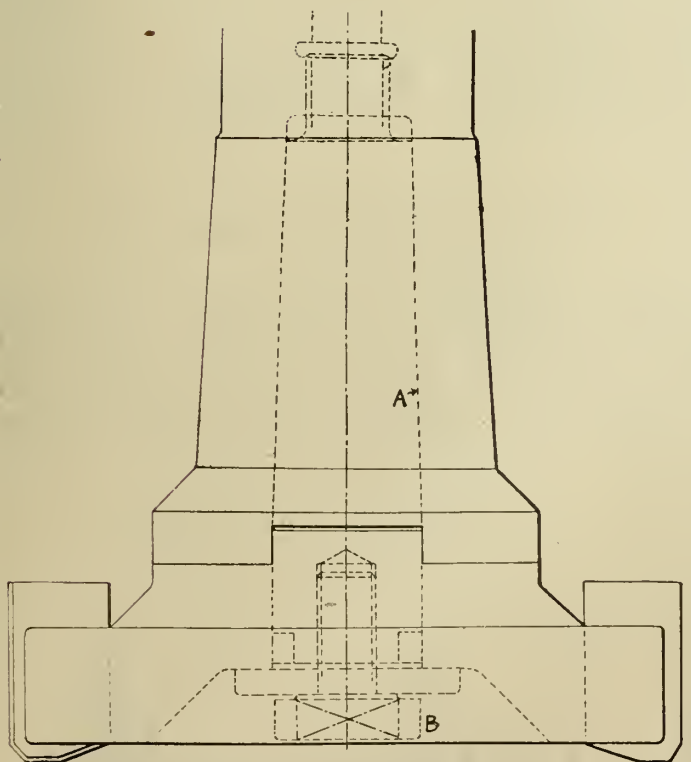


FIG. 14—FACE-CUTTER DRIVE WITH CLUTCH AND ARBOR.

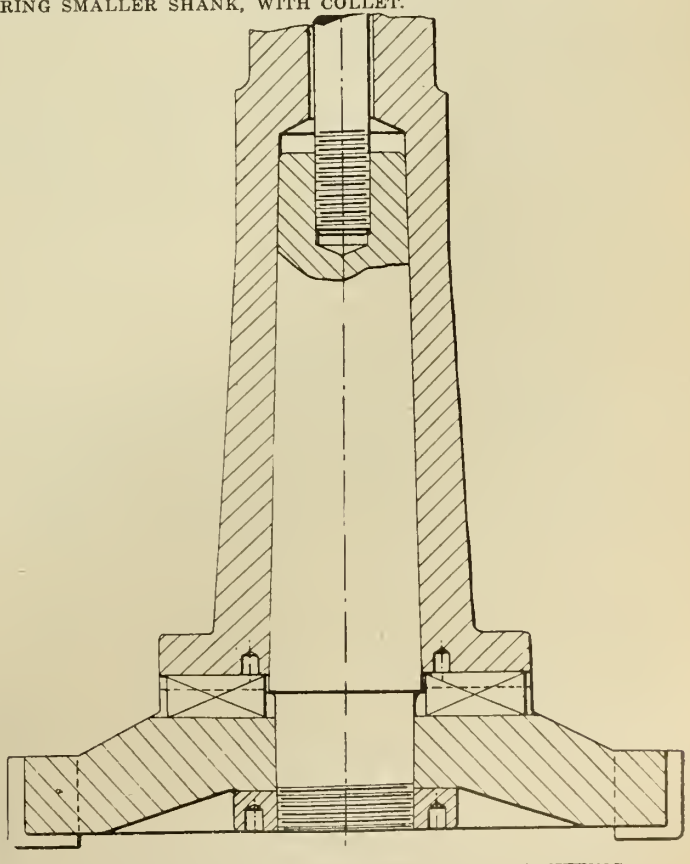


FIG. 15—INGERSOLL ARBOR AND CLUTCH FITTING.

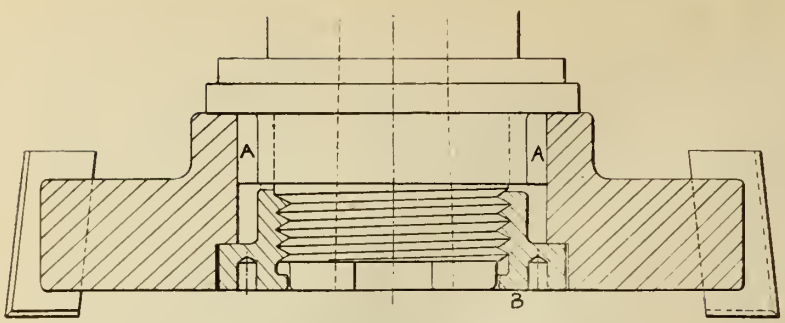


FIG. 13—DUPLEX KEY DRIVE FOR HEAVY MILLS.

Six slots are cut in the diameter of A, to enable it to be tightened or loosened with a hooked wrench, so forcing the cotter upwards or downwards and tightening or extracting the shank. The rotational effort is transmitted by the slotted nose of the spindle, clutching on to the flats located below the cotter hole, and in the case of the collet fitting the collet also has its nose mortised out to embrace the flatted shoulder of the arbor.

The problem of driving the larger cutters has given rise to much controversial practice, and to working difficulties through the sticking or freezing on of cutters after hard duty. The blind following of lathe methods in this case has perhaps been responsible for much of the trouble. It has always been the custom to attach lathe face-plates and chucks by a screwed fit on to the spindle, and the same idea was pursued by many manufacturers as regards face milling cutters. The two conditions are, however, not identical, since the face-plate or chuck affords more convenient means of release from its much larger relative diameter, and the fact that a bar can be applied to gain greater leverage. The cutter is by comparison smaller, and not easy to loosen, or to apply a bar on, without causing damage.

How Force Should be Conveyed

Designers have come to see that the tightening of a threaded fit ought not to be the means of producing rotation, but that the force should be conveyed in a positive manner, leaving the screwed element merely the duty of maintaining the cutter in place endwise. This modification in principle makes a vast difference in convenience of usage. Three main ideas are in use at present, the slotted spindle, the spindle with keys on the diameter, and the interior or box clutch. In any event, the aim should be to reduce the overhang as much as practicable. The large cutter heads, such as those on rotary milling machines, are in a different category, being permanent fixtures on the spindles, and consequently being fastened with keys, or with bolts passing through a flanged spindle. But where removal at intervals is necessary, the key or clutch method is preferable. A key drive is illustrated in Fig. 13, the keys standing out from the spindle body, and engaging in the grooves in the cutter hub. Retention is effected by the flange nut B. Fig. 14 gives an example of a clutch drive, with a separate arbor included for the purpose of centering the cutter. This arbor, A, is screwed gently into place up in the spindle, by a wrench fitting on the flats at the end of the parallel part, and the cutter is slid on, its clutch teeth intermeshing with the mortise across the spindle nose, and the retaining washer, and screw B, set in position.

The Ingersoll drive, see Fig. 15, comprises an arbor pulled in by draw bolt, and used to centre and retain the mill.

The advantage of centering by the larger diameter of the exterior of the spindle nose is obvious, and several types of drives are made, thus combining the steadiness of fit of the screwed nose without its disadvantages. The matching of the cutter hub occurs through either a parallel contact or a tapered one. The first-named is represented by Fig. 16 (J. Parkinson & Son, Shipley, England), the outside is finished to limit, and the bore of the cutter or head makes a close sliding fit thereon, the drawing up and retention being performed by screws tapped into the hole

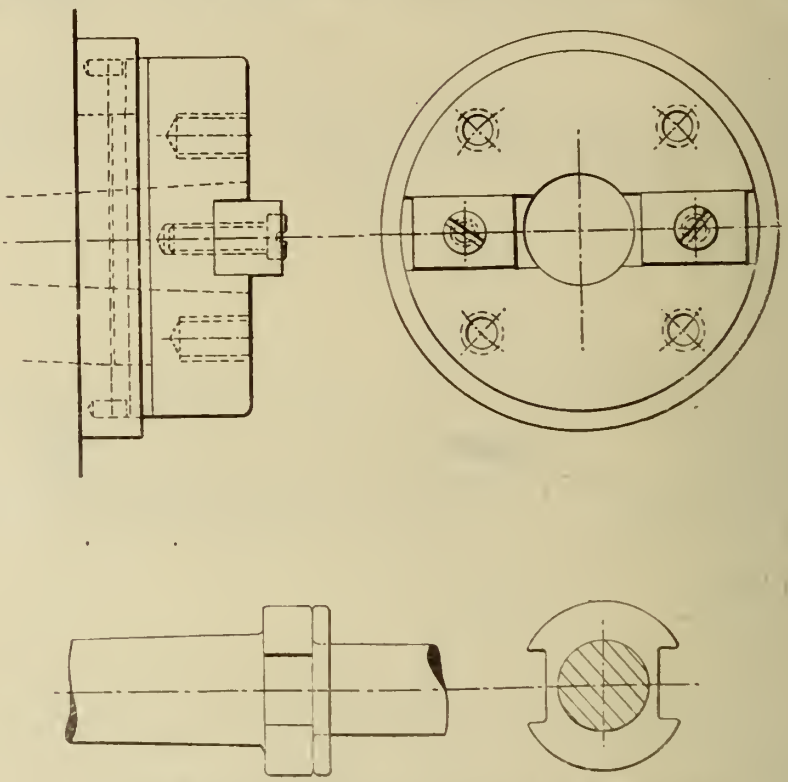


FIG. 16 (UPPER VIEW)—CYLINDRICAL NOSE WITH DRIVING KEYS.
FIG. 17 (LOWER VIEW)—ARBOR SLOTTED TO FIT FIG. 16.

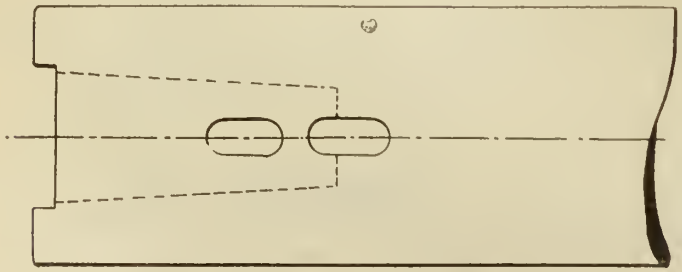


FIG. 21—BORING-BAR NOSE WITH SLOTTED FACE.

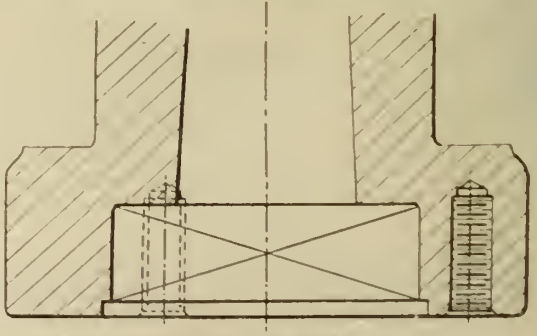


FIG. 18—BOX CLUTCH DRIVE.

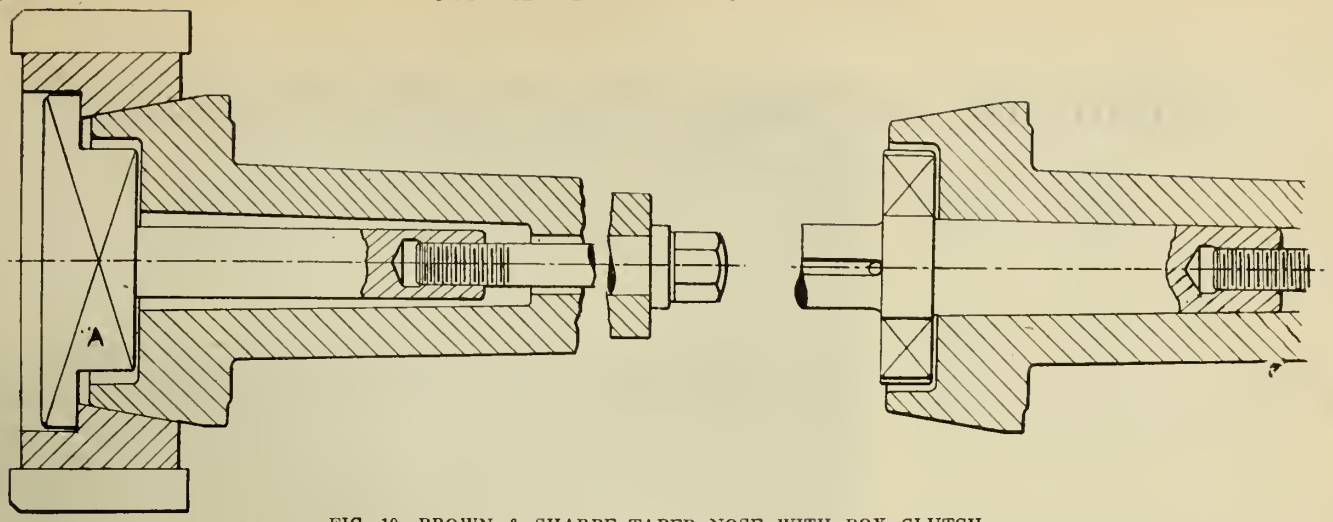


FIG. 19—BROWN & SHARPE TAPER NOSE WITH BOX CLUTCH.

in the spindle face. Arbors on which cutters are strung receive their drive from slots cut through shoulder, Fig. 17.

A similar form of nose is incorporated in the Cincinnati millers, and also in the Milwaukee machines, with the difference in the latter that face cutters are centred by an arbor instead of on the outside of the nose, and that a loose supplementary collar is screwed against the nose for driving arbors, this collar having slots on its outer face to catch the prongs or dogs sticking out on each side of the arbor.

Box Clutch Type

The strongest construction of nose is that embodying the internal or box clutch, a design which also possesses the merit of simplicity, and freedom from projecting parts, with minimum risk of injury. The centring of the hub, when a face cutter is mounted. takes place either upon a parallel exterior, or a tapered one, and the drawing up into place is accomplished with screws in the face, or—more rapidly and conveniently—by a draw-bolt. Fig 18 gives the choice of either way, large cutters being located by the spindle body, and secured with screws passed into the three tapped holes in the face, and arbors receiving their locking effort through a draw-bolt.

In the Brown & Sharpe construction (see Fig. 19) a draw-bolt serves for holding in in all cases. There is a driver, A, with round stem and flatted head, which latter engages in the box opening of the spindle, and also in the slots of the cutter head, which is drawn on to the tapered spindle nose by the action of this driver and the bolt. The arbors, or the collets are formed with prongs projecting to catch against the flats of the box clutch. Messrs. Alfred Herbert Ltd., of Coventry, (England), have also discarded the threaded nose principle, on account of the difficulties and inconveniences attendant upon its use, and now build their millers with the style drawn in Fig. 20.

There is a draw-bolt to pull the head up to location on the nose, and the drive in the specimen illustrated is taken through a centre flatted to fit the clutch, and tapped to take the draw-bolt. For removal, a pair of screws (one of which appears in the side elevation) is slipped into position and screwed up against the spindle face. An incidental but important point in connection with these clutch drives is that the cutters can be turned with equal facility in either direction, thus enabling left-hand cutters to be mounted without special preparation, a fact which is not the case with screwed noses.

The principles of centering and driving are not very dissimilar in regard to boring machines. Two points of difference as to spindle ends may be specified however, one is the necessity for coupling up a long boring bar to the spindle, and of propelling the latter along as the feed goes on. This is so in certain designs of machines. The other special feature concerns some classes of boring machines, which have to be employed for end facing operations, and the nose mechanism combines provision for driving bars, or for dispensing with this feature and traversing a tool across the end of the work. The mode of coupling up the bar ends is usually by the familiar taper and cotter fastening, one cotter way for the attachment, and another farther along for ejection.

(To be continued)

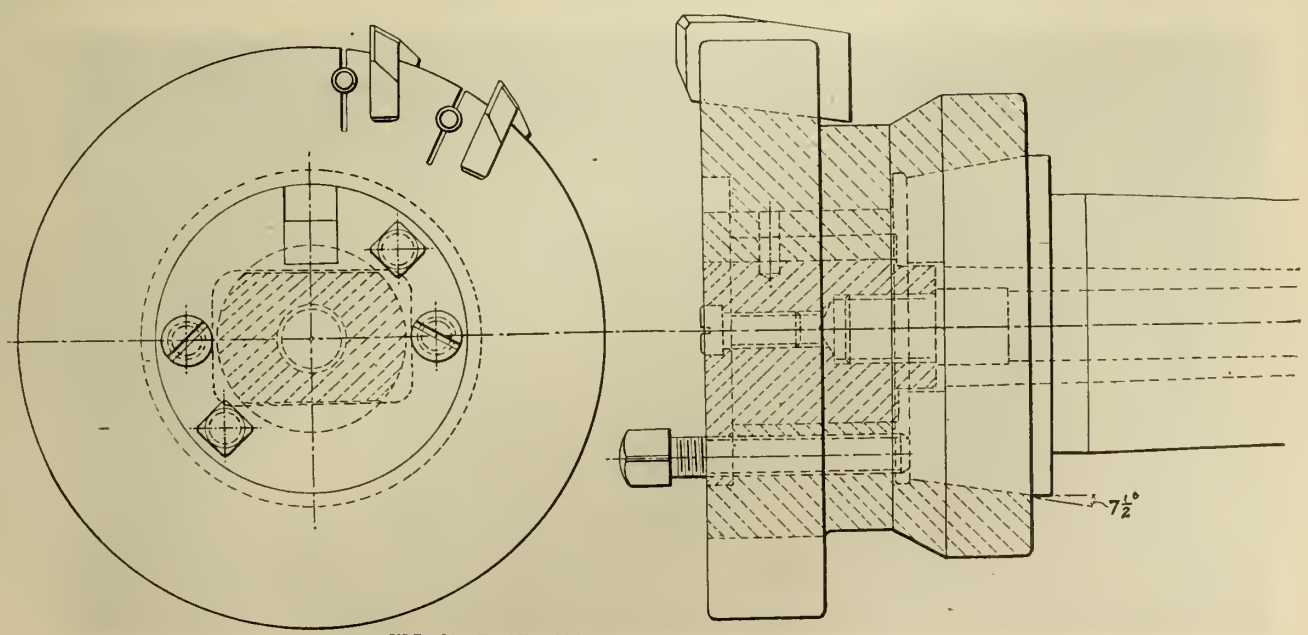


FIG. 20—TAPER NOSE WITH BOX CLUTCH DRIVE.

Automatic and Semi-Automatic Furnaces*

The Continuous Heat Treatment of Metals is a Very Important Study—Typical Furnace Installations for Various Materials Are Shown and the Advantages of Automatic Heating Are Discussed

COMPILED BY J. H. M.

QUANTITY production of quality product involves consideration of many factors frequently overlooked in those manufacturing operations which include the heat-treatment of metals.

It is generally assumed, for instance, that the uniform heat-treatment of large quantities of steel shapes of similar size requires merely a uniformly heated product, and that a uniformly heated product requires nothing more than a uniformly heated furnace. Nevertheless, variations in metallurgical quality of the finished product are likely to exist even though the product has been uniformly heated, and variations in the uniformity of heating are likely to occur even with an indicated uniform temperature in the furnace chamber. The real test is the degree of uniformity of the finished product, which is determined not only by the manner in which the heat is applied to each individual piece, but also by the manner in which it is cooled.

Uniform heating prepares the metal for uniform heat-treatment, but it is the final set or adjustment of the structure that actually determines the uniformity of the heat-treatment and the quality of the product.

To heat the charge uniformly it is necessary that each piece be subjected to the heat in the same manner, at the same temperature and for the same length of time, which requires something more than a uniformly heated furnace.

FIG. 2—Charging end of hardening furnace. Material is laid on slow-moving conveyor chain and delivered into heating chamber. Each piece is kept separate from the others while passing the heating zone.

If a large quantity of material is piled in a furnace chamber, it is certain that the outside pieces will be heated to, and finally cooled from, a higher temperature than the pieces at the centre or at the bottom of the mass. When a large, cold charge is introduced into a hot chamber at the same time, there is a natural drop in chamber temperature, which is recovered only as the charge absorbs heat. The temperature variation is in proportion to mass;

FIG. 1—Charging ends of automatic furnaces for heat treatment of crankshafts, etc.

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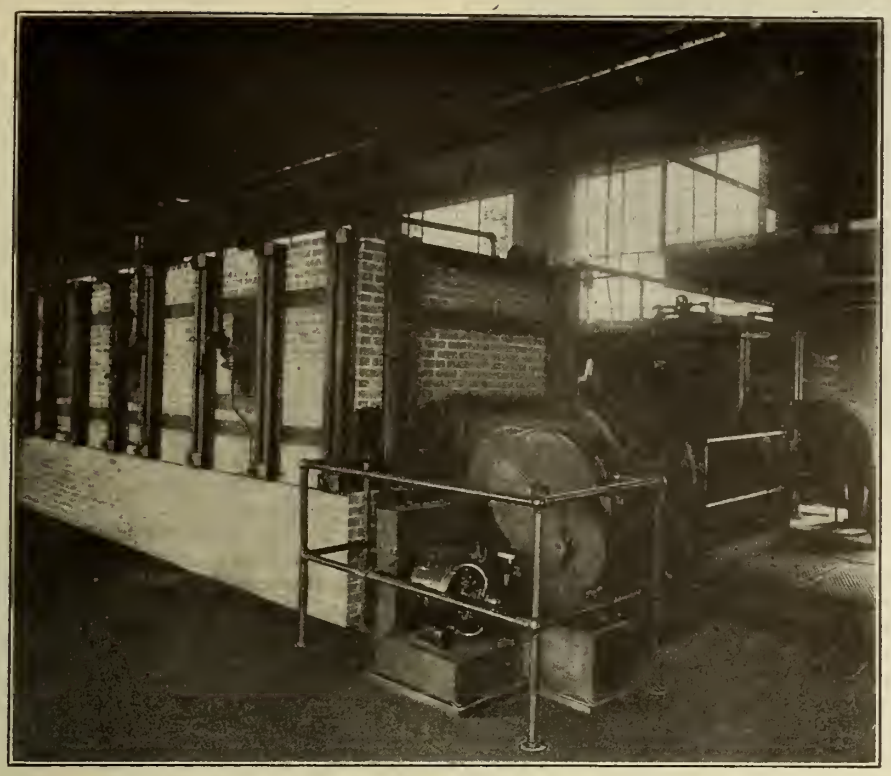


FIG. 3—Discharging ends of hardening furnaces. After reaching the final temperature, the pieces are removed through an opening in the side of the furnace, and quenched in a tank partly buried in the floor. A conveyor in this tank removes the material from the oil and delivers it to charging ends of tempering furnaces.

the time element in proportion to mass, surface and temperature; and the variations in proportion to the number of charges, all other conditions being equal.

Similarly, if a large number of uniformly heated pieces are plunged into a quenching bath at the same time, there is a tendency for the bath to become irregularly heated and the outside of the mass to cool at a lower temperature and in less time than the centre. Thus the good effect of uniform heating is partly negatived by subsequent unequal cooling, and to the extent of such disparity the product is inferior in quality.

With such mass methods of heating and cooling it is unreasonable to suppose that each piece receives the same treatment. It is immaterial what the furnace pyrometer reading or the temperature of the quenching bath may be, for, unless all pieces are both heated and cooled exactly alike, the indication of uniform temperature in the furnace or quenching bath serves merely as evidence, not as proof, of a final uniformly heat-treated product.

The ideal heating condition is approached when the heat is applied to each piece in the same manner, for the same time and at the same temperature; and is most accurately, conveniently and economically accomplished when the furnace operates with a continuous input and output of material, a continuous input of fuel and discharge of spent gases, and a gradual heating of the material to the final and determinative temperature.

The principle of treating each piece individually when heating, applies equally to cooling, whether it be quenching for hardening, rapid air cooling for normalizing, or slow, prolonged cooling as for annealing.

The automatic furnace most easily meets these conditions by insuring the gradual heating of each piece in the same manner, to the same temperature, for the same length of time. It also has the advantage of increasing output in proportion to labor and fuel, as one man with an automatic furnace may do more work, at less cost, than two or three men with a furnace operating on the batch principle. Further than this, the automatic furnace requires less floor space for a given output. With these advantages the automatic type of furnace is entitled to consideration whenever the manufacturing conditions are in harmony with this method of heating.

It should be borne in mind, however, that the automatic type of furnace has its limitations as well as its field of usefulness. It performs to best advantage when the supply of material is regular and the heating operation continuous; when the size and shape of the pieces to be heated are fairly uniform; when the temperatures to be maintained are not unduly high, and when there is a sufficient quantity of material to keep the furnace going at full capacity throughout the day.

Its field of usefulness is narrowed when the supply of material is irregular and the operation intermittent; when there is a wide variation in the size and shape of the pieces to be heated; or by other conditions that do not make the operation as a whole strictly continuous and in harmony with the factory product.

Just as an automatic machine must be set up differently to accommodate pieces of different size and shape, and is unsuited to the handling of small batches of work, just so is the usefulness of the automatic furnace confined to the heat-treatment of particular kinds and quantities of material.

It is generally more difficult to adapt an automatic furnace to a wide range in shape and size of pieces to be heated than, for instance, to adapt a turret lathe or automatic screw machine to the varying demand for product within their limitations. With the furnace, a marked variation in the shape and size of pieces generally necessitates a difference in construction of conveyor, also provision for chang-

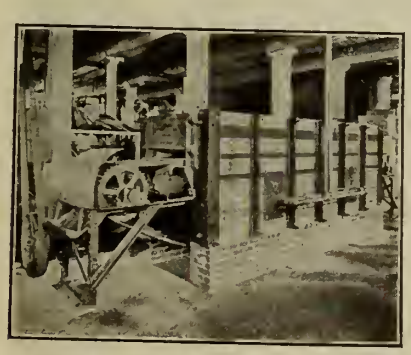


FIG. 4—Automativ furnace for heat treatment of coil springs, etc.

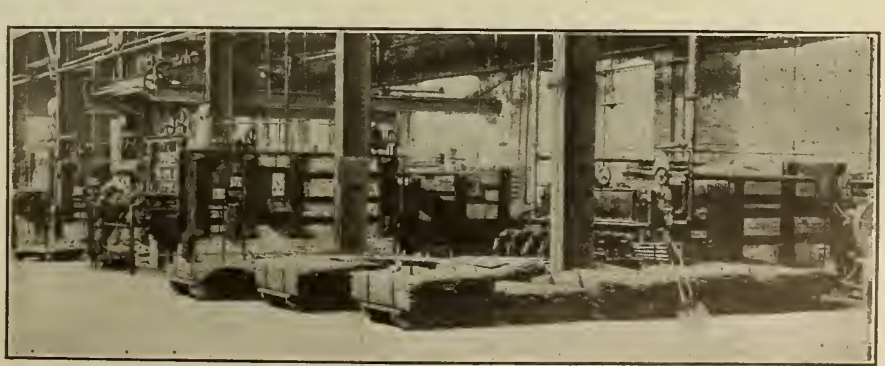


FIG. 5—General layout of automatic furnaces for continuously heating, hardening and tempering rod stock.

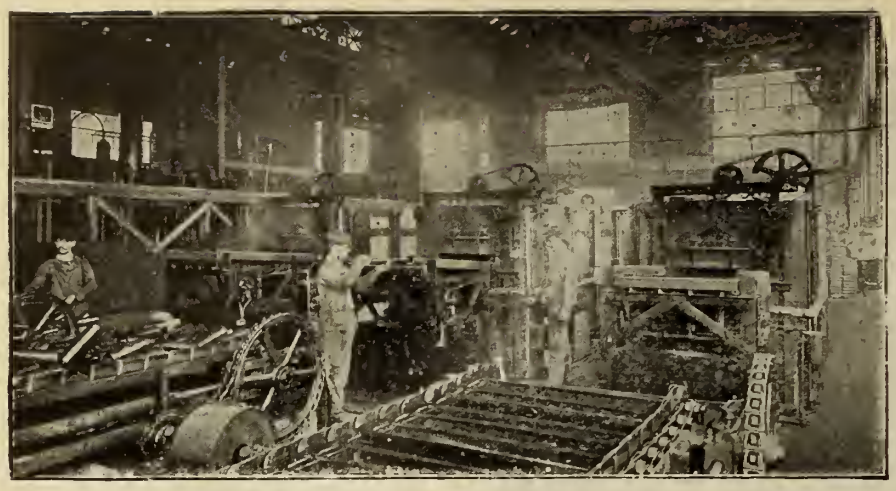


FIG. 6—Charging ends of tempering furnaces. In this case the pieces are removed from the conveyor of the quenching tank and charged into the tempering furnaces.

ing its speed to allow for any variation in heating time required by the difference in mass and surface of the pieces and variation of fuel input and discharge of spent gases. There is a very great difference between the operation of mechanism when subjected to heat and when cold. The necessity for difference in design to meet the conditions of expansion, contraction and comparative weakness of material when heated must be considered.

With the automatic type of furnace, the advantages from the standpoint of quality, denoting good heating, should be as evident as the advantages from the standpoint of production.

The necessity of producing a quality product is more important than the necessity of producing a product in large quantities. Unless this relationship is properly considered in the design and operation of an automatic furnace, the results fall short of what is actually required. This important point is frequently overlooked in the consideration of such furnaces. It is not only necessary to provide the mechanical features incident to the continuous movement of of material through the furnace, the combustion features necessary to transform the energy of the fuel into hot gases, but to properly deliver and apply the heat in these gases to as much of the surface of the individual pieces as possible. Of equal importance is the conservation of the heat in the gases to as much of the surface of the individual piece as possible. Of equal importance is the conservation of the heat in the gases after they have been in contact with the material, in order that the fuel used for the operation may be held to a minimum.

The metallurgist will recognize the advantages of a method of heating by which the material is gradually brought up to the final temperature utilization of heat in spent gases to preheat material; the exposure of each piece to the heat in the same manner, to the same temperature, for the same length of time; the uniformity not only of the individual pieces but of the sections thereof as compared with the corresponding sections of other pieces; in short, the advantages that naturally follow what is virtually a method of continuously preheating, heating, cooling and handling each piece the same as all others.

The production manager will appreciate the advantages of increased production per unit of floor space; the reduction in manual labor per unit of production; the uniformity of product, resulting in decreased scrap, following less dependence upon the human element; the fuel economy that naturally follows the direct transfer of the heat in the spent gases to the incoming cold material; the improvement in working conditions as a result of the lesser amount of heat, in proportion to output, thrown off into the room by the automatic furnace; in short, the saving in the cost of the finished product due to economy in labor, time, fuel, floor space, decreased rejections, etc.

Typical Installations

The illustrations herein cover some of the applications of this method of heating and cooling which is coming more and more into favor. Owing to the great variety in working conditions it is impracticable to fully standardize the design or sizes of such furnaces, as the individual requirements warrant consideration of each case on its merits, in order that the heating cycle may be properly adapted to the given manufacturing conditions. However, the illustrations afford an idea of the manner in which typical heating problems are handled and of the opportunity of effecting further improvement in industrial heating operations.

A continuous furnace for the heat-treatment of automobile crankshafts, camshafts and the like is illustrated at Fig. 1.

The shafts are carried through the furnace on a slow-moving conveyor driven by a motor. Each piece is heated individually. The spent gases are not only employed to preheat the incoming material, but also to preheat the air for combustion.

The furnaces illustrated at Figs. 2 and 3, are well suited for heat-treatment operations, such as the annealing, normalizing, hardening, tempering, etc., of such material as crankshafts, axles, shafts, springs, tubes, bars, rods, cylinders, etc. They are often arranged in series so that two or more operations such as annealing, hardening or tempering, may be conducted continuously and in sequence. Frequently, by simply adjusting the temperature or heating time, one furnace may be used for hardening, tempering, annealing or normalizing.

A hardening furnace of the automatic type, arranged in series with a quenching tank and tempering furnace, is illustrated by Fig. 2. The material to be heated is laid on slow-moving conveyor chain at the charging end and delivered into the furnace chamber. Special insulated shields and arrangement of blast provided over the working openings protect the operator from the heat.

The pieces are brought up to heat by being slowly passed through the furnace, from a low temperature at the charging end until they reach the maximum temperature at the discharging end, Fig. 3. They are then removed

FIG. 7—Rotary hardening furnace for automatically heating and quenching small steel parts.

from a working opening at the end or at the side of the furnace, as the size and shape of the material requires, and quenched in a tank partly buried in the floor. A conveyor in the quenching tank removes the material and delivers it to the charging end of the tempering furnace chamber. After the pieces have been brought slowly to the tempering heat they are discharged on the apron at the discharging end of the tempering furnace.

In the passage through the chamber of each furnace the pieces are kept separate and suspended in the heat, with practically point contact on the hot conveyor chains.

Coil Springs, Etc.

The furnace illustrated by Fig. 4 is adapted to the continuous tempering of such material as coil springs and similarly formed products that may be conveniently handled on the type of conveyor shown.

The conveyor is provided with a pocket for each piece, to afford the advantage of individual heating, with no piece in contact with another. The construction of the conveyor is adapted to the size and shape of the material to be heated. The size of the chamber and arrangement of working openings may be adapted to the quantity to be handled and the related shop conditions.

Light rod stock may be continuously heated for forming, hardening and tempering with the type of furnace illustrated by Fig. 5, arranged in series as shown. The rods in the foreground, cut to length, are placed on the conveyor and automatically pass through the heating furnace on the right, from which they are removed through an opening in the side wall near the opposite end of the heating chamber. They are then passed through the shaping machine, thence to the oil hardening bath (visible between the first two columns), from which they are automatically conveyed into and through the tempering furnace (on the left of the second column). As discharged from the tempering furnace they are inspected and adjusted, if necessary, and made ready for final fitting.

The progress of the rods is continuous from start to finish. The heating and cooling of each piece individually is clean, rapid and systematic. Pyrometers are provided to record the temperature of each heating operation.

The type of furnace and arrangement of units, while advantageous from the standpoint of quality and cost of heated product, should be considered only when the manufacturing conditions are such as require the continuous production of large quantities of material.

Tubes, Billets, Etc.

For the continuous heat-treatment of comparatively short material, such as tubes, billets, etc., which do not necessitate the use of a chain conveyor, there may be employed, either individually or in series, the type of furnace illustrated at Fig. 6.

At the charging ends of some hardening furnaces, the material is placed on a table and delivered into the furnaces by an automatic motor-driven mechanism (enclosed beneath the table). The charging mechanism is employed to deliver the material continuously into furnace and to fix the position, movement and time of exposure of each piece. The automatic movement begins immediately after the piece is placed on the table and is regulated by a controller convenient to the hand of the operator. To obtain the advantages of individual heating and cooling, the charging mechanism is so arranged that but one or two pieces are charged and discharged at the same time. This eliminates the disadvantages in heating and cooling common to any method that would involve the charging or discharging of a batch at one time. The charging mechanism is so arranged that the pieces are charged in proper rotation of heating and cooling.

At the discharging ends of other hardening furnaces, the pieces are plunged into the quenching bath one or two at a time at regular intervals, so that there is no opportunity for bunching of the material or irregular heating of the bath itself. It is but a matter of a second or two from the final heating in the chamber to the cooling in the bath and as there is practically no exposure to the atmosphere the steel is quite clean and free from scale.

The quenching tanks in front of other hardening furnaces are each provided with a conveyor and means for circulating the quenching fluid. The initial movement and sequence of the pieces as they are plunged into the bath is continued by the movement of the conveyor, which with the circulation of the fluid insures a uniform cooling of each individual piece.

Covers are provided to protect the bath, and protected footwalks facilitate passage between the tanks.

The conveyors in some quenching tanks carry the pieces out of the bath direct to the charging ends of the tempering furnaces, as shown at Fig. 6, where the pieces are removed from the conveyor to the charging table of the tempering furnace, passing through this furnace in the same manner as through the hardening furnace.

At the discharging ends of the tempering furnace, the pieces are continually discharged, one or two at a time, in the order as charged. They may be removed by hand, as shown, delivered to a conveyor to facilitate the uniform cooling of each piece individually and the transfer of the pieces to the point of the next operation.

When the product is to be annealed only, the procedure is the same as that described for the tempering operation.

Advantages of Automatic Heating

When the product is heat-treated in this manner, with ordinary care and attention on the part of the operators the chances for error are minimized and the percentage of rejections greatly reduced. The individual pieces have been charged automatically and gradually brought up to the final temperature; the time of exposure has been determined identically for all pieces; the quenching has been performed rapidly with practically no fall of temperature between the final heating and cooling operations and without material exposure to the air. The delivery of each heated piece separately into the quenching bath and the sustained movement on the conveyor through the bath in the order of their

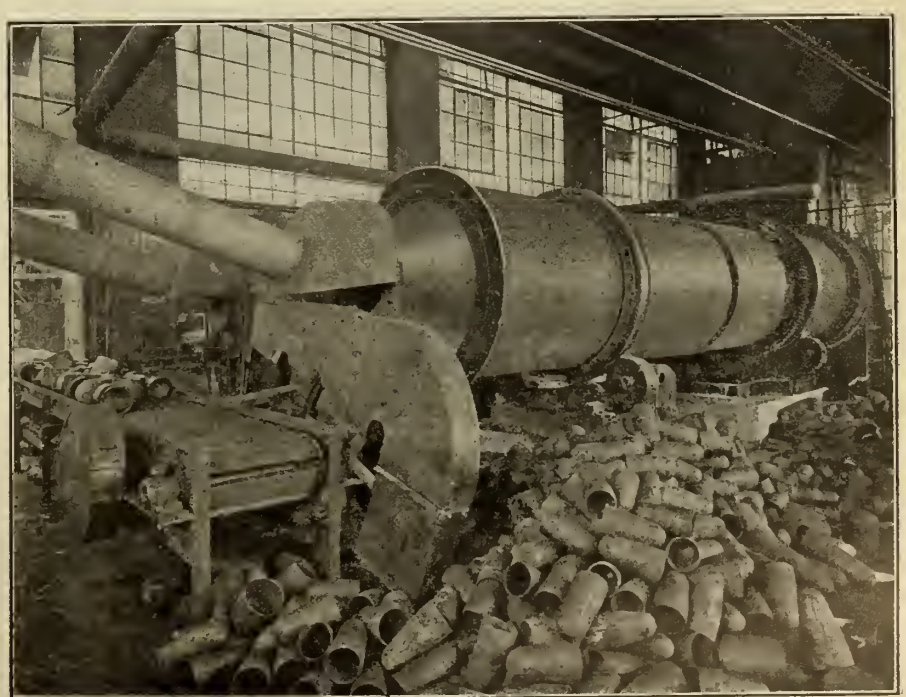


FIG. 9—Charging end of rotary furnace. This furnace is used for annealing pressed steel parts.

discharge from the furnace, together with the circulation of the quenching liquid itself, insures individual and uniform cooling.

Such individual and uniform heating and cooling results in a high-grade product, serves to decrease the cost of labor and fuel for the heat-treatment itself, the cost of subsequent machining operations, and the loss of product rejected as the result of poor heat-treatment.

It is frequently desired to anneal nonferrous metal in a manner that will leave it clean or bright or both so as not to require pickling at the end of the heating operation. To accomplish this result with material in the form of wire and miscellaneous punched, drawn, spun, stamped or rolled parts, you proceed as follows:

The material to be heated is placed on the conveying chain at one end of the furnace, travels downward through a water seal and thence upward into a closed muffle. In this muffle the metal is gradually brought up to the required temperature as it progresses to the discharge end of the furnace, at which point it is carried downward through another water seal and is delivered clean and bright at the discharge end of the conveyor.

The determination of furnace size and the details of chamber arrangement and conveyor construction are dependent almost entirely upon the manufacturing and plant conditions. The furnace may be built with single or twin muffles.

This type of furnace, particularly in the larger sizes, should be considered only when the composition of the metal permits, when the size and shape of the material to be annealed are more or less uniform and the quantity sufficient to permit the maintenance of heat both day and night. Expansion and contraction, following the irregular heating and cooling, and the tendency of operators to rush the firing operations when starting, would unduly shorten the life of the muffle.

Rotary Furnaces

For the heat treatment of comparatively small pieces, the size and shape of which will permit of continuous stream movement, the internally-fired rotary type of furnace, with helical lining, may be employed for annealing, normalizing, hardening, tempering, bluing and miscellaneous heating operations on ferrous or non-ferrous metal products, such as bolts, nuts, rivets, balls, saw teeth, buttons, cups, shells, etc.

Recent modifications of this type of furnace, which has been used extensively for years, widen its field of usefulness to a point heretofore considered impracticable with this method of heating and handling.

While a great variety in methods is employed for conveying material to or from the furnace, details of which are determined largely by the size, shape and quantity of material to be heated and the general manufacturing conditions, the principle of heating and movement through the furnace remain substantially unchanged.

The material to be heated is charged into the charging drum in bulk, and a definite quantity is taken from the drum into the furnace at each revolution. The material is gradually and automatically worked through the furnace, at a fixed speed, to the discharge end, where it reaches the desired temperature and is automatically discharged.

It is not only brought up to the desired temperature from the cold state gradually so as to afford time for the heat to penetrate its mass without overheating its surface parts, but each individual piece is constantly exposed to the heat in the chamber and to the ever-changing surface of the evenly heated spiral runway, being finally discharged at the time it reaches the desired temperature and degree of saturation.

The spiral runway permits a definite amount of material to pass from the charging drum into the furnace. Each charge is kept separate from the others, and each individual piece is continually turned over and moved forward in the spiral runway.

The horizontal position of the cylinder and the spiral runway are essential features of the furnace. Together with the variable speed regulator they determine the length of travel and time of exposure through the furnace, which is the same for each individual piece. This would be impossible in an inclined cylindrical furnace with a smooth lining and without provision to regulate the movement of the pieces. In such a furnace some of the material is bound to run ahead of the rest, causing a difference in time of exposure, resulting either in underheating or overheating. The horizontal position also permits of convenient charging and discharging and simpler driving mechanism.

Liquid or gaseous fuel, the control of which is practically the only manual part of the operation, is introduced into a combustion chamber at the discharge end where the heat is at the desired degree. As the hot gases of combustion pass onward and toward the charging end they meet the incoming cold material, which absorbs the heat in the gases, leaving their temperature comparatively low at the outlet on the charging end.

The temperature is continuously indicated, while the furnace is revolving, by pyrometer equipment adapted to the rotary motion of the furnace.

The lining, which is adapted to the temperature requirements and the nature of the material being handled may be refractory material or metal or a combination of both. In either case the principle of the spiral runway to move the material is retained.

The speed may be varied, according to the shape, size and quantity of material being heated, by means of a variable speed driving mechanism. When a conveyor is employed to deliver material to or remove it from the furnace, the speed of the conveyor may be synchronized with or maintained independently of the speed of the furnace.

When it is desired to quench immediately after heating, the furnace is generally provided with a quenching tank and conveyor, as shown at Figs. 7 and 8. With such construction, the material, in comparatively small lots, is discharged from the furnace into the quenching tank, being caught on the conveyor and discharged over the end of the tank.

Annealing Pressed Steel Parts

The successful adaptation of this

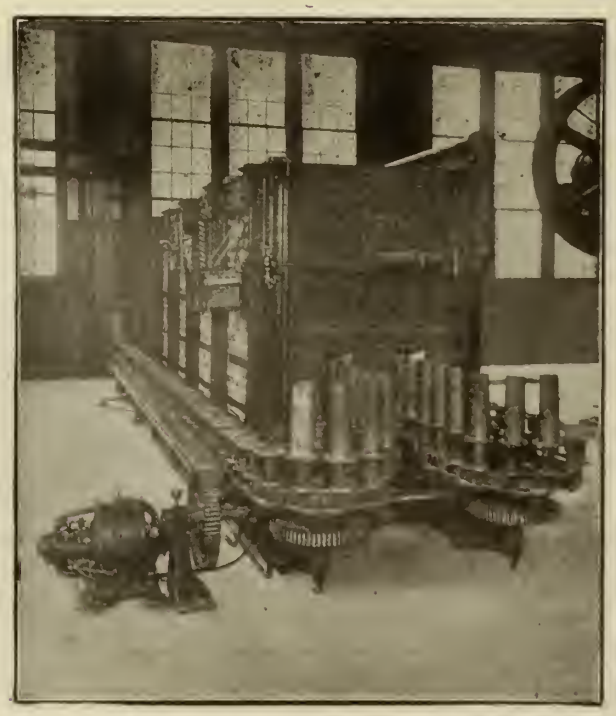


FIG. 10—Discharging end of automotic furnace for end heating.

type of furnace, in the larger sizes, to the annealing of pressed steel parts in large quantities has indicated the possibilities of improving the quality and decreasing the cost in this line of manufacture. In the operation shown at Fig. 9, the heavy drawn steel cups are charged into the furnace hoppers directly from a conveyor carrying the cups from the press room. The cups are wormed through the furnace to the discharging end, where they are automatically discharged through a large covered chute to protect them from the atmosphere until they reach the quenching bath, from which they are automatically carried up and dumped into mill trucks.

By this method of protecting the material in its passage from the furnace to the quenching bath, it has been found in practice that the pickling operations usually employed in connection with low carbon-pressed steel parts have been very materially reduced and in some cases entirely abandoned.

The furnace illustrated at Fig. 9 has a capacity ranging from 5,000 to 10,000 pounds per hour.

In an installation of this kind, when the volume of work handled is sufficient, a furnace may be employed for handling the output of each press, thus keeping the press and annealing operations in step and maintaining a steady and continuous output.

The heat-treatment of large quantities of small and medium sized drop forgings, ranging up to 8 or 10 pounds each, is successfully accomplished with these rotary furnaces arranged in series for normalizing, hardening and drawing. The sequence of operations and method of handling material from one furnace to another are similar to those already described. The advantages of this method from the standpoint of uniformity and cost per unit of output, are in market contrast to the uncertain functioning of heating and handling equipment generally employed in this line

For drying small metal parts after washing operations, a modification of the rotary furnace may be employed.

In this method, the material, charged into the hopper, is conveyed automatically into the perforated revolving drainage drum, in which the greater part of the moisture is removed, the liquid discharging into a drip pan. The material is then conveyed through the dryer, in which it is thoroughly dried, finally passing out through a chute.

This type of dryer may be employed in the handling of chemical products which require a very thorough drying, for which operations the drainage drum is omitted.

The method of applying heat to the material is practically the same as that employed in the rotary heat-treatment furnaces previously described. The charge is divided into a number of small lots, each separated from the others and continually agitated, with a consequent uniform exposure of all surfaces to the heat, assuring a very thorough drying process.

Special Automatic Furnaces

The great variety in manufacturing processes and plant conditions frequently calls for automatic furnaces of novel design adapted to the individual requirements. One of these, shown by Fig. 10, is employed to heat the end or a portion of the body of hollow cylinders without overheating the base, in order to facilitate the subsequent crimping, tapering or other forming operation. Such operations are delicate and require very thorough annealing so that the structure of the metal may permit of forming without fracture or uneven surface.

This method of heating illustrates a departure from long-established heating practice, resulting in a very material improvement in quality and production cost. The practice for years on this operation had been to revolve the individual piece and play gas flames against the section to be annealed. Fairly satisfactory results could be obtained by this method provided the metal were a good conductor of heat and the walls of the cylinder comparatively thin, but more especially if the operator were careful not to prolong the time of exposure. As a low temperature is usually required in the metal and the temperature of the flame was nearer to the melting point than to the annealing point, there was great danger of overheating, heating unevenly or underheating, which danger was lessened only by the skill of the operator.

Another method was to suspend the pieces in a heating chamber or bath, the temperature of which approximated the temperature desired in the metal. While this method was better than the other from the standpoint of uniform heating, both were open to the added objection that the output was limited and the cost high.

To eliminate these disadvantages on large quantities of material, the operation is made continuous with the type of furnace illustrated at Fig. 10, which is built with single or twin conveyors to suit conditions. The type of conveyor used on this furnace makes possible the continuous employment of practically the entire length of the conveyor for handling material. In practice the operators are kept busy in loading and unloading the furnace, the output per man is increased hundreds of per cent. over the previous practice, and the loss due to improperly heated product is practically nil.

Another furnace of this type, designed to heat the ends of tubes for bending, is illustrated by Fig. 11.

With this continuous furnace the tubes are placed in holders forming part of a conveyor. Provision is made at one end to automatically fix the length of tube exposed to the heat, and at the other end to automatically strip the tubes from the conveyor. Means are provided to cool by water such parts of the conveyor as are exposed to the heat and to localize the heating of the tubes as desired. The tubes are brought up to heat gradually, and each is subjected to the same temperature, for the same length of time and in the same manner. The results in practice have shown a marked decrease in rejections due to improperly heated material, an increase in output due to the automatic method of charging, heating and discharging, and decreased fuel consumption.

When the manufacturing conditions prohibit the use of a strictly automatic type of furnace, it is frequently possible to modify the method of handling without materially departing from the principle of continuous operation. Whenever a furnace is required to meet variable manufacturing conditions, it is preferable to consider a type of furnace that is practically continuous through not strictly automatic in operation.

(To be continued)

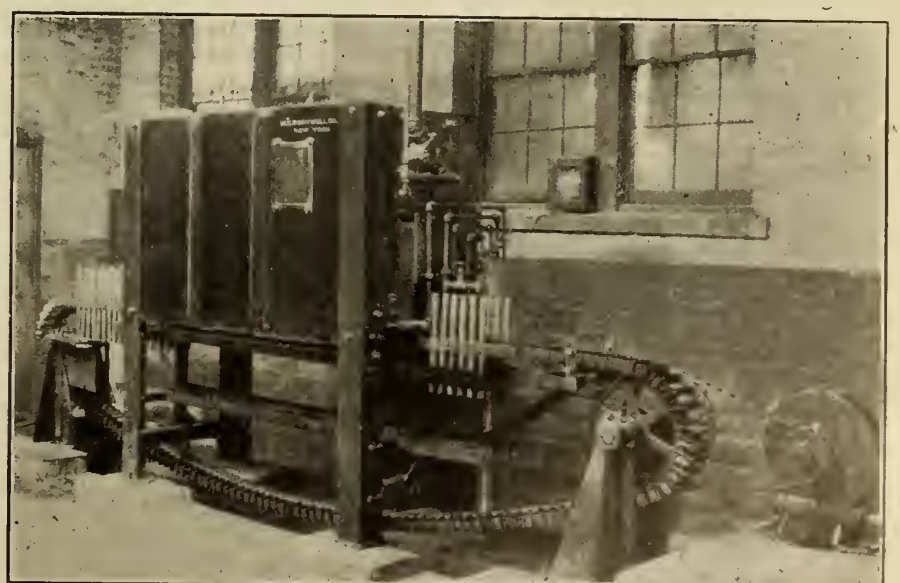


FIG. 11—Discharging end of automatic tube heating furnace. The tubes are placed in holders which form a part of the conveyor. The length of tube exposed to heat is automatically fixed.

Steel Treaters Will Meet at Philadelphia

It Will Pay You to Attend This Convention—Herein is Given a List of the Papers to be Presented—There Will Also be a Huge Live Exhibit in Operation

By J. H. M.

TO say that a knowledge of Heat Treatment in these days of keen competition is essential is like mentioning that Columbus discovered America, both facts are already well-known. To those interested in the progress of the heat-treating branch of the industry, we can offer a valuable suggestion. We have already stated in a previous issue that the American Steel Treaters' Society are holding a huge convention at Philadelphia, Sept. 14 to 18 inclusive. We are now able to present the list of talent who will issue, through the medium of papers presented, the very cream of the progress and development in this most essential branch of industry. We advise you to read this list. It will surprise you. The talent is the best in America, and the information which will be issued in this way will alone be worth going to Philadelphia for. You do not require to be a member of this society to enjoy the privilege of attending this convention. Everyone is welcome. To the manufacturer we would say "Go yourself," and to the heat-treaters and those interested we would say "Tell your employer you wish to attend. He will more than likely pay your expenses as the information you will bring back will more than repay him." Let Canada be well represented at this convention, for in addition to the papers as listed below there will be a huge assortment of live exhibits similar to what we already explained in a previous issue of Canadian Machinery.

Following are the papers to be presented at the convention of the American Steel Treaters' Society and the Steel Treating Research Society, Commercial Museum, Philadelphia, Pa: J. D. Andrews, district manager, Brown Instrument Co., New York City. Pyrometers and their Application to Steel Treating. Arthur N. Armitage, Mesta Machine Co., Pittsburgh, Pa. Pyrometers from the Standpoint of the User. T. F. Baily, President, The Electric Furnace Co., Alliance, Ohio. Relative Economy of Electric, Oil and Gas-Fired Furnaces. Guy P. Bible, salesman, H. T. Potts & Co., Philadelphia, Pa. Relation of the Steel Salesman to the Development of Heat Treatment. A. Bensel, 1st Vice-President, Driver-Harris Co., Harrison, N. J. High Temperature - Resisting Alloys for Carbonizing. Eric E. Bilgart, President Pyromagnetic Instrument Co., Chicago, Ill., The Relation of Time, Temperature, Mass and Surface to the Hardening of Carbon steel.

James Brakes, Jr., Electrical Tester, Commonwealth Edison Co., Chicago, Ill., Relative Economy of Electric, Oil, Gas and Coal-fired Furnaces. J. A. Brown, W. S. Rockwell Co., New York City, Factors Governing Production of Heated Product. N. E. Brown, Superintendent, U.S. Electrical Mfg. Co., Los Angeles, California. A Quenching Tank for Tool and Die Work. Peter Chambers, Owner, Angelus Steel Treating Co., Redondo, California. Forging Temperature of High and Low Carbon and Alloy Steels. E. F. Collins, Consulting Engineer Industrial Heating Devices, General Electric Co., Schenectady, N.Y., Relative Thermal Economy of Electric and Fuel Fired Furnaces, and its Influence on Process Coats and Plant Efficiency. J. D. Cutter, Climax Molybdenum Co., New York City, topic announced later. A. H. D'Arcanbal, chief metallurgist, Pratt & Whitney Co., Hartford, Conn. Working Test of High Speed Steel. Illustrated. Ed. F. Davis, Celite Products Co., New York City. The Function of Insulation in the Heat Treating of Steel. Illustrated.

A. K. Drury, H. A. Drury Co., Ltd., Montreal, Canada. The Heat Treatment of High Tensile Steels for Automobiles, etc. Wm. A. Ehlers, Industrial Furnace Engineer, American Gas Association, New York City. Fuels and Their Heat Utilization in Furnaces. Illustrated. Louis A. Elner, Assistant Metallurgist, H. H. Franklin Co., Syracuse, N.Y. Proper Heat Treatment for Carburized Steel Parts made from Plain Carbon Steels of Different Carbon Content, also from the Various Alloy Steels. The Advantages of the Double Quench, and the Direct Quench from the Carburizer. G. W. Franzheim, Supplee-Biddle Hardware Co., Philadelphia, Pa. Heat Resisting Metals. H. J. French, Bureau of Standards, Washington, D. C. The Heat Treatment of a High Chromium Steel. C. U. Geesey, Chemist and Metallurgist, The Garford Motor Truck Co., Lima, Ohio. The Functions of a Chemist and Metallurgist. R. L. Gilman, Experimental Heat Treater, Standard Steel and Bearing Co., New Haven, Conn. Carburizing, Hardening and Tempering High Carbon Alloy Steels in One Hundred Thirty Minutes.

F. A. Hall, American Metallurgical Corporation, Philadelphia, Pa. Topic not announced. H. G. Hall, The Bristol Co., Chicago, Ill. The Essentials of Modern Pyrometry. H. H. Harris, Quigley Furnace Spec. Co., New York City. Containers Used in Heat Treatment Processes. Illustrated. O. E. Harder, Associate Professor of Metallurgy, University of Minnesota. Topic not announced. Dr. J. Culver Hartzell, Dalton Adding Machine Co., Norwood, Ohio. No. 1—The Relation of the Electric Furnace to the Fabrication of Steels with Special Reference to the Chemical and Physical Changes Produced, and the Relative Economy of the Electric Furnace and the Gas, Oil and Coal-fired Furnaces. No. 2 — The Relation of Chemistry to the Fabrication of Steels, and the Effects of Small Percentages of Zirconium, Cobalt, etc., upon the Physical Properties of Steels. C. A. Haux. Foreman, Avery Co., Peoria, Ill. Carburizing Temperature Best Adapted to Steels of Various Carbon Contents.

O. C. Hedin, Treasurer, Gopher Machine and Tool Works, Inc., Minneapolis, Minn. Progress in Small Shop Hardening Methods. H. E. Hemstreet, General Foreman Spring Department, Sheldon Axle & Spring Co., Wilkesbarre, Pa. Heat Treatment of Axle Forgings for Heavy Trucks. R. L. Herrick, Editor, Raw Material, New York City. Molybdenum Steel. V. E. Hillman, Metallurgist, Crompton and Knowles Loom Works, Worcester, Mass. The Efficiency of Various Quenching Mediums and Their Applications. I. T. Hook, General Motors Co., Detroit, Mich. Factors Limiting the Strength of Materials. Carl Christian Jensen, Draftsman, Mahr Manufacturing Co., Minneapolis, Minn. The Current in the Thermo-couple. Charles Morris Johnson, Director of Research Department, Crucible Steel Co., Pittsburgh, Pa. Properties and Microstructure of Heat Treated Flame and Acid Resisting Steel. Illustrated.

G. W. Keller, Sales Manager, Brown Instrument Co., Philadelphia, Pa. Injecting a Little Salesmanship into your Jobs as Metallurgists. R. B. Kerr, Foreman Heat Treating Department, John Deere Harvester Works, Moline, Ill. Hardening Die Blocks and Carburizing Thin Stock. W. O. Kellogg, General Combustion Co., New York City. Economy in the Use of Fuel Oil. Fred Viall Larkin, Head of Department of Mechanical Engineering, High University, South Bethlehem, Pa. Lesson learned from the Manufacture of Munitions and Ordnance in the Heat Treatments of Steels used in Peaceful Pursuits.

H. O. Loebell, Henry L. Doherty & Co., New York City. Oxidation of Steel During the Period of Heating. W. G. Lottes, Steel Expert, International Harvester Co., Chicago, Ill. Various Quenching Mediums and Their Application. W. H. Lyman, General Superintendent, Warner Gear Co., Muncie, Ind. No. 1—Relative Economy of Electric, Oil, Gas and Coal-fired Furnaces. No. 2—The

Role of the Metallurgical Laboratory in Relation to the Inspection Department. T. A. Lynch, Research Engineer, Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pa. The Manufacture and Treatment of High Grade Helical Springs.

A. F. MacFarland, Metallurgical Engineer, Vanadium Alloys Steel Co., Latrobe, Pa. Topic not announced. W. H. Marble, Manager, American Stainless Steel Co., Pittsburgh, Pa. Stainless Steel. G. S. McFarland, Metallurgist, Jeffrey Manufacturing Co., Columbus, Ohio. A Research in Case-Carburizing. Illustrated. F. J. McIntyre, in Charge of Pyrometers, Hayes Wheel Co., Jackson, Mich. Practical Facts on Pyrometry. Marshall Medwedeff, Metallurgical Engineer, Samson Tractor Co., Janesville, Wis. The Role of the Metallurgical Laboratory in Relation to the Inspection Department. J. B. Morey, Foreman of Annealing in Wire Mill, Atlas Crucible Steel Co., Dunkirk, N.Y. The Efficiency of Various Quenching Mediums with Their Practice and Application.

W. F. Newhouse, Saranac Machine Co., Benton Harbor, Mich. Hardening Small Tool Steel Parts by the Molten Lead Process. T. Y. Olsen, Tinius Olsen Testing Machine Co., Philadelphia, Pa. Most Recent Developments in Testing Machines and Equipment for Metallurgical Use. Earl W. Pierce, Metallurgist, Maxwell Motor Co., Newcastle, Ind. The Role of the Metallurgical Laboratory in Relation to the Inspection Department and Machine Shop. Geo. Porteous, Supervisor of Forge and Heat Treatment, Minnesota Steel Co., Duluth, Minn. The Substitution of Open Hearth Steel of Suitable Analysis for Crucible Tool Steel, in the Manufacture of Hand and Pneumatic Chisels, Shear Blades and Kindred Tools. Chas. Ring, Chief Chemist, Ohio Steel Foundry Co., Springfield, Ohio. The Annealing and Heat Treatment of Miscellaneous Steel Castings.

Henry B. Smith, Metallurgist, and F. J. Olcott, Foreman Heat Treating and Forging, New Britain Machine Co., New Britain, Conn. The Forging and Heat Treating of Chrome Nickel Steel Spindles. E. P. Stenger, Metallurgical Engineer, Thompson and Black, Detroit, Mich. The Effect of Heat Treatment on Fatigue Strength. Illustrated. A. F. Strubing, Managing Editor, Railway Mechanical Engineer, New York City. Heat Treated Parts in Locomotive Service. O. E. Szekely, President, O. E. Szekely Co., Moline, Ill. Topic not announced. A. Tabachnick, Chicago, Ill. Effect of Repeated Heat Treatment Compared to Extended Heat Treatment. G. H. Trout, The Smith Gas Engineering Co., Dayton, Ohio. Producer Gas for Heat Treating Furnaces.

Henry Voltman, W. S. Rockwell Co., New York City. Factors Governing the Selection of Furnaces for the Heat Treatment Operation. D. A. Wallace, Waterloo, Iowa. Topic not announced. W. R. Ward, General Foreman, Tool Treatment Department, Bethlehem Steel Co., Bethlehem, Pa. A Practical Aid to the Treatment of Steels. W. H. Wiegand, Vice-President, E. J. Codd Co., Baltimore, Md. Chain and Tubular Furnace Doors. Illustrated. J. A. Wilson, President and General Manager, The Brooklyn Steel Treating Corp., Brooklyn, N.Y. The Relation of the Commercial Heat Treating Plant to the Ultimate Consumer and the work of the Society in the Interests of Both. Henry Traphagen, Metallurgist, Toledo Steel Casting Co., Toledo, Ohio. Selection of High Speed Steels for Tools.

Major A. E. Bellis, Metallurgist, United States Arsenal, Springfield, Mass. Hardening, Quenching and Tempering High Speed Steel. H. O. Loudenbeck, Engineer of Materials, Union Switch & Signal Co., Swissvale, Pa Topic unannounced. Mr. G. R. Brophy and Miss S. B. Leiter, Metallurgists, Research Laboratories, General Electric Co., Schenectady, N.Y. The True Action of Cyanide in Case Hardening Steel. Illustrated. R. A. Kunitz, Chief Engineer, Advance Furnace & Engineering Co., Springfield, Mass. Topic not announced. H. P. MacDonald, Vice-President, Snead & Company, Jersey City, N.J. Electrical Heat Treatment of Steel. Illustrated by moving pictures. J. J. de Boves, President, Apex Steel Corporation, New York City. Heat Treating the Order.

C. B. Peck, Associate Editor, and J. C. Marsh, Metallurgist, Railway Mechanical Engineer, 720 Transportation Bldg., Chicago, Ill. "The Field for Heat Treating Locomotive Forgings." J. L. Thorne, Metallurgist, United States High Speed Steel & Tool Corp., 489 Fifth Ave., New York City. Heat Treatment of High Speed Steel. Robert B. Pottinger, Manager, R. B. Pottinger, Racine, Wis. Subject: "Forging, Welding, Tempering Light Steel." Theo. G. Selleck, Alfred O. Blaich Co., Chicago. Subject: "Case-hardening." Illustrated.

To give the program in detail would use more space than we can afford, but from start to finish this convention should be, to use an old familiar term, "A real humdinger." The ladies are also invited and special arrangements have been made to entertain all those attending, so the fair sex will no doubt be there in strength. Remember the dates, Sept. 14 to 18. Make it a point to be there.

INTERESTING DRILL TALE

An incident which has come to our attention, showing where electrical devices are helping to solve the skilled labor shortage, is worth repeating. In this particular case, a Cleveland manufacturer had plans for erecting a mezzannine floor to be supported by twenty-eight iron columns. In order to anchor these columns securely at the base, it was necessary to cut square openings through the floor, 15 inches x 18 inches.

It was at this point that the difficulty was encountered. The flooring consisted of ⅞ inch matched hardwood laid on two-inch planks, both laid in a heavy concrete base. Sawing was impossible. By drilling a hole at each of the four corners and then chipping with a hammer and chisel, two men required four and two-sevenths hours to cut out the first opening. This was too slow, and then someone thought of drilling the entire outline of the desired opening with an electric drill.

By this latter process, the remaining twenty-seven holes were cut out with an average time of exactly one-third that of the former method. Had the first plan been followed through it would have required twelve ten-hour days for two men to complete the job. With the assistance of the drill, the entire work was finished in four ten-hour days or a saving of the time of the two men for eight full days. Figures were obtained of the combined wages of the two men who did the work, and it was found that eighty hours had been saved at the rate of $1.35 per hour, which equalled a total saving of $108. The electric drill used was a "Van Dorn," Code-D400 type, and its cost was practically paid in the saving in four days' operation.

The use of the electric drill for general millwright purposes in drilling or cutting openings in wood, iron and steel, etc., is something deserving of close attention.

USEFUL PUBLICATIONS

The Canadian Engineering Standards Association have informed us that a stock of the most important publications of the British Engineering Standards Association are now available for distribution. Of course a nominal price must be charged for these publications. Below is a description of some of these books.

Requests for copies should be addressed: Secretary Canadian Standards Association, Room 112 West Block, Ottawa, Ont.

24-1911. British Standard Specifications for Railway Rolling Stock Material. Part I. Locomotive Carriage and Wagon Axles. (Revised December, 1911.)—Alternative specifications (with and without limits on sulphur and phosphorus) are given for locomotive axles (crank and straight) and for carriage and wagon axles. 25 cents net.

24-1911. British Stanadard Specifications for Railway Rolling Stock Material. Part II.—Locomotive, Carriage, and Wagon Tires. (Revised December, 1911.).—Specifications are given for locomotive tires (with chemical analysis) and for carriage and wagon tires (both with and without analysis). 25 cents net.

24-1911. British Standard Specifications for Railway Rolling Stock Material. Part III.—Laminated, Volute and Helical Springs and Steel for Laminated Springs. (Revised December, 1911.).—Gives alternative specifications (with and without chemical analysis as to carbon sulphur and phosphorus) for each of the above. 25 cents net.

The Lubrication of Soft Metal Bearings

Friction, Flooded Lubrication, Bearing Design and Other Points of General Interest Are Discussed in This Article, Which Appeared in "Mechanical World"

FRICTION is the name given to the force which opposes motion and is, therefore, ever present between the journal and the bearing. It is found in all manner of mechanical devices and, strangely enough, is one of the most valuable and at the same time most destructive forces. Without friction, brakes would lose their value, and nuts would never be used on bolts. Trains would of necessity run on tracks provided with gear teeth, and we could not walk as we do now, but would be compelled to find other means of locomotion. Friction, however, is not desirable in bearings. Although much experimental work has been done on this subject, the laws of friction are as yet but little understood.

The surfaces of all materials which appear smooth are in fact made up of microscopic hills and valleys. When two surfaces in contact are moved relatively to each other, the clashing of the points creates a force which opposes motion. Wear results from this action, and the energy expended is converted into heat.

Fluids, as well as solids, show friction, and this has been described as the force encountered in rolling the particles of the fluid against one another. The laws of friction in fluids and solids are quite different, and these have been summarised as follows: For solids, dry or slightly lubricated, frictional resistance is proportional to the load; it is independent of the extent of the rubbing surfaces; except at very low speeds it decreases as the velocity increases.

In liquids the frictional resistance is independent of the load; it is directly dependent on the extent of the rubbing surfaces; and increases as the velocity increases.

The function of the lubricant in bearings is to separate the surfaces by a film so that metallic contact does not occur. If such a separation does take place the friction resulting will follow the laws for fluids. It has been well established by Tower that under conditions of perfect lubrication the journal is actually fluid-borne, and in this case the laws of fluid friction may be applied. He showed that when a bearing is plentifully supplied with lubricant the friction depends very little on the load or the character of the surfaces, but is dependent on the extent of the surfaces, the velocity and the character of the lubricant.

Tower's experiments were made with the load and bearing above a journal, the lower part of which was immersed in a bath of oil. He found that the journal carried the oil between the surfaces and formed a film between them. One of the most interesting points of his experiments was noted quite accidentally. In the course of his work he had occasion to drill an oil hole at the top of the bearing and found that the oil flowed freely from it. He attached a pressure-gauge at this point and determined that a pressure of 200lb. per square inch was developed, although his load was only 100lb. per square inch of projected area. Later experiments showed that the pressure of the film at the top was greatly in excess of that at the sides and that it was greater on the discharge side than on the entering side. The thickness of the film has been determined as between 0.0013in. and 0.0029in.

However, in most applications such ideal conditions are not reached, and usually on starting the surfaces are in contact and subject to the laws of friction for solids. Lubrication is often interrupted or imperfect, by reason of improper distribution, and friction does not follow exactly the laws either of solids or of liquids, but is intermediate between them. This is the type of intermediate friction encountered in bearings with which the present paper deals, and it is necessary an indefinite quantity depending on all of the named variables. It will be seen that the matter of the character and supply of lubricant, as well as the nature of the surfaces, will be important factors in determining the friction and wear of the surfaces.

Since lubrication is so vital in the matter of friction and wear, prime consideration should be given to it in bearing design. Every effort should be made to create a film, although it is not always practicable nor desirable to provide bath flood, or forced lubrication. Various methods for supplying the lubricant are in use.. Drop-feed lubrication, which is the simplest form, requires only a hole in the bearing through which the oil is introduced. Unfortunately, this hole is often placed at the point of greatest pressure, so that no opportunity is allowed for the establishment of a film. Introduction at the point of minimum pressure would probably reduce both wear and friction.

Saturated-pad lubrication is employed in some cases, the most common example of which is the railroad car bearing. The bearing covers only the upper third of the journal, and waste, saturated with oil, is pressed against it from below.

Ring or chain lubrication is used on many line-shaft bearings and on bearings of electrical equipment. Chains or rings are provided of a diameter considerably larger than the journal and resting on it, and these run in grooves in the bearing and through a reservoir of oil. Good results have been obtained by this method, and it is claimed by some authorities that conditions closely approaching perfect lubrication are reached.

Flooded Lubrication

Flooded lubrication consists of pumping the oil or carrying it by gravity in large volume to the bearing and delivering it at practically no pressure. Perfect films are often obtained, and the added advantage of dissipating the heat of friction brings it into use with large high-duty bearings. Forced lubrication is used in a limited number of cases. Oil is pumped to the points of maximum pressure and a perfect film is maintained. The pressure of delivery at the bearing must, therefore, be above the pressure of the film, and ranges from 15lb. per sq. in. to 600lb. per sq. in.

Grease lubrication is applied principally to heavy, slow-moving machinery. Considerable friction is encountered from the lubricant itself, but under heavy pressures the "body" of the grease prevents abrasion by the tenacity with which it clings to the respective surfaces and separates them.

Oil grooves are resorted to in many bearings in an endeavor to secure a film. However, when the film is once formed, the grooves are a distinct hindrance to its maintenance. Grooves should,, in general, not lead into the region of maximum pressures, as in this case they may actually lead the oil away from, instead of towards, the place where it is most needed. Grooves should preferably be placed in the region of minimum pressures, and should run parallel to the axis of the shaft. Care should be taken to round the edges of the grooves to minimise the danger of injuring the film.

In bearings subjected to heavy loads the oil or grease may be entirely squeezed from between the surfaces when motion ceases. Grooves to the pressure points will provide convenient reservoirs of grease for starting and thus prevent abrasion, and this is the only case where such grooves should be countenanced. Errors in locating grooves may be avoided, to a great extent, by keeping in mind the desirability of securing films.

Another factor in securing proper lubrication is clearance between the bearing and the journal. Where the bearing covers only a portion of the journal, the latter can be made smaller in diameter, thus providing clearance at the

minimum pressure sides. This is often further increased by planing away additional metal from these sides. The amount of clearance desirable will vary with the velocity of the journal and the nature of the lubricant, but in general it can be said that too much clearance will decrease the opportunity for the formation of a film. The error, however, is often made on the other side—that is, too little clearance is provided. It should be remembered that the bearing is often rigidly held, so that with a temperature rise expansion of both bearing and journal tend to decrease the space between them.

Clearance should be provided between bearing and container whenever possible to allow free expansion. Without this, expansion of the back of the bearing may cause pinching off of the lubricant at the sides and what are apparently perfectly fitted bearings, when cool, may be in fact very badly fitted when they become warm.

Dissipation of heat from the bearing is a matter which is often overlooked. The heat of friction is usually carried away by radiation, but in some cases cooling is accomplished by currents of air, oil, or water. Water cooling is often employed, but in some cases this is not practicable and the bearing is called upon to run at high temperatures.

Bearing Design

Bearing design is sometimes checked up by the product of pressure, in pounds per square inch of projected area and velocity in feet per minute. Various values have been assigned, ranging from 24,000 to 1,720,000. One manufacturer of heavy machinery limits this value to 60,000 for ordinary lubrication, while 1,100,000 seems to be good practice for locomotive main crankpins.

As will be seen from some of the precautions in design, the gearing that has the best lubrication will last longest, other things being equal. Grit and dirt will often start scoring, and it may be of interest, in passing, to note that this remedy is sometimes used in curing hot boxes. Bearings are occasionally so tightly fitted that little lubricant can enter between the surfaces. Minute oil grooves may then be secured by introducing a small quantity of powdered emery, which makes circumferential scratches on both the journal and bearing surface. Care should then be used in cleaning the emery from the lubricant, as abrasion to a serious extent may be caused. Clean bearings, well lubricated and kept in alignment, should give little trouble when properly designed.

Shipyard Not Closing.—There is no truth in the rumors that the Davie Ship Building plant at Levis, P. Q., was about to shut down. The rumor also included the subsidiaries of the plant, and is equally unfounded in regard to them, according to Mr. A. A. Wright, vice-president of the company.

RUBBER VULCANISING

The story of the rubber industry is very entertaining, as told in Mechanical World. They state as follows:

The rise of the rubber industry, which was founded in Manchester by Macintosh in 1825, to its present position and magnitude, may be directly attributed to the discovery by Goodyear, in 1839, of the process known as vulcanisation. Raw rubber, which Macintosh employed in the earliest days as a proofing for fabrics, is by no means a suitable material, from the manufacturer's point of view, for the production of a finished article, in spite of the fact that it possesses a number of unique properties.

Amongst other drawbacks to its use are the facts that it is strongly adhesive, and that it is sensitive to changes of temperature, becoming soft and tacky at a summer heat and stiff and hard in the winter. These defects alone would have sufficed to limit very seriously its uses in industry. In fact, it is safe to say that but for Goodyear's investigations and subsequent discovery, the industry would have been one of minor importance—if, indeed, it had continued to exist at all.

Goodyear found that by incorporating rubber with sulphur and heating for a suitable period to a temperature of about 140 degrees C., rubber becomes profoundly modified and acquires new properties which render it eminently suitable for the manufacture of a host of useful articles. It loses its adhesiveness, becomes resistant to temperature changes, and exhibits greatly enhanced strength, elasticity and durability. A year or two later, Hancock, in England, independently discovered the process, his method consisting in immersing sheets or formed particles made from raw rubber in a bath of molten sulphur at a temperature of 135 degress to 140 degrees C. In principle the two methods are the same.

In 1846 Parkes showed that rubber could be superficially vulcanised by immersing it in a cold dilute solution of sulphur chloride in carbon bisulphide. This method is adopted to the vulcanisation of thin sheets or films of rubber only.

From these early days up to the present time all manufactured rubber goods have been vulcanised by one or other of these processes, that of Goodyear finding by far the widest application.

An entirely new process for affecting vulcanisation has recently become available as the result of the discovery, by Mr. S. J. Peachey, Lecturer in Chemistry at the Manchester College of Technology, that by exposing rubber alternately to the action of two gases—viz., sulphur dioxide and hydrogen sulphide—it becomes rapidly and completely vulcanised, even at the ordinary temperature. The process appears to be of fundamental importance for the following reasons:—

1. It is a true sulphur vulcanisation (as distinct from the sulphur-chloride treatment) and yields a product entirely comparable with that obtained by the Goodyear process.

2. It eliminates the use of heat, and to a great extent the use of mechanical pressure.

3. It employs two gases, both of which can be produced on a large scale at a very cheap rate.

4. It is rapid in action.

5. It enables the manufacturer to employ organic filling agents, such as leather waste, sawdust, shoddy waste, and the like, which cannot be used in connection with the hot process. In this manner a number of cheap and highly durable materials may be fabricated from the various wastes, and employed as floor and wall coverings, for boot and shoe manufacture, and for upholstery work.

6. Coal-tar dyestuffs, and even natural dyes, which, with a few exceptions, are destroyed by the "hot cure," can be introduced into mixings to be cured by the new process with the production of delicate tints and shades hitherto unobtainable.

The process has the advantage of extreme simplicity, and its translation from the laboratory to the works should prove a very simple matter.

Already numerous samples of daintily coloured floor-coverings, fancy leathers, and felts, suitable for hat making, have been produced in the laboratory, and these have an appearance and a finish which could hardly be improved upon. Severals pairs of boots have been soled with leather reformed from waste by the new process, and the practical test of several months' hard wear has shown that the reformed leather is even more durable than the real article.

The process can be extended to the vulcanisation of rubber in solution. If a solution of rubber in benzole or naphtha be saturated or partly saturated with hydrogen-sulphide and mixed with a solution of sulphur-dioxide in the same solvent, the liquid sets in a few moments to a stiff jelly, and on eliminating the solvent by evaporation a fully vulcanised rubber is obtained. The use of the mixed solutions for producing perfectly vulcanised seams and joints has proved highly satisfactory in practice, and inner tubes repaired in a few moments by the new process have an excellent life. Further, by the aid of the solution process, reformed leather soles and heels may be attached to boots without the aid of stitching or nailing, and indeed a boot may be produced from the reformed leather without a single stitch being necessary.

The above-mentioned applications of the process have been fully worked out in the laboratory, but they do not exhaust a fraction of its possibilities — and new technical effects in many other directions are continually presenting themselves.

The Peachey process is fully protected all over the world.

WHAT OUR READERS THINK AND DO

TAPER TABLE

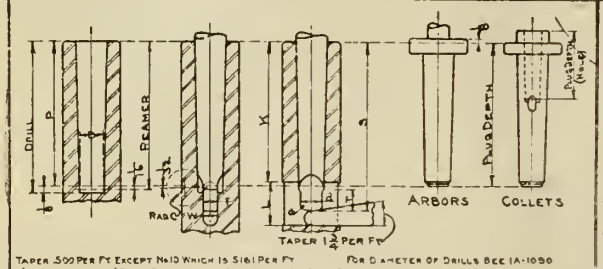
By J. H. M.

The accompanying table of standard tapers should be of decided interest to every reader as it represents the latest table issued by the Brown & Sharpe Co., of Providence, R. I. This firm has made certain changes which they have found advisable, and we would strongly suggest that readers cut the table out for further reference. Should you so desire, you could write the B. & S. people for further copies of the chart.

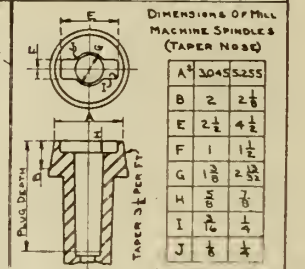
STANDARD TAPERS

BROWN & SHARPE MFG. CO. PROVIDENCE, R.I.

DEC. 6 1919 G.B.A.E. LP



TAPER .500 PER FT EXCEPT NO 10 WHICH IS 5161 PER FT. FOR DIAMETER OF DRILLS SEE TA-1090
NO 8 B & S STANDARD PLUG DEPTHS ARE NOT USED IN ALL CASES
† SPECIAL LENGTHS OF KEYWAY ARE USED INSTEAD OF STANDARD LENGTHS IN SOME PLACES STANDARD LENGTHS NEED NOT BE USED WHEN KEYWAY IS FOR DRIVING ONLY AND NOT FOR ADMITTING KEY TO FORCE OUT TOOL.



DIMENSIONS OF MILL MACHINE SPINDLES (TAPER NOSE)

	A† 3045	5255
B	2	2 1/8
E	2 1/4	4 1/2
F	1	1 1/2
G	1 3/8	2 13/32
H	5/8	7/8
I	3/16	1/4
J	1/8	1/4

† DIAMETER AT SHARP CORNER

NO OF TAPER	DIAM OF PLUG AT SMALL END D	PLUG DEPTH P B & S STANDARD	PLUG DEPTH P MILLMAN STANDARD	PLUG DEPTH P MISCELL	WHERE USED	KEYWAY FROM END OF SPINDLE K	SHANK DEPTH S	LENGTH OF KEYWAY † L	WIDTH OF KEYWAY W	LENGTH OF ARBOR TANGE T	DIAMETER OF ARBOR TANGE d	THICKNESS OF ARBOR TANGE t	RADIUS OF TANGE TO CORNERS C	RADIUS OF TANGE TO CORNERS a	DISTANCE TANGE TO PROJECT FROM TEST TOOL
						K	S	L	W	T	d	t	C	a	
1	.200	15/16				15/16	1 1/16	3/8	135	3/16	170	1/8	3/16	.030	.003
2	.250	1 3/16			COLLETS-LL	1 11/64	1 1/2	1/2	166	1/4	220	5/32	3/16	.030	.003
		1 1/2				1 15/32	1 7/8	5/8	197	5/16	282	3/16	3/16	.040	.003
3	.312			1 3/4	DRILL COLLETS	1 23/32	2 1/8	5/8	197	5/16	282	3/16	3/16	.040	.003
				2	MACHINES-SI	1 31/32	2 3/8	5/8	197	5/16	282	3/16	3/16	.040	.003
4	.350		1 3/4		COLLETS-A&J, ATTACHMENTS-CIC	1 13/16	1 31/32	11/16	228	11/32	320	3/32	5/16	.050	.003
		1 11/16				1 51/64	2 3/32	11/16	228	11/32	320	3/32	5/16	.050	.003
			1 3/4		COLLETS-C, D, CC, F, N & R	1 11/16	2 1/16	3/4	260	3/8	420	1/4	5/16	.060	.003
5	.450			2	DRILL COLLETS	1 15/16	2 5/16	3/4	260	1/8	420	1/4	5/16	.060	.003
		2 1/8				2 1/16	2 3/8	3/4	260	3/8	420	1/4	5/16	.060	.003
6	.500	2 3/8			COLLETS-MM, MACHINES-11, N-2, N13	2 19/64	2 3/8	7/8	291	7/16	460	3/32	5/16	.060	.005
				2 1/2	DRILL COLLETS	2 13/64	3 1/32	15/16	322	15/32	560	5/16	3/8	.070	.005
7	.600	2 7/8			MACHINES-XI	2 25/32	3 1/32	15/16	322	15/32	560	5/16	3/8	.070	.005
				3	COLLETS-BB, DD, E, KK, Q, R & Z, ATTACHMENTS-A1BB, A1CC, B0B, B1B, B1C, C1B, 26B	2 29/32	3 1/32	15/16	322	15/32	560	5/16	3/8	.070	.005
8	.750	3 5/16			MACHINES-J10, J11.	3 29/64	4 1/8	1	353	1/2	710	11/32	3/8	.080	.005
9	.900			4	COLLETS-F, FF, G, H, O, SS, T & W, MACHINES-B00, B0, BYO, ATTACHMENTS-A2B, A2CC, B2E, B3B, B24B, C2C, 248, 261	3 1/8	4 5/8	1 1/8	385	5/16	860	3/8	7/16	100	.005
		4 1/4			MACHINES-12, 13, 14, 122	4 1/8	4 7/8	1 1/8	385	5/16	860	3/8	7/16	100	.005
10	1.046		5		MACHINES-J12, ATTACHMENTS-AB1, A1B, 249, 252, 253, 262.	4 17/32	5 13/32	1 5/16	447	21/32	1 010	7/16	7/16	110	.005
				5 11/16	COLLETS-GG, P, PP, V & X-0, MACHINES-A1, AA1, A1½, AA1½, A2, AA2, B, BB1, BY1, B1½, BB1½, B2, BB2, BY2, B12, C, ATTACHMENTS-B1F	5 13/32	6 3/32	1 5/16	447	21/32	1 010	7/16	7/16	110	.005
				6 3/32		6 1/16	6 15/16	1 5/16	447	21/32	1 010	7/16	7/16	110	.005
11	1.250	5 15/16			MACHINES-J14, J16, ATTACHMENTS-AB2, AB3, 256, 257, 258, 259	5 25/32	6 11/32	1 5/16	447	21/32	1 210	7/16	1/2	130	.005
			6 3/4		COLLETS-T, TT, VV, W, X1 & YY, MACHINES-A3, AA3, BBH2, B3, BB3, BB13, CE, C3, ATTACHMENTS-A1A, B2F	6 49/64	7 15/32	1 5/16	447	21/32	1 210	7/16	1/2	130	.005
12	1.500	7 1/8	7 1/8		COLLETS-WY & Z, MACHINES-AAH3, AA4, BBH3, BB4, C3, P3, P13, ATTACHMENTS-B3F	6 45/64	7 15/16	1 1/2	510	3/4	1 460	1/2	1/2	150	.005
				6 1/4	ATTACHMENTS-AB4, 250, 260										
13	1.750	7 3/4				7 9/16	8 3/16	1 1/2	510	3/4	1 710	1/2	5/8	170	.010
14	2.00	8 1/4	8 1/4		COLLETS-Y, MACHINES-AAH4, BBH4, BBH5, PP3, P4, PP13, ATTACHMENTS-B4F, B5F	8 1/32	9 5/32	1 11/16	572	27/32	1 960	9/16	3/4	190	.010
15	2.25	8 3/4				8 17/32	9 3/32	1 11/16	572	27/32	2 210	9/16	7/8	210	.010
16	2.50	9 1/4			MACHINES-P5	9	10 1/4	1 7/8	635	15/16	2 450	5/8	1	230	.010
17	2.75	9 3/4													
18	3.00	10 1/4			MACHINES-P6										

THIS TABLE IS WELL WORTH PRESERVING.

WOOD STEADY RESTS

By Donald A. Hampson.

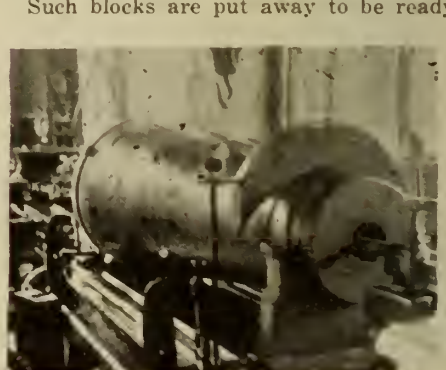
Shops doing general repair work often feel the need of a larger steady rest for the lathe or lathes, as the case may be. This is noticeably true of those shops at long distances from the larger cities—shops that are usually none too well equipped and that endeavor to serve the wants of a community which may range from automobile work to power plant and mining machinery repairs.

The pocket book of the owner cannot stand the price of a big lathe—one that may stand idle eleven months in the year. And then anyway, the capacity of steady rests as regularly supplied is from one-quarter to one-third the largest diameter that may be turned in the machine. Drums, pipe threading, transmission machinery parts, special castings—these are a few of the more common parts that come to the lathe for some job that requires a steady rest much bigger than the one on the floor.

The photo shows the one best way out of these jobs. This is a drum for a variable speed drive—26" at the big end, both ends to be bored out, and that in a 28" lathe.

Two inch maple blocks form the rest. The lower one is cut out to the radius of the small end of the drum with two notches at the bottom to line it with the ways of the lathe. The top piece is cut to two radii—one for the small end and one for the big end when the piece is reversed. In the foreground may be seen a bar 1" x 2" steel secured to the lathe by heavy C clamps; into this are tapped rods that draw down on a strap passing over the top wooden piece. The whole forms a secure and satisfactory arrangement and one that enabled two of these drums to be refitted in quick time.

Such blocks are put away to be ready



VIEW OF THE STEADY RESTS.

for some future job or re-cut for a different one if there is no possibility of needing again for the original purpose. But few shops have pipe centres for anything over 6" size, and when a piece comes along to be cut off or made up into a "Dutchman" they have to turn the work down. One of these wooden rests will do the trick most acceptably.

COLLARS FOR MILLING MACHINE ARBORS

By G. BLAKE

Collars for milling machine arbors are in constant demand in the machine shop, and it will be readily admitted that the majority of good first-rate shops, although stocked in tools and equipment, generally suffer from a lack of suitable collars. In most cases they are worn and badly knocked about, this being the result of the collars having been made from mild steel and left soft. How often does one notice this state of affairs and make up their mind to have proper sets made up hardened and ground.

With this object in view, the writer got out the following tables of sizes and standardized them in the works where he is engaged as mechanical superintendent. The collars were made from ordinary black mild steel, which will case-harden quite well for the purpose. The cost from a manufacturing point of view is not heavy, as they can be readily made on a capstan or turret lathe. The turret and capstan lathe is looked upon by some solely as a production machine, but it is surprising to find that it is a very valuable asset for the toolroom, for roughing out work, for turners, and a boy can run the capstan, thus lightening the heavy costs of the toolroom. Of course such a condition can only apply where there are a number of centre lathes in the toolroom and sufficient work to justify the inclusion of a capstan lathe.

Returning to the subject of milling collars, the tables were got out as will be seen for 3 different diameters of arbors, 1 in., 1¼ in., and 1½ in., they being the most common sizes in general use.

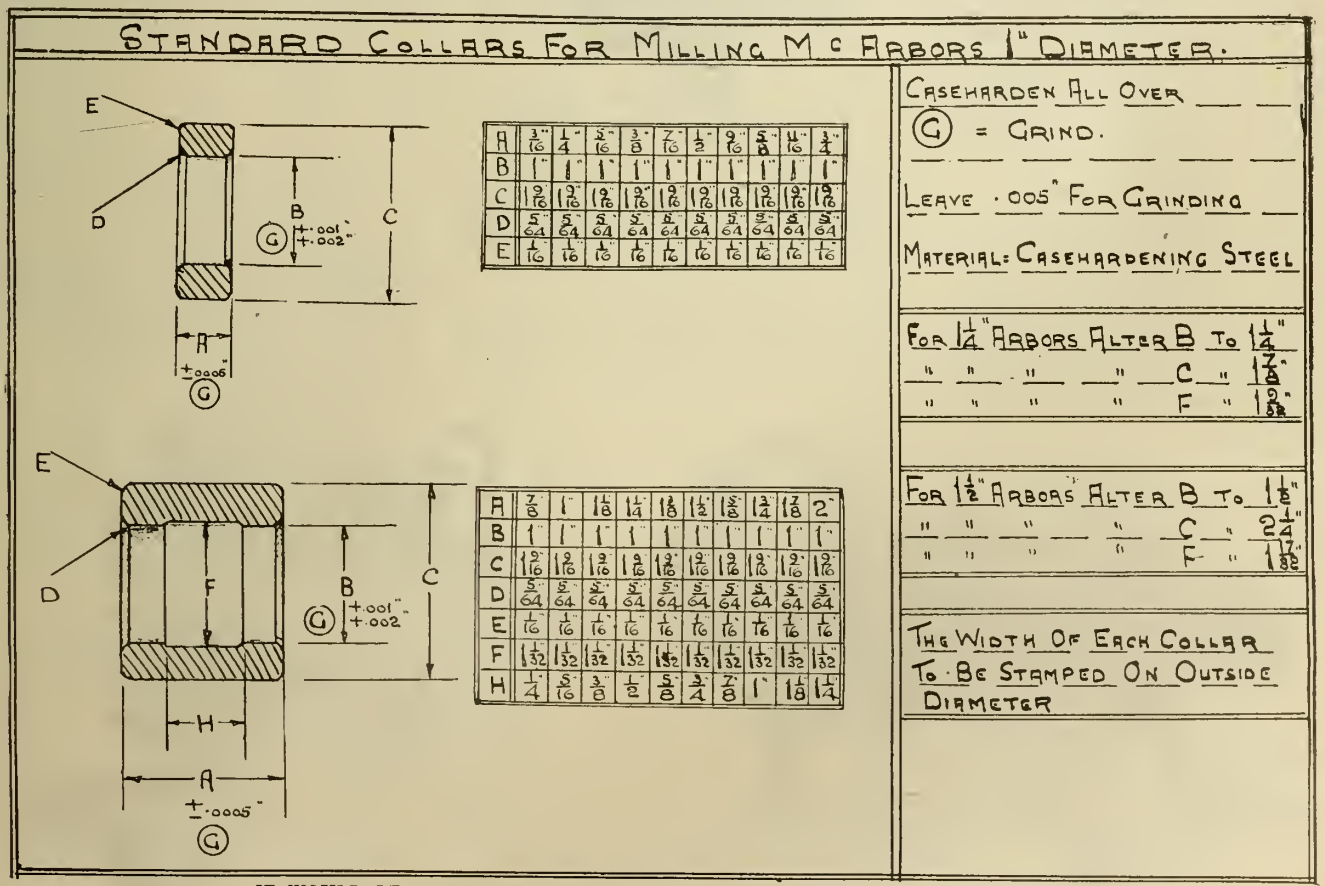
Other special widths of collars can be included to suit the particular work engaged in, but the sizes given cover a wide range for milling work. The idea of making the collars on the capstan is that once set up they can be produced very cheaply in batches, whereas in many instances they are made in the toolroom by a skilled man, thus sending up the cost.

THE "JENTIL" PROCESS

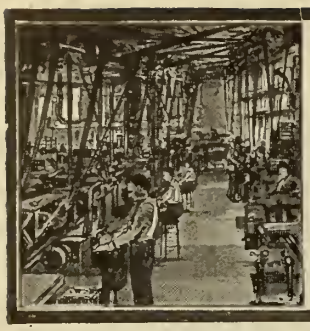
The efficiency of the "Jentil" process for cleaning, derusting and rustproofing, is a development of the munitions making for the British Government. The "Jentil" process produces a non-magnetic oxide which thoroughly protects and at the same time cleans off rust, paint, enamel, lacquer, grease, etc., leaving a pleasant ebony finish. Rust, no matter how deep, may be removed, leaving one homogeneous metal. No distortion of the ferrous articles treated takes place. It is claimed that there is no measurable difference in the size of any article after treatment. The process renders every article black in appearance, a rusty or dull surface will finish a dull black after treatment, and a burnished surface prior to treating will finish a burnished black.

The time required in cleaning, derusting and rustproofing will vary from fifteen to forty-five minutes, according to the size of the article treated, and at a very low cost. During the process the articles never come into contact with any acids. In cases where it is desired to lacquer, japan, enamel, etc., it is claimed that the "Jentil" finish provides an excellent primary or base, which does not discolor or otherwise affect the subsequent enamelling. No previous treatment is necessary when putting on a "Jentil" finish. Articles going through the process do not require to pass through a bath of pickling acid; rough iron castings can be treated without sand-blasting, or other form of cleaning. One advantage of this process is that assembled articles may be treated with equal satisfaction.

The uses for this treatment are so varied that it would be almost impossible to mention any particular industry to which it would especially apply, as it may be economically adopted to almost every commercial and industrial requirement. The "Jentil" process is being placed on the Canadian market by the Jentil Cleaning, Derusting & Rust-protecting Co., Limited, 137 McGill St., Montreal.


STANDARD COLLARS FOR MILLING M C ARBORS 1" DIAMETER.
E
D
B
C
A
G
+.001" +.002"
±.0005"
F
H
CASEHARDEN ALL OVER
G = GRIND.
LEAVE .005" FOR GRINDING
MATERIAL: CASEHARDENING STEEL
FOR 1¼" ARBORS ALTER B TO 1¼"
" " " " C " 1 7/8"
" " " " F " 1 29/32"
FOR 1½" ARBORS ALTER B TO 1½"
" " " " C " 2 1/4"
" " " " F " 1 17/32"
THE WIDTH OF EACH COLLAR TO BE STAMPED ON OUTSIDE DIAMETER

IT WOULD BE A GOOD IDEA TO CLIP THIS TABLE FOR FUTURE REFERENCE.



DEVELOPMENTS IN SHOP EQUIPMENT

WIRE NAIL MACHINES

The Joseph T. Ryerson & Son, Chicago, Ill., have placed on the market what is known as their line of Ryerson-Glader wire nail machines.

These machines are built in six sizes, similar to the one shown in Fig. 1, and range from the No. 00 to the No. 4 size. The production capacities of the six sizes range from 500 nails per minute for the No. 00 to 175 nails for the No. 4.

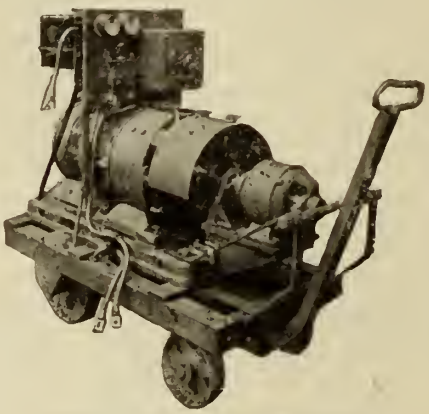
All important adjustments are within easy reach of the operator and can be made while the machine is running. All parts subject to strain or wear are of steel.

The wire is fed automatically from a bundle or coil between straightening rolls and then into the dies. While the wire is gripped in the dies the head is formed with one blow of the heading hammer, and as the latter recedes the straightener carriage moves forward the length of stock required for a nail. The wire is again gripped and the point cutting dies both make the point and clip it off, leaving enough stock outside the dies to form the next nail head. In advancing, the heading hammer operates an ejector which removes the finished nail. The top view, Fig. 2, shows the operating parts of the machine.

The wire is straightened by the straightener rolls moving back over the wire while it is gripped in the dies. The crankshaft is counterbalanced to compensate for the thrust of the header cross-head. The equipment furnished consists of one set of gripping dies for the larger size of wire to be used in the machine, together with two pairs of point cutters.

ELECTRIC-WELDING OUTFIT

The illustration shows a reproduction of a photograph of a single-operator electric-welding equipment manufactured by the Westinghouse Electric & Manufacturing Company, and is claimed to be exceptionally efficient because the generator operates at arc voltage and no resistance is used in circuit with the arc. The necessity for providing automatic moving devices such as relays and solenoid control resistors is eliminated There are 21 steps provided, from 50 to



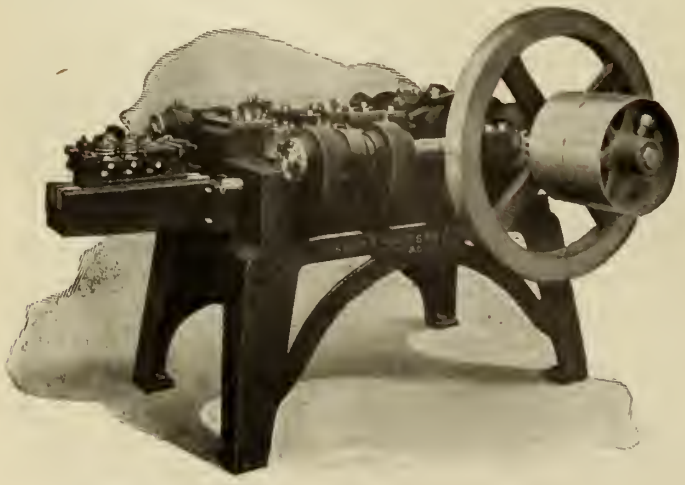
GENERAL VIEW OF THE OUTFIT

225 amperes, giving a current regulation of less than 9 amperes per step, making it much easier for a welder to do vertical or overhead work necessary in railroad shops.

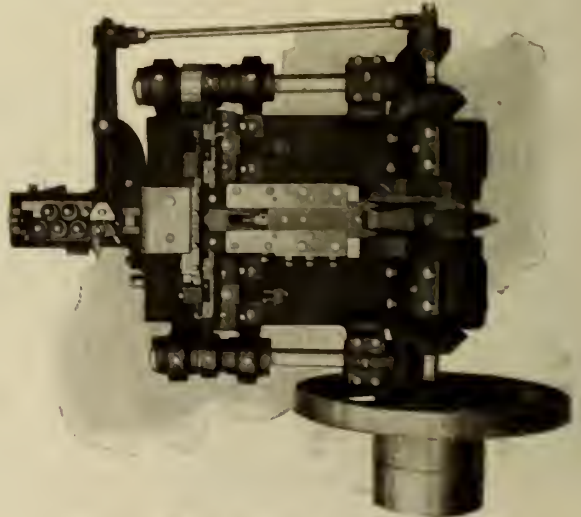
For portable service, the motor generator set with the control panel is mounted on a fabricated steel truck, equipped with roller bearing wheels, and is easily hauled about the shop or yards by one man. The suitable plugs and receptacles for three-phase, three-wire or two-phase four-wire, direct or alternating motors allow the set to be quickly and conveniently connected to the supply circuit at any desired point. Only one plug is desired for the motor but the number of receptacles required depends upon the number of points at which it is desired to do the welding work. These plugs and receptacles are supplied on special orders.

The panel is made up of a single section upon which are mounted indicating instruments, protective apparatus and switches for adjusting the welding current. If additional circuits are required it is necessary to use separate outlet panels.

Each outlet panel consists of slate panel on which is mounted a circuit breaker, line switch and necessary single pole resistance adjusting switches for regulating the heat at the arc by varying the amount of current supplied. These outlet panels may be supplied for either metal or graphic electrode welding or both and may be operated simultaneously and independently of each other, the only limit being the capacity of the generator. A metal or graphic electrode holder is supplied with each welding panel, according to the work for which the panel is designed. The holders are of light weight, are well balanced and are designed so that they may be used continuously without overheating.



GENERAL VIEW OF THE WIRE NAIL MACHINE.



PLAN VIEW OF THE SAME MACHINE.

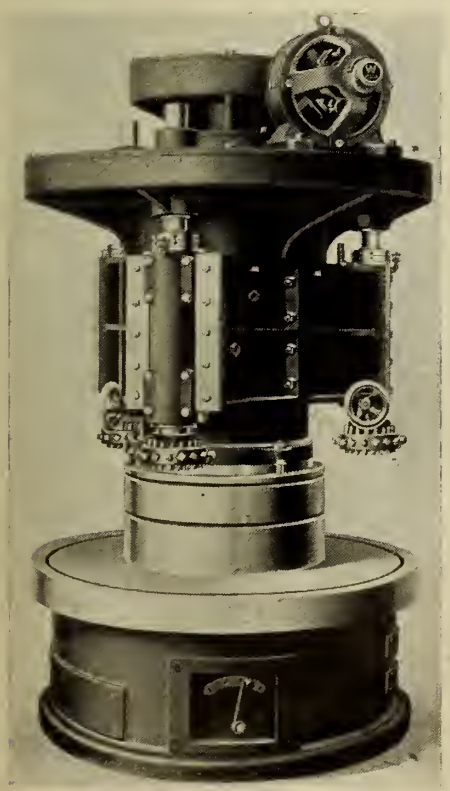
CONTINUOUS MILLING MACHINE

The multiple spindle continuous vertical milling machine which is here illustrated and decribed is now being built by the Betts Machine Company, Rochester, N.Y. The machine as shown is provided with three spindles, but it can be furnished with additional spindles to meet any requirements of work where such a design is considered desirable.

It is intended for heavy production milling on duplicate parts and is of very simple and rigid construction. The spindles are steel forgings and they are driven through long splines and spur gears. Each of the spindle carries a milling cutter and may be adjusted vertically by hand. This, with a four spindle machine may be fitted with two roughing cutters and two finishing cutters, there by completing the operation in one cycle. The power for driving this machine is furnished by either a pulley or an individual electric motor at the top of the machine.

The table has a flat bearing on the bed, and a split tapered bushing provides for taking up wear in the bearing on which the table revolves about the column. The table is driven through a large internal gear, all bearings are bronze bushed and all gears run in a bath of oil. Four rates of continuous feed are obtained through sliding steel gears. None of the gears are ever in mesh except those that are actually transmitting power, so that there is no unnecessary wear.

The holding fixtures are carried on the table that revolves continuouly, and no time is lost in chucking the work as the pieces are changed while the fixtures are passing from one cutter to the next. It is claimed that one of these machines will take care of as much work as can be conveniently handled by two men, and depending on the nature of the work it has a production capacity three times as great as a single spindle machine.



GENERAL VIEW OF THE MILLER.

NEW THINGS IN MACHINE TOOLS

HEAVY DUTY MOTOR

The Westinghouse Electric and Manufacturing Company are placing on the market a special "H K" motor for providing maximum efficiency where heavy starting torque is required, such as that of crane and hoist service. This motor has been designed to meet the demands where the load consists of a series of starts, stops and reversals. A notable feature in its construction is its compactness, giving small overall dimensions, light weight and great mechanical strength. A blower is placed in the rotor which effectively ventilates both armature and field windings. Little energy is required to start the motor owing to the small diameter of the armature. To utilize to advantage the ventilating feature of the "H K" motors they are rated on the one-quarter hour basis.

GEAR HOBBING MACHINE

The Cincinnati Gear Cutting Machine Company has recently completed and placed in service a new type of gear hobbing machine. The capacity of the machine has a maximum for gears of 17¼ inches diameter and 12-inch face. Spur and helical gears may be cut, the latter either right or left and up to 4 degrees of angularity. The work spindle is horizontal and is rigidly supported by two long bronze-bushed bearings. The thrust bearings are of alternate steel and bronze washers. The outer bracket that supports the work arbor is of interesting design, being made in two portions, only one of which is released and backed off when removing the arbor. The second section is provided with a special centering attachment so that accurate return of the work arbor is assured after reloading. The hob spindle is driven by helical gearing to provide smooth running, and is adapted for eight changes of speed. Automatic knockout is provided for stopping the machine at the finish of the cut. The machine may be entirely controlled from the operator's position in front. The net weight of the machine is about 5,600 pounds.

LATHE ATTACHMENT

A very useful milling attachment for lathes has recently been developed by the Hinckley Machine Works, of Hinckley, Ill. It is adapted for placing on the tool slide of the lathe and its construction permits of doing a wide range of work speedily and economically.

BAR AND PIPE FORMER

The Wallace Supplies Manufacturing Company, of Chicago, Ill., have recently produced a machine for the bending of cold bars to any desired shape, and also various sizes of pipe. The machine is power driven and adjustable stops are provided to obtain any degree of bend required. When angles, channels and similar shapes are worked forms and follower bars are necessary. The machine stops automatically when the bend is competed. Special provision is made for the prevention of distortion when bending.

LIFTING AND TIERING TRUCK

The Automatic Transportation Company, of Buffalo, N.Y., are now making a lifting and tiering truck, the duty of which is to pick up and elevate loads to any desired height up to six feet, such as the loading of material on to box cars, waggons, platforms, etc. The entire mechanism is operated electrically, and the machine has a capacity of about two tons. The platform is carried by two strong uprights and is raised or lowered by means of a large single pitch screw revolving in a heavy bronze nut. The speed of the lift is about four feet per minute. Automatic limit stops are provided to prevent overrun of the platform at either extreme position.

TURRET TOOL HOLDERS

The Lovejoy Tool Company, Inc., of Springfield, Vt., are introducing to the trade a new line of turret tool holders. The turrets are made of hardened steel and are interchangeable with any base, a feature that permits of using a number of turrets with the one attachment, so that the tools for one setting do not have to be removed from the holder, thus giving quick and accurate changes. One movement of the binding lever releases the turret, accurately indexes it to the next tool position and again rigidly clamps it to the base. These turrets can be used on lathes having a centre distance above the tool block as small as 1 3-8 inches.

PNEUMATIC RIVETER

The Baird Pneumatic Tool Company, of Kansas City, Mo., are placing on the market a specially constructed pneumatic riveter. The machine is supported on a stand and is intended for use in riveting traction plates on the rims of pneumatic tires, but with slight modifications, can easily be adapted to a great variety of work.

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The Council of Action

THE creating of what is known as a Council of Action by the leading trades unions in Great Britain, with the avowed object of dictating to the Government its policy on certain questions of national importance, creates, as Mr. Lloyd George plainly states, "the most formidable challenge ever given to democracy." There can be no doubt that the people of Great Britain generally are war weary, and not labor alone. The greatest beneficiaries of the war were the trades unionists, and some of the capitalists, though not by any means all. It is the great middle classes who suffered the most and got nothing at all out of it who would probably be the most unwilling to see their country embarked on another period of war. Their voice, however, is not heard above the clamor made by the representatives of organized labor, which, after all, is by no means a majority of the community, but, on the other hand, a relatively small portion. Organized labor in Great Britain has, since the war, been frankly out to get everything it could possibly extort, and has not been afraid, in this endeavor, to attempt the complete paralysis of the country. The great transportation strike should have taught their representatives that when they go in opposition to the general public they are comparatively powerless, and it is quite possible that in making their threats of a general strike in the event of Britain taking action in Poland, they did so with their tongues in their cheeks. As a matter of fact, the British Prime Minister says that the aims of the Government and the aims of the Council of Action are practically the same, but he plainly and positively states that were they not, "dictation would be resisted by all means in the power of the Government." Trades unions can serve an excellent purpose, and have been instrumental in making life a more pleasant thing for the trades unionist. When they start to assume the role of the Government it is time to call a halt. While every right-minded person wishes to see labor, both organized and unorganized, get all the good out of life that it is possible to obtain, no sane person wishes to see any minority of the people holding a club over the rest. Lloyd George is to be congratulated on his uncompromising stand against such coercion.

The Mechanic of the Future

WITH no attempt at disparagement towards the present-day mechanic, we can point with pardonable pride to the old-time machinist whose locks may be quite few, but his experiences many. Talk to him a short time and he will unfold to you tales of accomplishments under the greatest of difficulties. "We had to be all-round men in those days," he will say, with a wag of his head, which brings us up to the point of weighing in our mind the calibre of present-day mechanics.

While still a trained workman, he is a specialist rather than an all-round man. He may be a lathe hand, milling machine operator, bench hand, etc., but in very few cases a man that can tackle intelligently any machine in the shop. Why is this so? For various reasons. It may be that he has never served a full apprenticeship, or he may have been an easy-going chap, content to be an adept at one particular duty. Then, again, he may never have had a proper chance to become an all-round workman. Many plants, unfortunately, encourage their mechanics to become specialists, and while this may be an easy way to obtain maximum production, what of the mechanic of the future?

A young chap need not serve a full apprenticeship these days to make real money. All he need do is serve a year or so, then shoot off to some automobile manufacturing plant, take over a mechanic's (?) job, and make a mechanic's wages. It is hard to credit that young fellows 19 years of age can make as much, and sometimes more, than a first-class tradesman by such a course, yet we have proof that this is so.

Do such men ever become real mechanics? To our mind, NO! They are merely handy men at a particular duty. Except we get together and make an apprenticeship in the machine tool trade attractive for the young man of to-day, the time is drawing near when the all-round machinist will be a thing of the past.

The Engineer's Opportunity

THE organization of the Federated Engineering Societies at their recent conference at Washington, D.C., is certainly a step in the right direction.

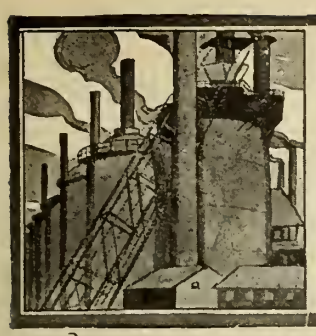
About 75 branches of the engineering profession were represented, these including Civil, Mechanical, Mining, Electrical, Sanitary, Heating, Marine, Agricultural, Radio, Refrigerating, Fire Protection, Industrial, Automotive, Military Engineers, Architects and Geologists, etc.

The need of such a body has been felt for years, but the problem was to successfully affiliate the various interests. The action taken at Washington has removed the only remaining nigger in the woodpile.

The object of this newly formed body is both ambitious and essential. They desire to raise the standing of engineers generally, and to teach the public how much they really depend upon the engineering profession. Any society, club or organization, the chief object of which is the advancement of the knowledge and practice of engineering and the application of applied sciences, and which is not organized for commercial purposes, is eligible for membership.

The success of this society, as we see it from our side of the line, depends entirely upon the engineers themselves. With proper support this body should grow to be a powerful influence and will form the official mouthpiece, so to speak, for engineers all over the country.

To our mind the forming of this society should be greeted with great enthusiasm by engineers in general and they should rally to its support. An opportunity such as this affords is not to be treated lightly. We will watch with interest the development of the organization, and once more emphasize the necessity of every engineer becoming a live member and actual booster.



MARKET DEVELOPMENTS

Pig Iron and Coke the Leading Features

There Have Been Advances in Most Grades of Pig Iron, Steel Products Not Showing Much Strength—Coke Situation Likely to Become Easier with Improvement in Car Supply.

IN the local market conditions are very much the same as they were last week. There have been no changes in prices of machine tools, or in stocks handled by the steel warehousemen. The same causes are operating, viz., summer vacations, tight money, and crop expectations. It is probable that if any change of prices occurs it will be in an upward direction, rather than downward. In the United States there has been a general advance on all grades of pig iron, while steel products have shown a tendency to decline. The coke situation which has been very acute, through car shortage, now is expected to show an improvement, and this in turn may affect the pig iron. At the present time, makers of pig iron are very loath to take on business for 1921, as they have no idea of what costs are going to be. There has been considerable curtailment of production among automobile manufacturers, though some of the principal firms are still working at full capacity. The falling off in these trades is expected to be made up by large buying by the railroads once the new freight rates come into force. In the case of the Illinois Central Railroad, which has an enquiry out for over fifty machine tools, it is thought that the purchase of these was decided on before the freight rate increase. One effect of the falling off in the automobile trades, and the cancellations occasioned thereby, has been a speeding up of delivery in the machine tool market. The old material market has shown a strong upward tendency in practically all grades, heavy melting steel being particularly strong. This, of course, refers to the U. S. market, the local market being quiet.

PIG IRON AND COKE ARE THE INTERESTING MATERIALS AT PRESENT

Special to CANADIAN MACHINERY

PITTSBURGH, August 19.—In the general iron and steel market situation pig iron and coke occupy the centre of the stage. Steel products are quiet and merely show, on the whole, a slight declining tendency. Pig iron on the other hand has lately assumed a very aggressive attitude, with some furnacemen predicting much higher prices, and some sales being made at actual advances. It is true that other furnaces deprecate advances and state they will be the last to quote higher prices. The advances in pig iron, when made, have been based upon scarcity rather than upon volume of demand, while the common excuse of furnacemen has been the high price of Connellsville coke. For some time this excuse held good, or at any rate coke stayed at an altogether fancy price. Now, however, coke seems to be lined up for a decline. At the moment of this writing no actual decline is found in the market but in some quarters it is held that everything is set for a decline within a couple of days or so.

A tense situation is accordingly produced, with pig iron having assumed an advancing attitude, partly on account of coke, and coke now threatening to decline and remove this supporting factor.

In some quarters it is thought that the furnacemen who of late have been actively engaged in endeavoring to push the market upwards were doing so because they felt that while the pig iron market could not stay up for any length of time there was a combination of circumstances in which they could push the market up temporarily and make something out of the movement. If the market was about to decline some day it might as well decline from a higher as from a lower level. Some furnacemen do not agree with this reasoning and hold instead that if the market were held steady it would last longer than if it rode for a fall.

Prices in Detail

For some time past foundry iron has been quotable at $46, valley. For a fortnight or more predictions have been common that $50 iron was going to be seen shortly, and two merchant interests at least announced that their price was $50 and they would not sell until they got that price. One of the two has now succeeded, making a sale at $51, furnace, equivalent, considering the point of delivery, to about $50.50, valley. The quantity was 500 tons, for delivery over the remainder of the year, and the buyer a New England foundry interest. It chances that the brand sold is a very well established one and the buyer might have paid the price asked on account of desiring that particular brand for the mix, so that the one transaction while interesting does not mark up the market as a whole.

In basic pig iron the curious situation is presented that over a week ago a sale of a good sized tonnage was reported at $48.50, valley, when the recognized market had been $46.50. It is alleged that the reputed buyer denied having made any purchase at any price. The market could hardly advance $2 without being active at the same time, yet since that report no sales at any price have been reported. In a normal market, if the sale reported made the market, other transactions should have followed by this time, and thus a very curious situation is presented. In some quarters "the market" on basic iron is regarded as $48.50, while in other quarters the market is still called $46.50.

In the case of Bessemer iron, which had been $47, valley, there have been some odd lots sold at this price in the past few days, while on the other hand one sale is reported at $50. The trade is decidedly puzzled as to where prices really do stand.

Improved Coke Situation

Monday, August 2, saw a great improvement in car supplies in the Connellsville coke region. Monday is always a particularly good day, but the improved placement continued all week,

and the next week Monday and Tuesday saw practically 100 per cent. placement, the supplies during the remainder of the week being relatively good also. The Connellsville Courier reported coke production in the week ended August 7 at 194,140 tons. This was 21,270 tons gain over production reported in the week previous, and about 5,000 tons more than the best production that had been reported since the middle of April, when the outlaw rail strikes suddenly reduced the production greatly. In the week following, not yet reported upon, it is believed there was a further increase.

The improved car placement seems to rest upon a solid foundation. It is not a case of a few more cars getting into the service, as there were plenty of cars as it was, the difficulty being that they moved altogether too slowly. One furnace after another was reporting that it had two or two and one-half times as much coke en route as was normally necessary in order that daily receipts should average up to the requirements, and of course those cars were placed at coke works less than half as often as normally. Now, however, the furnaces report much better coke movement. One Shenango valley furnace reports to-day that coke has been getting through from ovens in three days, when not long ago many cars took a couple of weeks. By reason of heavier shipments and also the quicker movement some furnaces have received more coke in the past few days than they are able to unload.

The outlook accordingly is that there will be a sharp break in the spot coke market, which in the past few weeks has been at the record high level in the history of the Connellsville coke trade. Up to this writing no definite decline has occurred in the market, but in most quarters the decline is momentarily expected. Generally speaking furnace coke is quotable at $17.50 to $18.50, though rarely has $18 been shaded. Foundry coke has been showing a wide range according to quality, or lack of quality. Ordinary 72-hour coke, which is produced in large quantities when car supplies make the running time so irregular, has been available at $19, but most foundries would not consider the $19 coke as really of foundry quality. For $19.50 some coke has been obtainable that would pass muster with perhaps the majority of furnaces. For selected brands higher prices have been paid, and after coke had passed through one or two brokers some foundries remote from the region have paid as high as $21 per ton at ovens.

Steel Market Quiet

The steel market continues quiet, even quieter than it was in July. It is waiting for some definite lead. Several sales of sheet bars have gone through at $70, against $75 previously paid, and $70 might possibly be shaded. Six steel interests are counted up as being willing to sell at not over $70. Finished steel products are hardly changed. While the market has been very dull the unfilled tonnage statement of the Steel Corporation indicated that the corporation sold 150,000 or 200,000 tons more in July than in June, this of course being due to the independents having so much higher prices than the corporation.

LOCAL MARKET STILL ON VACATION

TORONTO.—Looking for market news in the Toronto machinery market is like looking in a dark hole for a black cat that isn't there. Most of the men in this business seem to be out of town for vacations, and those that are not might as well be. There is practically nothing moving, although there is a certain amount of enquiry. There is little real buying sentiment behind this, and it is more in the nature of a feeling out of the market than anything else. Naturally, there has been no change in price lists since last week, although it is by no means certain that there may not be some slight increases in the near future. Deliveries in some lines are better, and in the case of milling machines, these can now be supplied in some instances from stock. Steel warehousemen state that they are keeping going in a quiet way, and have nothing to complain about, considering the general conditions. Deliveries are if anything better than last week, though the change is very slight. There is little likelihood of any change in prices. There is no doubt that the first two weeks in August are sustaining their reputation of being an off season. The prospects of the Toronto ball team seem to be a livelier topic than the prospects of the machinery market just now. When we get through the holiday season, and the exhibition, and get the harvest gathered, perhaps we shall settle down to business.

THE RAILROADS ARE DOING SOME BUYING NOW AND MORE EXPECTED

Special to CANADIAN MACHINERY

NEW YORK.—While business in machine tools has been steadily declining in volume during the last two or three months, the increase in freight rates granted to the railroads is expected to have a salutary effect on railroad buying of shop equipment within the near future. The announcement of the decision of the Interstate Commerce Commission on the freight rate advance is too recent to have brought any new railroad business into the market as a direct result of that action, but the fact that the carriers will soon have funds with which to make necessary purchases is a cause for optimism among those makers of and dealers in tools which are used for railroad shop work. The Illinois Central issued a list at Chicago calling for more than 50 tools, but it is probable that this inquiry had been fully decided upon before the news of the rate increase was made public. Several of the eastern roads are known to have fairly large lists prepared and quotations will be asked for as soon as the directing heads of the roads can persuade their boards to make appropriations. The fact that higher rates have been granted will probably make it easier for some of the roads to market new securities with which to buy equipment.

With the exception of the General Electric Co., there is none of the Eastern industrial companies doing any buying worthy of note. The General Electric Co. has been a consistent buyer for months, its latest inquiry calling for about 20 tools for its Schenectady plant. An eastern company affiliated with the automobile industry has purchased 25 internal grinding machines for replacement.

Delivery periods on machine tools are becoming shortened, due to the falling off in new business and also to the fact that there have been some cancellations, particularly in the Detroit district, where automobile production has dropped off in certain plants. It is reported that the Cadillac, Buick, Ford, Dodge and Hupmobile plants are working practically full, but in other factories production has been cut from 25 to 50 per cent. and some workmen have been laid off. Cancellations of machine tool or-

POINTS IN WEEK'S MARKETING NOTES

The Illinois Central Railway has an enquiry for over fifty machine tools.

—

Toronto steel warehousemen find business fairly good for the time of year.

—

Delivery periods on machine tools are getting better.

—

Pig iron reaches the $50 mark in the U. S. market, while coke is expected to ease off.

—

The scrap iron market has assumed a firm tone, and several advances are reported from U. S. points.

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HEAVY DUTY
Universal Millers

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Their long life insures ample returns for the investment made.

May we explain to you their many advantages and the convenience of their control.

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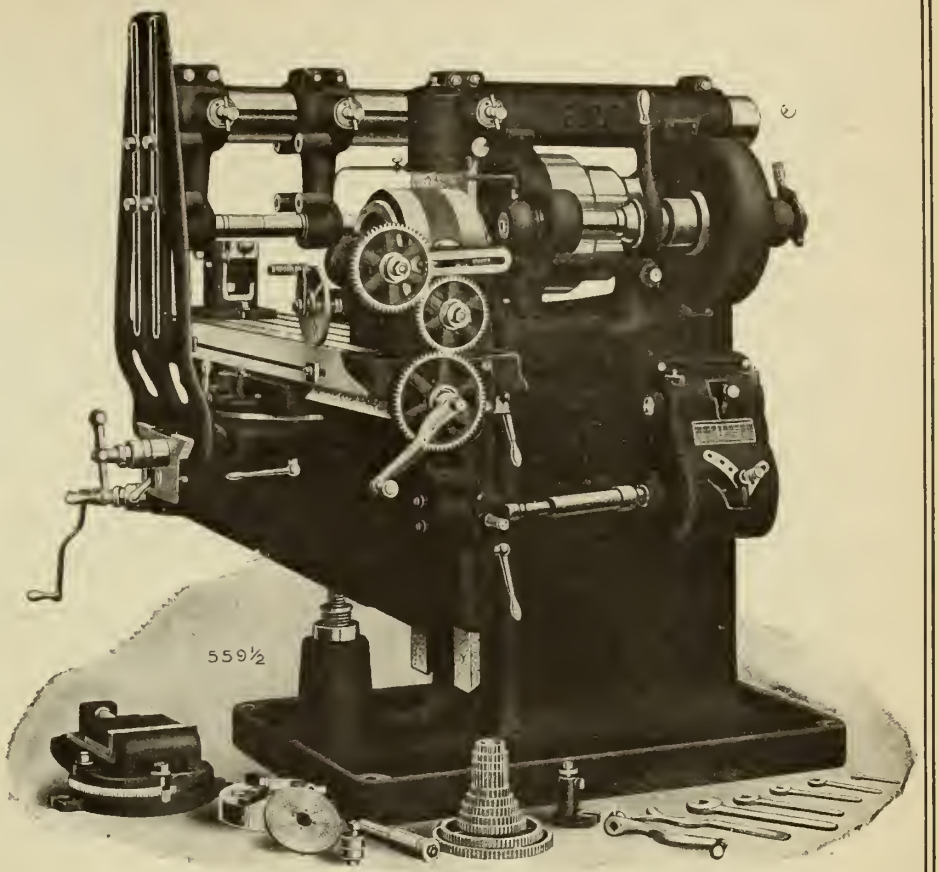

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You can use them to great advantage on any work in your shop that's suitable for a machine tool of this kind. The operating is easy and the labor cost comparatively low.

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Ingersoll File Company, Limited.
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INGERSOLL

If interested tear out this page and place with letters to be be answered.

BUYERS AND SELLERS OF IRON AND STEEL

Pittsburgh sheet mills are curtailing production on account of the car shortage. It is estimated that production has now fallen to about 40 per cent. below capacity.

For the first seven months of 1920, the Ford Motor Company turned out 990,000 cars. This was 10,000 short of their schedule.

Deliveries on plates by Pittsburgh mills are improving. One result of this is a slightly easier market, but the price ranges generally from 3.25 cents to 3.50 cents.

In order to relieve the shortage of cars, it is proposed to move a much larger amount of grain over the Great Lakes. This in turn will cut into the ore shipments, which are already far behind.

The Dominion Steel Corporation recently shipped its first consignment of plates for foreign order from its new plate mill at Sydney, Cape Breton.

Increased car supply, and conservative buying, is expected to make the market price of coke in the U. S. drop considerably in the near future. A drop of from $1 to $3 is spoken of in some quarters.

The putting into force of the freight increases in the United States is expected to provide an impetus to the heavy machine tool trade. One road has already come into the market for 53 tools of various kinds.

European production, coupled with the increase in freight rates, is leading some of the steel exporters in the United States to fear the coming of competition from that quarter.

Although the United States production of July was greater than that of June, the daily production was less, counting the one day extra in July. The figures for the month were 3,060,626 tons in July, as against 3,046,623 tons in June.

ders in the east have not been numerous, but some companies have been affected by the partial slump in automobile production, notably the Simms Magneto Co., East Orange, N.J., which has cancelled a considerable number of machines. The Empire Cream Separator Co., Bloomfield, N.J., which had extensive plans for increasing its output of cow milking machines, has also cancelled a large part of the shop equipment it recently bought.

Machine tool sales offices in New York are receiving few inquiries and are largely marking time.

U.S. SCRAP METAL

The scrap iron market is showing generally stronger according to advices from the various U.S. points. Heavy melting steel has been sought and $28.50 to $29 offered for it. Buying by English mills is expected to take place shortly, there having been several enquiries noted. Rerolling rails are in in good demand, and very hard to get. New York reports an active and upward moving market, especially in steel, grades. No. 1 heavy melting steel is quoted at $21 to $22 f.o.b. New York, while stove plate has advanced to $25, an increase of 50 cents. Shipments are very difficult to make, the railroad situation still being very bad. This latter fact has been the cause of a quiet market in Boston, though there has been some heavy melting steel sold for export at $22 at Boston dock. No. 1 machinery scrap is bringing $43 delivered. With the exception of heavy melting steel, the Pittsburgh market is easier, but this grade is quoted at $27 to $27.50 delivered, while a special grade of this material has been sold at something over $28. There is a strong market at Buffalo for all grades. The demand is mostly for prompt shipments, the object being to get the material before the new freight rates go into effect. Some dealers fear that after that date the demand will fall off. Chicago reports a firm market with not much actual business, but a general advance in quotations. There is not much moving, as cars are hard to obtain. Railroad offerings amount to about 13,000 tons. There is an improving enquiry reported from Cincinnati, but there is a good accumulation of stocks there which is moving very slowly. St. Louis is supporting what is practically a dealer's market, consumers staying out. Prices remain steady, and there is not much material available.

Have you had a meal of seaweed yet? Before long this saying may be very common, for a scientist in the Government service in California has recently developed a process for pickling the kelp of the Pacific Coast. Los Angeles stores are already offering it for sale. Who knows, but here we may have at our hands, the solution to the H. C. of L.

When you speak of boycotting anything, do you know where the statement first came from? The average person never bothers where it comes from so long as the meaning is clear, but for the novelty of the thing, we will state how the expression came into being. A Captain Boycott was an agent for an estate in Ireland, and the tenants, dissatisfied with his management asked the landlord to remove him. On declining to do so, the tenants and their friends refused to work for Boycott, and that's how the word began.

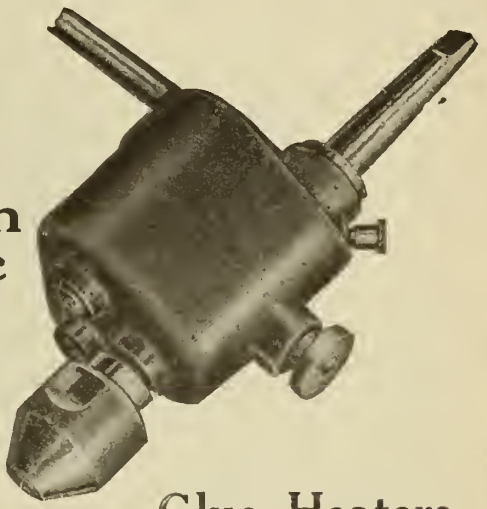
PIG IRON TRADE

Pig iron has reached the $50 mark for foundry No. 2 grade, and basic has also advanced. Philadelphia reports a sale of No. 2 plain for spot shipment at $51, while No. 2x is $50 eastern Pennsylvania furnace. The railroad situation is still very difficult, and iron is hard to get. Basic is worth anywhere from $45 to $50 eastern Pennsylvania furnace. The Chicago market is quiet, but at the same time shows no signs of weakness. On the contrary whatever tendency to change is apparent is in the direction of a raise in prices. While there is likely to be less demand from the automobile trade, there will be more than enough coming from the railroads to make up for this. $1.75 to $2.25 silicon for 1921 delivery has been sold at $46, furnace. There is not much interest taken as a whole in next year's delivery sales. The outstanding purchase in the New York market was the Worthington Company's which closed for nearly 10,000 tons for its first half supply. There are new enquiries for first half aggregating 5,000 tons in addition to this. From Pittsburgh the reports also show advances, basic having gone up $2 a ton and foundry iron from $1 to $3 for No. 2 foundry. Basic is quoted at $48.50 valley, while No. 2 foundry is quoted at $50 valley. Some sales have been made at the lower figure of $47. Other grades are strong but no sales have been made to establish a price. Cleveland also reports a tendency to higher prices. Foundry iron has been sold at $47 and $48, while some is being held for $50. The advance of prices by the last remaining Virginia furnace that was in the market has stopped the buying of this iron in the New England district. There have been some sales of Alabama iron in this district, the price for No. 2 x delivered being $54. There is no Pennsylvania iron offering. There is a good demand coupled with a scarcity of iron in Buffalo, last half and first quarter being the deliveries favored. Iron for last half delivery sold for $49. There is an enquiry for 10,000 tons for export basic iron. No. 2 x for first quarter delivery has been sold for $50, but there is not very much being offered for 1921 as yet. St. Louis reports light sales with prices about the same as last week. 1921 enquiries are in evidence, without receiving much attention from makers. Cincinnati iron is quoted at $42 for remainder of the year and first quarter by some makers, while others ask $45 for the same. Birmingham market is strong, but shipping difficulties are great and a large tonnage has accumulated. Production is being kept up. There are some enquiries for next year's iron.

We Can Supply Everything in Tools

Aikenhead's

Wahlstrom Automatic Tapping Attachment



Attached to any drill press this Wahlstrom Automatic Tapping Attachment will pay its cost in short order. It is ten times faster than hand tapping and its simple to-and-fro motion frees the lands of chips, thus preventing jamming and tap breakage.

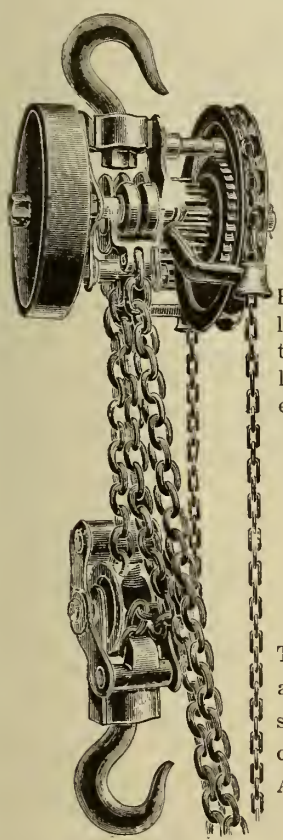
The Wahlstrom is constructed of hardened and ground parts and has nothing whatever that can get out of order. It is manufactured in two sizes. No. 1 takes taps of all sizes from 5-40 to ½-inch standard. No. 2 takes taps from ¼ to ¾-inch.

May we send one for ten days' trial?

Return if not satisfactory. Full details on request.

Glue Heaters

Aikenhead's International Glue Heater operates on dry heat and is built in a variety of sizes which makes it adaptable to the requirements of all classes of shops, large and small. **Booklet and prices on request.**



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Made in sizes with capacities up to 40,000 lbs.

Have a "Simplex" handy for moving your heavy castings and machines. It handles the largest loads with ease and dispatch and greatly reduces labor costs for fitting and erection. Loads up to 1,600 lbs. easily handled by one man. Capacity loads of 40,000 lbs. lifted by two men. Load positively cannot slip. Chains are properly guided so as to eliminate any tendency to jump the sprocket or stick in the guides. Made in 12 sizes.

Write for prices and full information.

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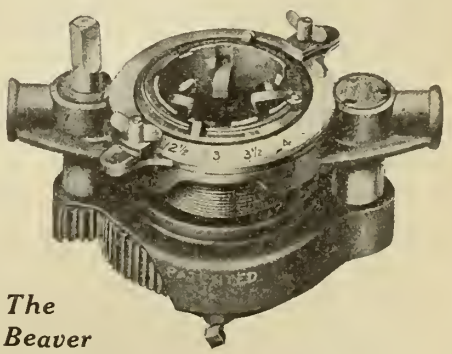
Cutting from ⅛ to 6 inch pipe

The BEAVER Die Stock shown here is instantly adjustable to cut over or under as well as exact standard threads. Other well-known lines we carry are: Toledo, Osler, Jardine, Premier and Armstrong. Let us know your requirements.



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In these days of high production costs every minute wasted by a mechanic and every piece of work spoiled through inaccurate gaging eats up the profit. Introduce the "Limit System" into your shop with a set of Johansson Gages. They eliminate both these wastes and get equal results even in the hands of unskilled operators.

The Johansson book tells all about them. Write for your copy to-day.

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The Van Dorn operates on either Direct or Alternating Current and will drill 50 per cent. more holes at one-third the cost for power than the best pneumatic drill of similar rated capacity. Not a claim without foundation, but a fact that we would like to prove again by demonstration in your plant. Sent on 10 days' trial.

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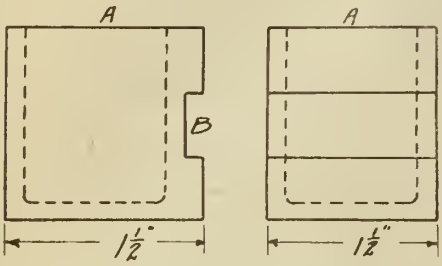
If interested, tear out this page and keep with letters to be answered.

AN UPSET GRINDING OPERATION

By Donald A. Hampson.

The term "upset" is used in the heading because the operation to be described upsets all our common theories as to grinding, more than that, long practice has proven that the process is correct for this particular job, which leads us to repeat, "When theory and practice do not agree, it is time to change the theory." It is a special case only, however, where "slow" grinding has resulted in the right kind of production.

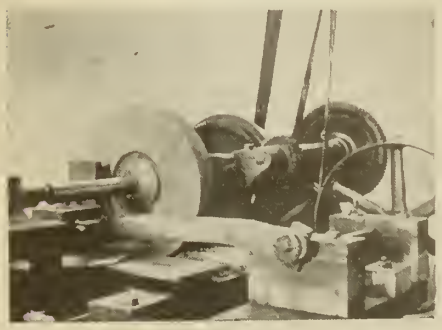
Our drawing shows a piece of grey iron that is one of a score used as part of a friction clutch made in large quantities. The surface marked A must be



PIECE TO BE GROUND

machined so that it will hold cigarette papers at all four corners—this is an accurate working surface in the clutch assembly and it is also used as a holding surface for milling the notch B, which likewise must be within very close limits.

All the accepted methods of milling and of grinding were tried out and though they turned out blocks that were acceptable, they were only made so by going through a roughing and finishing operation, which proved too laborious for good manufacturing. The casting was too light to stand up under any kind of milling cut and not show a change of size where the roughing cutter struck the cross ribs:—grinding was tried with discs or ring wheels but unless each piece was individually clamped for wet grinding, it could not be turned out flat—with the dry disc grinding, the heat of cutting and the inevitable pass-off from the disc would leave one or



SHOWING METHOD OF SET-UP

more low corners or sides on the work.

Just how the slow grinding process was evolved is a matter of conjecture. The photo shows the set-up on a lathe that was discarded for conventional work. The emery wheel that does the business runs at 27 r.p.m.

This wheel is held between large flanges on a mandrel that is supported on the lathe centres. Eighteen inches in diameter, in general of cup shape but with a working "edge" five inches wide, this wheel is good for a year's steady grinding. During that time, it will grind 200 pieces an hour, of required accuracy, on the average, and a laborer who gets the hang of things has doubled that production.

As will be seen, a jack shaft is mounted in wooden bearings at the rear of the headstock, this shaft carrying a crank that drives the cross slide with a reciprocating motion through the medium of a hickory pitman. On the cross slide there is an angle plate with guides between which the castings are dropped. To secure power enough, the lathe is run with the gears "in," which also gives a slow speed that grinds without heat. From 1-32" to 1-64" is removed from each piece.

The operator sits at the front of the lathe. The carriage is restricted by stops to about a half inch of travel, which is limited at the grinding end by an adjustment for sizing purposes. With the carriage moved back, one or two castings are dropped in the space in the angle plate after which the carriage is moved to bring the work against the emery wheel. A treadle and rod is provided so that the operator's weight may be utilized for pressure in grinding, but the stop prevents overdoing and grinding castings too small. A "kicker" ejects the finished pieces, which come out cool and uniformly flat. About once in two weeks of steady running, it becomes necessary to dress the wheel, this being done with an ordinary Huntington dresser guided by a bar of steel held parallel to the travel of the cross slide.

In production and accuracy, as well as cost, this unique arrangement has proven all that could be wished. The concern has several times invited specialists in the grinding and milling machine field to submit proposals for tools that would offer greater production, but after trying out sample lots, the answer has come back each time, "We cannot better your present production, quality considered."

OXYGEN PLANTS TO BE BUILT

The sensational development of Canadian industries in pre-war days was a weak and toddling growth compared to the mighty strides the Dominion is making industrially to-day. From 1905 to 1915 the capital invested in Canadian factories increased more than 135 per cent. and the value of factory products advanced roughly from $700,000,000 to $1,400,000,000. It would be rash to attempt an estimate of Canada's industrial growth since 1915, but it is not a guess to assert that the Dominion has forged ahead industrially as never before in its history.

An important recent announcement bearing on Canada's future industrial development is that of the Dominion Oxygen Company's promised erection of a chain of great oxygen plants for separating oxygen from the atmosphere. The first of these plants will be situated in five of the Dominion's industrial centres, and service stations will be established throughout Canada to supply oxygen users wherever there is a demand for the gas, either on or off the railroad.

The first of these plants has already been completed at Toronto, and it is said to be the largest oxygen plant ever built in Canada. It will supply the Canadian market through an extensive warehousing system, pending the erection of the aditional plants. Sites for these additional plants have been secured at Montreal, Winnipeg and other points, so that the work of construction may be prosecuted as rapidly as possible.

ANOTHER FIRM TO BUILD DIESELS

The Worthington Pump and Machinery Corporation have issued a bulletin announcing their entry into the marine Diesel engine construction field. The bulletin reviews the marine situation and the case for the Diesel internal combustion engine, and quotes instances of actual working to demonstrate the reliability of this prime mover. The announcement of the building of a 2,400 I.H.P. six cylinder marine Diesel by the company follows. This engine was built at the company's Snow Works, Buffalo, and the cylinders are 29 inches bore by 46 inches stroke, and the crank shaft makes 120 revolutions per minute, the engine being of the 4 cycle type. The engine is built to the Worthington Company's own designs, but the leading features of successful foreign builders have been incorporated. The company have made plans to enable them to produce these engines in large numbers as the demand increases.

One of the most conspicuous forms of British engineering activity since the war lies in the growth of locomotive production. Every country in the world wants locomotives, and the extension of many locomotive shops in both England and Scotland, is designed to ensure that the demand will, as in the past, be met with.

It is so far to the good that most of these shops were retained on locomotive work during the war. One firm alone supplied 152 locomotives to British railways, 380 to the French railways, and 300 for other overseas countries during the war. This was in addition to producing many narrow gauge locomotives, hundreds of "Tanks" and hundreds of thousands of shells, numerous aeroplanes, torpedo-tubes, gun carriages, and other "munitions." The total value of the company's output during the war was sixteen million pounds.

GEOMETRIC

SELF-OPENING DIE HEADS

"YOU CAN'T BEAT 'EM"

It is not the manufacturers of Geometric Self-Opening Die Heads who make this statement, but the users of the tools.
This is the reason that besides being the originators, we are known as the

LARGEST AND BEST KNOWN MANUFACTURERS OF AUTOMATIC THREADING TOOLS

The big question is: Have you applied Geometric Screw Thread Cutting Tools to your threading work?

THE GEOMETRIC TOOL COMPANY

NEW HAVEN CONNECTICUT

Canadian Agents: Williams & Wilson, Ltd., Montreal; The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg and St. John, N.B.; The Canadian Fairbanks-Morse Co., Ltd., Manitoba, Saskatchewan, Alberta.

If interested, tear out this page and keep with letters to be answered.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$42 40
Lake Superior, charcoal, Chicago	57 00
Standard low phos., Philadelphia	50 00
Bessemer, Pittsburgh	43 00
Basic, Valley furnace	42 90
Toronto price:—	
Silicon, 2.25% to 2.75%	52 00
No. 2 Foundry, 1.75 to 2.25%	50 00

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	$ 5 50
Steel bars, base, Toronto	5 50
Iron bars, base, Montreal	5 50
Steel bars, base, Montreal	5 50
Reinforcing bars, base	5 00
Steel hoops	7 00
Norway iron	11 00
Tire steel	5 75
Spring steel	10 00
Band steel, No. 10 gauge and 3-16 in. base	6 00
Chequered floor plate, 3-16 in.	8 40
Chequered floor plate, ¼ in.	8 00
Bessemer rails, heavy, at mill	....
Steel bars, Pittsburgh	3 00-4 00
Tank plates, Pittsburgh	4 00
Structural shapes, Pittsburgh	3 00
Steel hoops, Pittsburgh	3 50-3 75
F.O.B., Toronto Warehouse	
Small shapes	4 25
F.O.B. Chicago Warehouse	
Steel bars	3 62
Structural shapes	3 72
Plates	3 67 to 5 50
Small shapes under 3"	3 62
	C.L. L.C.L.

FREIGHT RATES

Per 100 Pounds.

Pittsburgh to Following Points		
Montreal	33	45
St. John, N.B.	41½	55
Halifax	49	64½
Toronto	27	39
Guelph	27	39
London	27	39
Windsor	27	39
Winnipeg	89½	135

METALS

	Gross. Montreal	Toronto
Lake copper	$25 00	$24 00
Electro copper	24 50	24 00
Castings, copper	24 00	24 00
Tin	62 00	65 00
Spelter	11 50	12 00
Lead	10 75	11 00
Antimony	13 00	14 00
Aluminum	34 00	36 00

Prices per 100 lbs.

PLATES

Plates, 3-16 in.	$ 7 25	$ 7 25
Plates, ¼ up	6 50	6 50

PIPE—WROUGHT

Price List No. 44—April, 1920.

STANDARD BUTTWELD S/C

	Steel Black	Steel Galv.	Gen. Wrot. Iron Black	Gen. Wrot. Iron Galv.
⅛ in.	$6 50	$ 8 50	....	....
¼ in.	5 13	7 26	$ 5 43	$ 7 56
⅜ in.	5 13	7 26	5 43	7 56
½ in.	6 84	8 42	7 27	8 84
¾ in.	8 45	10 58	9 03	11 16
1 in.	12 50	15 64	13 35	16 49
1¼ in.	16 91	21 16	18 06	22 31
1½ in.	20 21	25 30	21 59	26 68
2 in.	27 20	34 04	29 05	35 89
2½ in.	43 00	53 82	....	....
3 in.	56 23	70 38	....	....
3½ in.	71 30	88 32	....	....
4 in.	84 48	104 64	....	....

STANDARD LAPWELD S/C

	Steel Black	Steel Galv.	Gen. Wrot. Iron Black	Gen. Wrot. Iron Galv.
2 in.	$30 90	$37 74	$34 60	$41 44
2½ in.	45 34	56 16	51 19	62 01
3 in.	59 29	73 44	66 94	81 09
3½ in.	73 14	90 16	82 34	99 36
4 in.	86 66	106 82	97 56	117 72
4½ in.	0 98	1 23	1 24	1 49
5 in.	1 15	1 44	1 44	1 73
6½ in.	1 49	1 86	1 87	2 25
7 in.	1 94	2 43	2 42	2 90
8-L in.	2 04	2 55	2 54	3 05
8 in.	2 35	2 94	2 92	3 51
9 in.	2 81	3 52	3 50	4 21
10-L in.	2 61	3 26	3 25	3 90
10 in.	3 36	4 20	4 18	5 03

Prices—Ontario, Quebec and Maritime Provinces

WROUGHT NIPPLES

4" and under, 60%.

4½" and larger, 50%.

4" and under, running thread, 30%.

Standard couplings, 4-in. and under, 30%.

Do., 4½-in. and larger, 10%.

OLD MATERIAL

Dealers' Average Buying Prices.

	Per 100 Pounds. Montreal	Toronto
Copper, light	$15 00	$14 00
Copper, crucible	18 00	18 00
Copper, heavy	18 00	18 00
Copper wire	18 00	18 00
No. 1 machine composition	17 00	17 00
New brass cuttings	11 00	11 75
Red brass turnings	14 50	15 75
Yellow brass turninbs	9 00	9 50
Light brass	7 00	7 00
Medium brass	8 00	7 75
Scrap zinc	6 50	6 00
Heavy lead	7 50	7 75
Tea lead	4 50	5 00
Aluminum	19 00	20 00
	Per Ton	Gross
Heavy melting steel	18 00	18 00
Boiler plate	15 50	15 00
Axles (wrought iron)	25 00	20 00
Rails (scrap	23 00	18 00
Malleable scrap	26 00	25 00
No. 1 machine east iron	32 00	33 00
Pipe, wrought	12 00	12 00
Car wheel	33 00	33 00
Steel axles	25 00	20 00
Mach. shop turnings	11 00	11 00
Stove plate	26 50	25 00
Cast boring	14 00	14 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, 7-16 and up	+10
Carriage bolts, ⅜-in. and less	Net
Coach and lag screws	—15
Stove bolts	55
Wrought washers	—25
Elevator bolts	+10
Machine bolts, 7-16 and over	+10
Machine bolts, ⅜-in. and less	+10
Blank bolts	Net
Bolt ends	Net
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	+25
Machine screws, fl. and rd. hd., brass	net
Machine screws, o. and fil. hd., brass	net
Nuts, square, blank	+25 add $2 00
Nuts, square, tapped	add 2 25
Nuts, hex., blank	add 2 50
Nuts, hex., tapped	add 3 00
Copper rivets and burrs, list less	15
Burrs only, list plus	25
Iron rivets and burrs	40 and 5
Boiler rivets, base ¾" and larger	$8 50
Structural rivets, as above	8 40
Wood screws, O. & R., bright	75
Wood screws, flat, bright	77½
Wood screws, flat, brass	55
Wood screws, O. & R., brass	55½
Wood screws, flat, bronze	50
Wood screws, O. & R., bronze	47½

MILLED PRODUCTS

(Prices on unbroken packages)

	Per Cent
Set screws —20% 25 and	5
Sq. and hex. hd. cap screws	12½
Rd. and fil. hd. cap screws	plus 25
Flat but. hd. cap screws	plus 50
Fin. and semi-fin. nuts up to 1-in.	12½
Fin. and Semi-fin. nuts, over 1 in., up to 1½-in.	—5
Fin. and Semi-fin. nuts over 1½ in., up to 2-in.	+12½
Studs	+5
Taper pins	—12½
Coupling bolts	+40
Planer head bolts, without fillet, list	+45
Planer head bolts, with fillet, list plus 10 and	+55
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	+60
Collar screws	list plus 20, 30
Thumb screws	40
Thumb nuts	75
Patch bolts	add +85
Cold pressed nuts to 1½ in.	add $1 00
Cold pressed nuts over 1½ in.	add 2 00

BILLETS

	Per gross ton
Bessemer billets	$60 00
Open-hearth billets	60 00
O.H. sheet bars	76 00
Forging billets	56 00-75 00
Wire rods	52 00-70 00

Government prices.

F.O.B. Pittsburgh.

NAILS AND SPIKES

Wire nails, base	$6 10
Cut nails, base	7 00
Miscellaneous wire nails	50%

ROPE AND PACKINGS

Plumbers' oakum, per lb.	0 10¼
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 35½
British Manila rope	0 28
New Zealand hemp	0 28

POLISHED DRILL ROD

Discount off list, Montreal and Toronto ..... net

ATKINS STERLING QUALITY SAWS

O'er Land and Sea

North - South - East - West

Atkins Sterling Quality **Saws**

are noted for their efficiency. Let them prove that their use will lighten your labor.

Send For Catalog

"A Perfect Saw For Every Purpose"

E. C. Atkins & Company

Established 1857

"The Sterling Quality Saw People"

Factory HAMILTON, ONT. *Branch* VANCOUVER, B. C.

MISCELLANEOUS

Solder, strictly	$ 0 35
Solder, guaranteed	0 39
Soldering coppers, lb.	0 62½
White lead, pure, cwt.	20 35
Red dry lead, 100-lb. kegs, per cwt.	16 00
Gasoline, per gal., bulk	0 38
Pure turp., single bbls., gal.	3 15
Linseed oil, raw, single bbls.	2 37
Linseed oil, boiled, single bbls.	2 40
Wood alcohol, per gal.	4 00
Whiting, plain, per 100 lbs.	3 00

CARBON DRILLS AND REAMERS

S.S. drills, wire sizes	32½
Can. carbon cutters, plus	20
Standard drills, all sizes	32½
3-fluted drills, plus	10
Jobbers' and letter sizes	32½
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	50
Sleeves	50
Taper pin reamers	25 off
Drills and countersinks	net
Bridge reamers	50
Centre reamers	10
Chucking reamers	net
Hand reamers	10
High speed drills, list plus	10 to 30
Can. high speed cutters, net to plus	10
American	plus 40

COLD ROLLED STEEL

[At warehouse]

Rounds and squares	$7 base
Hexagons and flats	$7.75 base

IRON PIPE FITTINGS

	Black	Galv.
Class A	60	75
Class B	27	37
Class C	18	27

Cast iron fittings, 5%; malleable bushings, 22½%; cast bushings, 22½%; unions, 37½%; plugs, 20% off list.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$8 50	$10 50
Sheets, Blue ann., No. 10	8 50	9 50
Canada plates, dull, 52 sheets	8 50	10 00
Can. plates, all bright	8 60	9 00
Apollo brand, 10¾ oz. galvanized	....	....
Queen's Head, 28 B.W.G.	11 00	....
Fleur-de-Lis, 28 B.W.G.	10 50	....
Gorbal's Best, No. 28	....	....
Colborne Crown, No. 28.	....	....
Premier, No. 28, U.S.	11 50	11 60
Premier, 10¾-oz.	11 50	12 00
Zinc sheets	16 50	20 00

PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13.00; 5-16, $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅞ in., $9.20; ¾ in., $9,30; ⅝ in., $9.50; 1 in., $9.10; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $13.00; 5-16 in., $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.50; ¾ in., $9.30.

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

BOILER TUBES.

Size.	Seamless	Lapwelded
1 in.	$27 00	$.....
1¼ in.	29 50	.....
1½ in.	31 50	29 50
1¾ in.	31 50	30 00
2 in.	35 00	30 00
2¼ in.	35 00	29 00
2½ in.	42 00	37 00
3 in.	50 00	48 00
3¼ in.	.. ..	48 50
3½ in.	63 00	51 50
4 in.	85 00	65 50

Prices per 100 ft., Montreal and Toronto

OILS AND COMPOUNDS.

Castor oil, per lb.	
Royalite, per gal., bulk	27½
Palacine	30½
Machine oil, per gal.	54½
Black oil, per gal.	28
Cylinder oil, Capital	82½
Petroleum fuel oil, bbls., net	18

BELTING—No 1 OAK TANNED

Extra heavy, single and double	6½
Standard	6½
Cut leather lacing, No. 1	2 00
Leather in side	2 40 3 00

TAPES

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	$4 60
Polishing wheels, bull-neck	2 00
Emery in kegs, Turkish	09
Pumice, ground	06
Emery glue	30
Tripoli composition	09
Crocus composition	12
Emery composition	11
Rouge, silver	60
Rouge, powder, nickel	45

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	.08½
Grits, 80 and finer	.6

BRASS—Warehouse Price

Brass rods, base ½ in. to 1 in. rod	0 34
Brass sheets, 24 gauge and heavier, base	$0 42
Brass tubing, seamless	0 46
Copper tubing, seamless	0 48

WASTE

XXX Extra	.24	Atlas	.20
Peerless	.22½	X Empire	.19½
Grand	.22½	Ideal	.19
Superior	.22½	X Press	.17½
X L C R	.21		

Colored

Lion	.17	Popular	.13
Standard	.15	Keen	.11
No. 1	.15		

Wool Packing

Arrow	.35	Anvil	.22
Axle	.28	Anchor	.17

Washed Wipers

Select White	.20
Dark colored	.09
Mixed colored	.10

This list subject to trade discount for quantity.

RUBBER BELTING

Standard ... 10% Best grades... 15%

ANODES

Nickel	.55 to .60
Copper	.38 to .40
Tin	.70 to .70
Zinc	.16 to .17

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	$42 50	$43 00
Copper wire, list plus 10		
Plain sheets, 14 oz., 14x60 in.	46 00	44 00
Copper sheet, tinned, 14x60, 14 oz.	48 00	48 00
Copper sheet, planished, 16 oz. base	46 00	45 00
Braziers', in sheets, 6 x 4 base	45 00	44 00

LEAD SHEETS

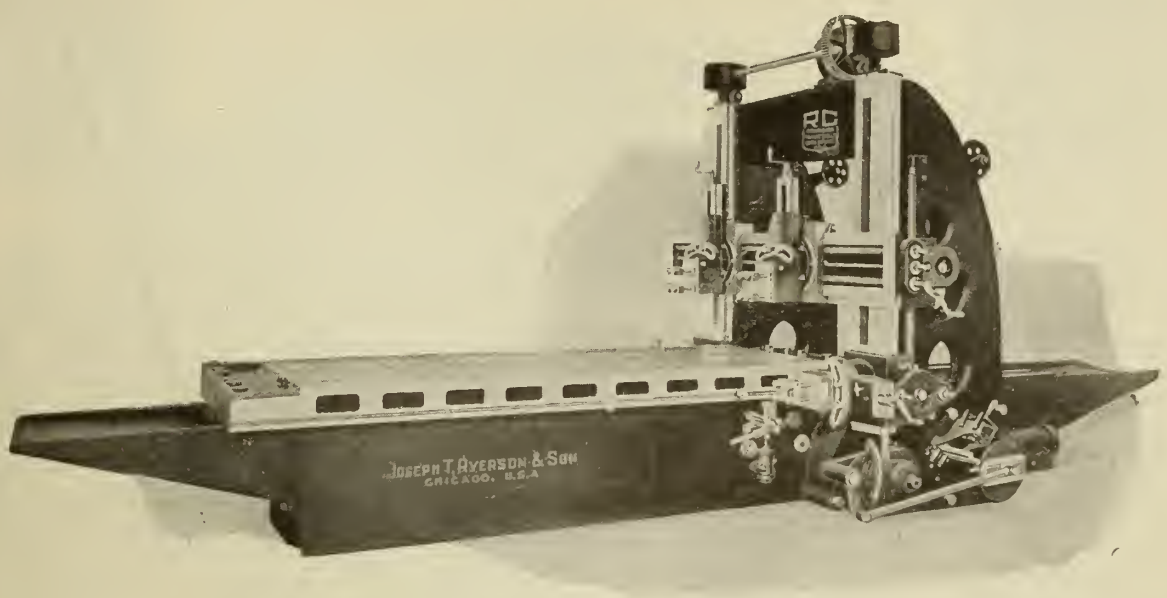
	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$10 75	$14 50
Sheets, 3½ lbs. sq. ft.	10 50	14 00
Sheets, 4 to 6 lbs. sq. ft.	10 25	13 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS

Acid, boracic	$ .23
Acid, hydrochloric	.04
Acid, nitric	.11
Acid, sulphuric	.04
Ammonia, aqua	.15
Ammonium, carbonate	.23
Ammonium, chloride	.22
Ammonium hydrosulphuret	.75
Ammonium sulphate	.30
Arsenic, white	.14
Copper, carbonate, annhy.	.41
Copper, sulphate	.15
Cobalt, sulphate	.20
Iron perchloride	.62
Lead acetate	.30
Nickel ammonium sulphate	.20
Nickel carbonate	.32
Nickel sulphate	.22
Potassium sulphide (substitute)	.42
Silver chloride (per oz.)	1.30
Silver nitrate (per oz.)	1.25
Sodium bisulphate	.14
Sodium carbonate crystals	.06
Sodium cyanide, 127-130%	.38
Sodium hyposulphite per 100 lbs	8.00
Sodium phosphate	.15
Tin chloride	.80
Zinc chloride, C.P.	.30
Zinc sulphate	.10

Prices per lb. unless otherwise stated



Ryerson-Conradson Planers

U.S. AND FOREIGN PATENTS

The Ryerson-Conradson Multi-speed Planers present a new type of machine, superior to any other type of planer in efficiency, durability, smoothness of operation and adaptability to motor drive. In designing this machine we have overcome the serious disadvantage of a reversing motor or shifting belts.

The back gears, bull pinion, bull wheel and rack are all of the herring-bone design, being hobbed from the solid by special machinery. This gives a remarkably smooth, steady operation and provides great resistance to wear and a consequent reduction of back lash.

Forward and reverse gears are controlled by pneumatic clutches, which are of the annular type, self-compensating for wear.

The new Bulletin No. 2101 describes completely the special features and advanced design of the Ryerson-Conradson Planers. Write for it!

ESTABLISHED 1842 INCORPORATED 1888

JOSEPH T. RYERSON & SON

CHICAGO, ILL., U.S.A.

MACHINERY

Canadian Representatives:

GARLOCK-WALKER MACHINERY CO., 32-34 Front Street West, TORONTO

MONTREAL WINNIPEG

If interested, tear out this page and keep with letters to answered.

INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS PERSONAL AND TRADE NOTES

TRADE GOSSIP

Windsor Factories Close. — Several factories connected with the automobile industry have closed down for probably two weeks, the reason given being the annual stock-taking.

Box Industry for Moose Jaw.—Premises have been secured on Manitoba St., W., by Messrs. Poner and McBride, who will commence a box-making industry, which will include the manufacture of wooden and cardboard boxes and egg crates. The new industry was started under the initiative of the board of trade which will give it all possible support in order to ensure a success.

Want To Get Heat.—A strong committee has been appointed by the Board of Directors of the Chamber of Commerce of Chatham, to meet representatives of the Chatham Heating Co. The object of the committee is to try and prevent a repetition of last year's experience, when business suffered to a considerable extent due to a lack of heat, which it is claimed the company failed to supply.

Favor Acceptance of Award.—Officials of the four railway unions said that the award of the United States' Railway Board to employees of the American Express Co. would be recommended for acceptance by them. The award affects 80,000 men, and the total wage increase will amount to a sum of $30,000,000 annually. The award will be submitted to a referendum of the men, with the union officials' recommendation of acceptance.

Want To Export Coal. — The chairman of the Dominion Railway Commission is receiving many applications for permission to export coal. There has been an order against the export of any coal from August 1st, and the applicants claim that they had the contracts made and vessels chartered to carry the coal before the order came out. They, therefore, claim that they should be allowed to export those orders.

Car Shops for Toronto.—It is understood that representatives of car-building firms have been looking over the ground with a view to establishing a street car building shop in Toronto. This is irrespective of the continuation of the Toronto Street Railway's shops for car manufacturing. There is a probability also that the plant of the Dominion Shipbuilding Co. may be utilised for this purpose.

Alberta's Coal Export Increased. — The output of the Alberta mines for the six months ending July 31st was 3,043,940 tons, as compared with 2,068,907 tons for the same period last year. There has been more coal marketed during the six months period than in any corresponding period in the history of coal mining in Alberta. The exportations for the six months show a 50 per cent. increase.

Car Company Active.—Orders aggregating $30,000,000 are on the books of the Canadian Car & Foundry Co., and negotiations for further export business are in progress. The shortage of cars on Canadian railways augurs well for the industry for some time to come. The company have experienced some difficulty, as have others, in getting material from the United States, this condition also having been caused by the car shortage over there.

Coal Situation Better.—According to Mr. J. D. A. Morrow, vice-president of the National Coal Association in the United States, and who has just returned from a ten days' trip, the situation is better than it was. Due to the increased car supply, a big increase in the coal shipped to New England and the North-West besides other parts of the country had taken place. The production for last week, he estimated, was about 11,000,000 tons, which is still 1,000,000 tons under the normal requirements.

Hydro Business Last Year. — In a statement made by the Hydro Electric Commissioners, the following figures are given. The number of municipalities taking power has increased in ten years from 12 to 115, and the power distributed from 25,000 to 225,000. There are 12 rural systems, 23 companies, and five Government industries. The total assets at the Falls and in the municipalities amount to $40,693,070 and the accumulated reserves $7,654,370 and the surplus $2,177,934.

Ball Bearings on Picnic.—A very enjoyable time was experienced by the staff and employees of the Chapman Double Ball Bearing Co. at the firm's picnic at Queenston Heights recently. The party travelled over by boat and were met at Queenston by the members of the Ball Bearing Transmission Co., of Buffalo, who arrived by train and motor. The chief feature of the day was a baseball game between the Toronto and Buffalo teams (not the International league). The Ball Bearing Transmission were easy winners.

Chemical Plant Extends.—Extensions are being made to the plant of the Brunner Mond Co., at Amherstburg, Ont., which will enable them to increase their output by 50 per cent. The plant is now producing, in addition to soda ash, a number of soda compositions which are used as cleaning powders in various industries. At the beginning of this year, the plant was operating at about only half its capacity, but now it is being worked to the limit, and the extensions are necessary to provide ample production for the future.

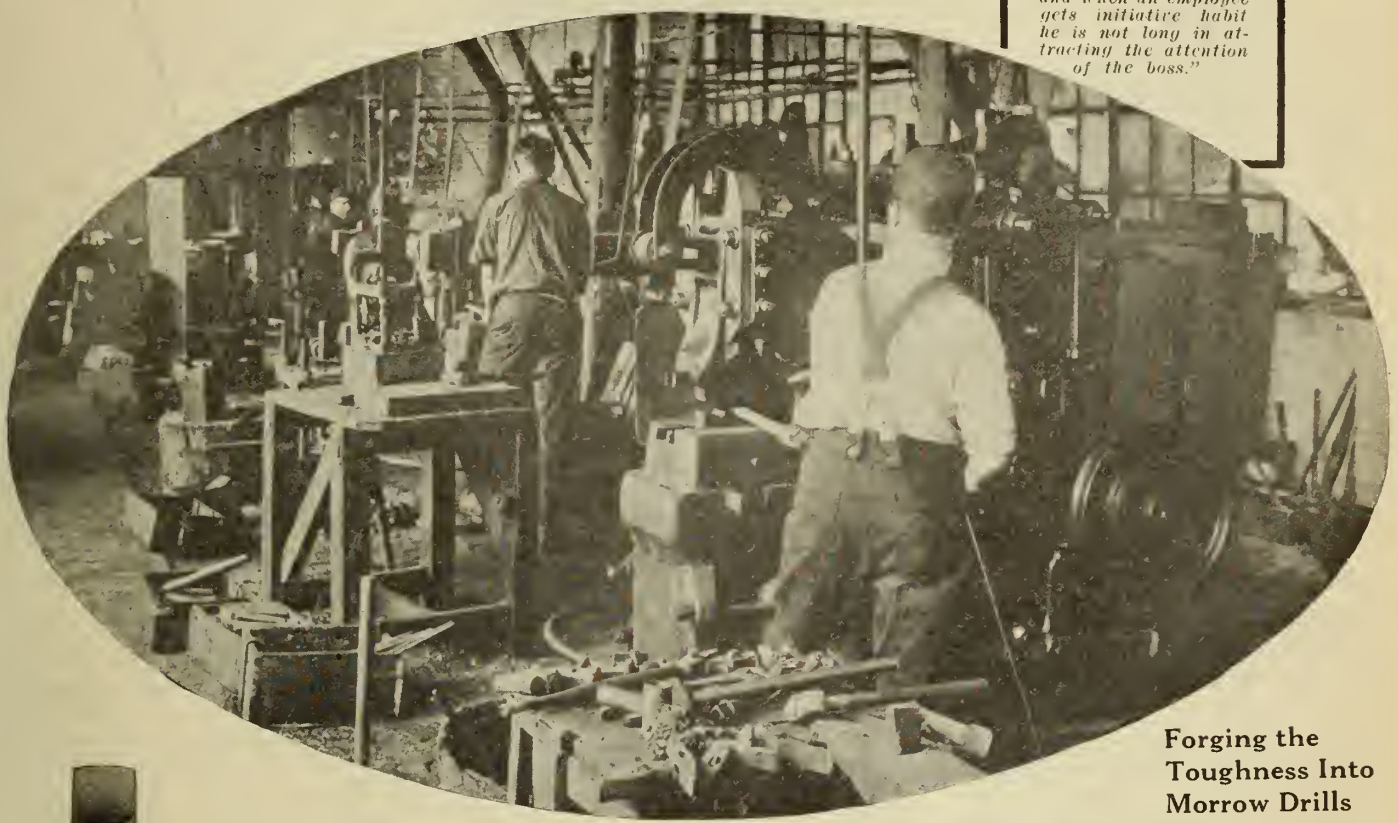
Mine Sells Entire Output.—The Blue Diamond Coal Mines at Brule, Alta., have contracted their entire output for the next six months, according to J. P. Bickell. Mr. Bickell is a director of the McIntyre Porcupine Mines, Ltd., which has just purchased the coal mining company. The contract is for the west, and the entire capacity is required, even if it exceeds 2,000 tons per day. The output is at present about 600 tons per day, and it will require over a year to bring the output up to 2,000 tons per day.

American Manufacturers Here. — A party of American business men, members of the Manufacturers and Wholesale Merchants' Board, which is associated with the Chamber of Commerce, of Cleveland, Ohio, arrived in Toronto recently. The party was 34 in number, and is composed of employment managers, production managers and accountants. They are making a tour for educational purposes, and will visit several of the large industries in Toronto during their stay.

Baldwin Plant Ready Soon. — The plant at Ashbridge's Bay will be ready for operation in about three weeks' time, it is expected. There will be a staff of between eight and nine hundred men employed at the beginning, and when the plant has worked up to full capacity it will employ 6,000. A large number of the men are coming direct from the works in Wales and incidentally among these are included some who were in Moscow with the general manager of the plant here, Mr. Cound.

Baldwin's Buy Furnaces.—Canadian Baldwin's have purchased two 50-ton furnaces which were installed at Collingwood by the Cramp Steel Co., and later secured by the Western Canada

"In every great business there are many opportunities for the employee to do things he is not told to do, and when an employee gets initiative habit he is not long in attracting the attention of the boss."



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Steel Co., which went into liquidation. The Toronto firm intended to bring these furnaces to Toronto and install them in the plant here. There is some difficulty at the moment connected with an agreement the town of Collingwood had had with the original installers, but Mr. A. M. Russell, president of Baldwins, thinks they will be able to overcome that. In addition to these two furnaces, two fifty ton open hearth furnaces will be installed. There are also ten six ton electric furnaces already in the plant.

Bounty for Iron Industry.—The Hon. William Sloane, Minister of Mines for the Province of British Columbia, speaking about the possibility of an iron smelting industry in the Pacific Coast Province, pointed out that the present bounty offered by the Provincial Government would amount on a 300-ton plan to something like $1,000,000. He stated that Mr. Fleming, of the Canadian Collieries (Dunsmuir), was looking into the situation, as their company thought of entering into the industry. As to the claim that there would be no market for the product, Mr. Sloan thought there would be no difficulty on that score, as the Pacific Coast could be supplied at prices beyond the competition of eastern furnaces. In any case, he thought the Federal Government could be induced to build extensive car shops for the National Railways at one of the western terminals, which would absorb a large percentage of the output of a 300-ton furnace.

MARINE

Another Shipyard Failure. — The Three Rivers Shipyard, a branch of the National Shipbuilding Co., of Wilmington, Delaware, U.S.A., located at Three Rivers, P. Q., has gone into liquidation. The company built a fleet of ten wooden steamers for the French Government. A liquidator has been appointed to wind up the affairs of the company.

Halifax.—The strike at the Halifax Shipyards, which commenced June 1st, has at last been settled. The plumbers, coppersmiths, and pipe fitters, the three unions which had hung out after the other men accepted the company's award of five cents per hour increase, have decided to return to work. The decision was practically unanimous, only one member dissenting out of one hundred.

Barge Building at Victoria.—A considerable portion of the plant of the Foundation Co. of British Columbia, located at Ellice Point, has been purchased by Capt. A. Berquist, a well-known tug operator. The plant includes two of the gantry cranes, four shipbuilding ways, and shipbuilding plants and buildings. The amount involved was about $25,000. It is Captain Berquist's intention to construct tugs and barges at the plant, at which he built the tug Berquist in pre-war days.

To boom Toronto Port—A meeting was held at the City Hall recently, Mr. Hollinrake, of the C.M.A., being in the chair, when it was decided to request the City Council, Board of Trade, Harbor Commission, Canadian Manufacturers' Association, Rotary Club and Kiwanis Club, and the District Labor Council to appoint representatives on a committee to procure evidence to present to the next meeting of the International Joint Committee on its next meeting here. The meeting was under the auspices of the Canadian Deep Waterways Association.

CATALOGUES

The Farwell Milling Machine is described and illustrated in catalogue No. 58 of The Adams Co., Dubuque, Iowa, and its combination with a planer is shown. A number of different applications of the tool are given, and some excellent photos of actual operations being performed. The same company have just issued a leaflet illustrating the Farwell Gear Tester.

The Farwell Gear Hobber is the title of catalogue No. 809, issued by the Adams Co., of Dubuque, Iowa. An introduction deals with the subject of gear hobbing in principle, with several illustrations, and is followed by a chapter on the advantage of gear hobbing. The remainder of the book is devoted to a description of the line of Farwell Gear Hobbers, which are well described and illustrated.

The Independent Pneumatic Tool Co. have issued their catalogue No. 11, descriptive of their air drills, hammers, grinders, etc. Various types of piston and turbine air drills are illustrated, and detailed descriptions given, a large number of sectional half-tones being used. The same is true of the section dealing with hammers, and the tools used in them. Various snaps for different styles of rivet-heads are also shown. pneumatic hoists are also described, and a number of illustrations showing the application of the various pneumatic tools are included. A section of the catalogue is also devoted to electric drills. At the back of the book are instructions on care and operation, instructions for ordering, and weights and dimensions of the various appliances.

PERSONAL

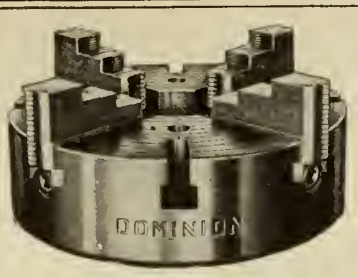
Mr. J. S. Kinnear, who has been Pullman agent in Toronto for 11 years, has retired, and is going to his former home in Boston. The evening of his retirement was made the occasion for the presentation of a diamond pin by the employees of his department, and his associates, the majority of whom are in the G. T. R. The presentation was made by Mr. S. A. Fier, who succeeds Mr. Kinnear. Mrs. Kinnear was the recipient of a gold wrist watch.

A REMARKABLE RUBBER DISCOVERY

A discovery of the highest importance has been made by a lecturer in chemistry at the Manchester (England) School of Technology. When rubber and sulphur are mixed together at a high temperature the rubber becomes hard and tough—"vulcanized" is the technical term for the change. While rubber can stand the necessary heat, other raw material with which it might be usefully mixed would be destroyed. The new invention is a cold process, in which two gases are used to produce the free sulphur required in vulcanising. When crude rubber, either in the solid or the liquid form, is treated with the two gases it becomes efficiently vulcanized, and when it is mixed with any waste material such as sawdust, leather scraps, or paper, a similar change takes place without the properties of the waste material being affected. This discovery is to be applied immediately to the manufacture of linoleum, the heavier classes of wallpaper, and artificial leather for upholstery. It is also applicable to the manufacture of one-piece boots (of rubber and leather scrap) and of felt (combining rubber and "shoddy").

OPTICAL INSTRUMENTS

Optical equipment for the inspection of flat surfaces and the comparison of standards, is a line of tools now being placed on the market by the Van Keuren Company of Boston, Mass. By means of these instruments comparisons can be made to one-half a wave length of light, which for daylight is approximately 0.00001 inch. It is claimed that the working flats of the set will register an accuracy of 0.000005 inch and that of the master flat to within 0.00000025 inch. Full instructions are included with the instruments and the equipment is intended for shop use.



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250	125		720	350	2,300	
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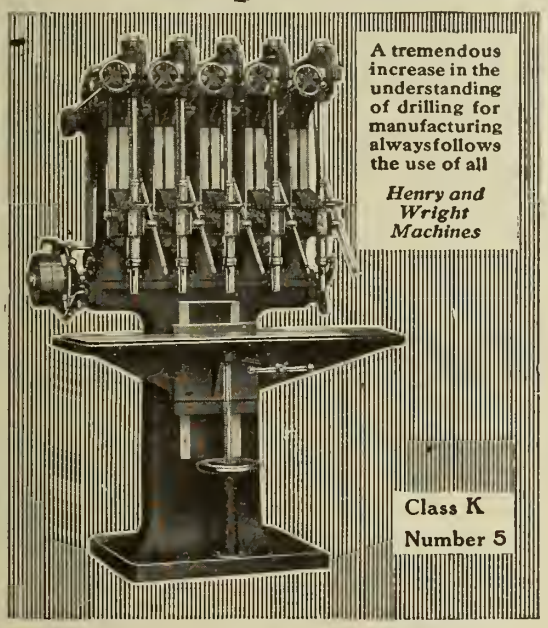

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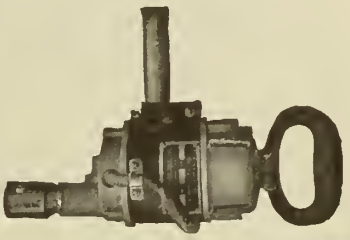

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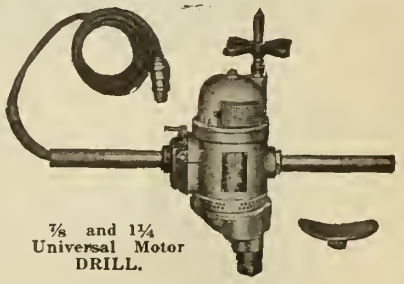

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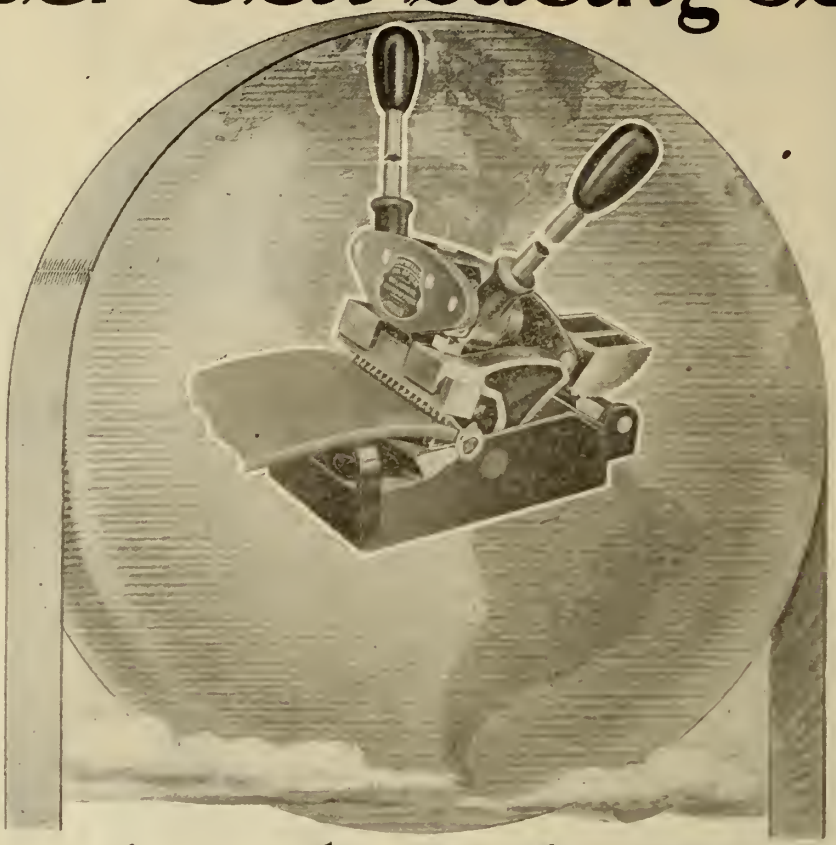

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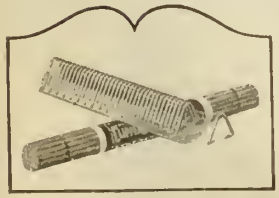

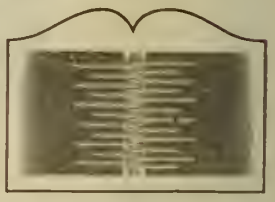

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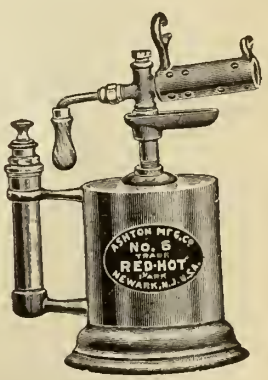

"Red Hot" Torches

Machinists' Tool Chests

The Rice Lewis line includes: Set Screws, Cap Screws, Machine Screws, High Speed and Carbon Drills, Files and a complete line of machinists' tools (Starrett, Brown & Sharpe, etc.), Bar Iron, Sheet Iron (black and galvanized), Machine Steel, Cast Steel, High Speed Steel, Cold Rolled Steel, etc.

RICE LEWIS & SON, LTD.
19 Victoria St., Toronto, Ont.

Consult Canadian Machinery Buyers' Directory

If what you want isn't advertised in this issue, consult our Buyers' Directory. If it isn't listed in our Directory, write us and we will give you the information.

THE MORSE CHAIN CO.

are the
Largest Manufacturers in the world
of
High Speed Silent Chains

Why?

Morse Chain possesses the exclusive
Rocker Joint
Frictionless—Requires no Oilbath.

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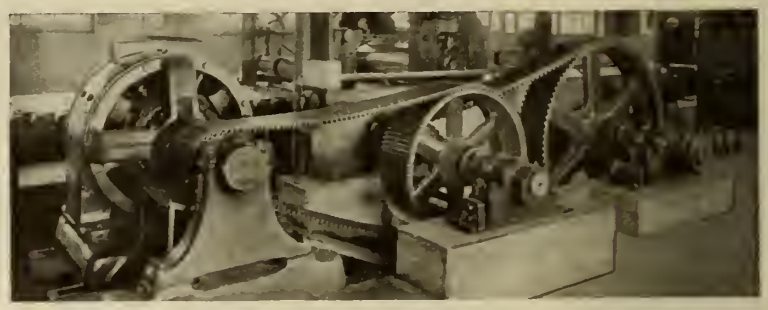

80 H.P. Morse Drive to Rolls, reverses direction every 45 seconds

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If you are a regular reader, you'll appreciate the value of the information to be secured. Pass the good word along to your friends.

Canadian Machinery is Canada's oldest exclusive machinery, iron and steel, and general metal-working industries paper. It is well established, well edited, well connected.

A careful study of its pages each week will serve to keep you posted on all that's new and worth knowing in machine shop circles.

Order now and ask for the September Export Number.

Subscription Price $4.00 per Year.

Canadian Machinery & Manufacturing News
143 University Ave., Toronto, Ont.

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STAR HACK SAWS ARE NOW SOLD BY THE MAKERS

For 37 years we have made Star Hack Saws and owned the famous Star name and brand—selling our saws through the Millers Falls Co.

This arrangement is terminated August 15th by mutual consent and we will hereafter market Star Saws ourselves direct to the trade. This development from sales agency representation to direct selling has been going on in every line of business. Factories have found out that when they sell their own products they are in a position to give the most effective trade and users' service on the goods they make.

This is exactly what the Clemson selling service now means to Star Saw users and the trade. It means a closer understanding and a more constructive service, because the same organization that makes Star Saws will now be in direct contact with the customers who buy and use them.

Star Saws themselves will continue the quality leadership that for 37 years has made them the standard blades. Star reputation has cost us a life-time of effort that makes us guard it jealously and concentrate our every resource and energy in maintaining and increasing it.

The high speed qualities of the steel—the undercut hook on the teeth—and the toughness secured by special heat treatment—these recognized points of Star Saw superiority are thus standardized by uniform methods of production. Thus you can be sure of securing satisfactory service from every blade you buy in the famous green box —whether it is a power or hand blade —all hard or flexible.

CLEMSON BROS. INC.

MIDDLETOWN, N.Y.

Star Hack Saw Blades are made of tungsten steel. Machine and Hand Blades — Flexible and Hard.

Clemson representatives cover the country in giving Star service. Write our office at Middletown, N.Y.

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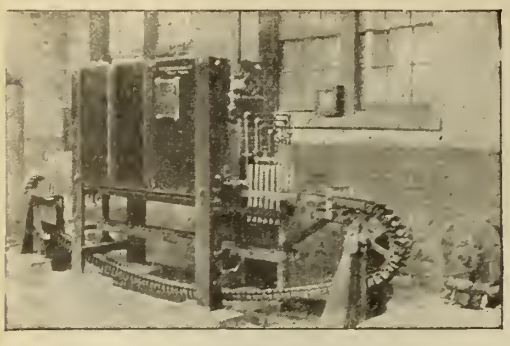


Automatic Tube Annealing Furnace.
An example of "Quantity Production of Quality Product" made possible by use of Automatic Furnace.

AUTOMATIC FURNACES
WILL THEY HELP ME?

That depends on the kind and quantity of material you handle per day, the regularity of its flow, layout of plant and machinery, fuel available, etc.

Having designed and built hundreds of Automatic Furnaces for many industrial heating requirements, we can help you determine whether the automatic furnace and continuous method of heat-treating would improve your product and lower its cost.

Many interesting applications of the continuous method to the field of industrial heating are shown in Bulletin 217-T. This bulletin illustrates and describes both the furnaces and the heating and handling methods employed in a great variety of manufacturing operations.

Write for copy of bulletin to

Canadian Representative
R. J. McLEAN, 604 SOUTHAM BLDG., MONTREAL, P.Q.

We Make Industrial Heating Furnaces for Every Requirement.
"Furnace and Fuel to Suit the Work"

W. S. ROCKWELL CO. INDUSTRIAL ESTABLISHED 1888 FURNACES 50 CHURCH ST. NEW YORK

Gray Iron and Semi Steel Castings of all Descriptions

From 5 lbs. up to 4 tons

Foundry capacity, 15 tons per day.

Difficult castings our specialty.

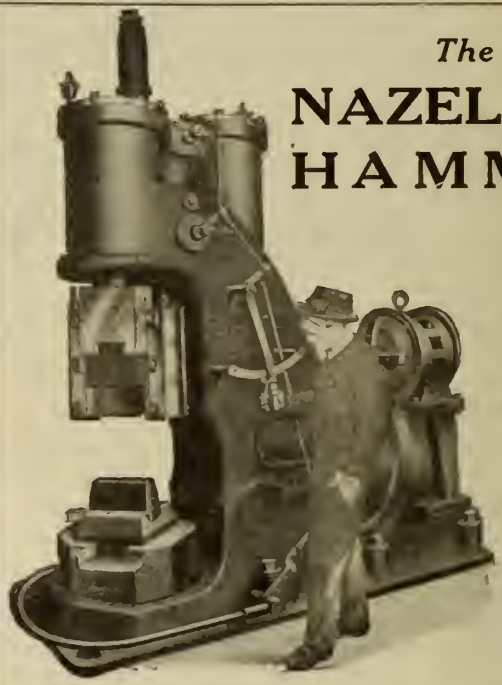
Mixtures regulated by chemical analysis and all castings sandblasted.

Estimates from blue prints submitted promptly.

If desired, we can make patterns to your drawings.

G. W. MacFarlane Engineering, Limited
Paris, Ontario

The
NAZEL AIR HAMMER



NOTED FOR ITS BLOW AND CONTROL

A self-contained unit, HAMMER AND COMPRESSOR COMBINED, built in three types, six sizes arranged for BELT OR DIRECT MOTOR DRIVE, with capacities up to 7 inches square, for all manner of jobbing, manufacturing and certain classes of drop forgings.

Nazel Engineering & Machine Works
Dept. F., Philadelphia, Pa.

ELECTRIC AND OXY-ACETYLENE WELDED
STEEL TUBING ALSO BUTT STEAM TUBING

Prompt service in supplying Steel Tubing for all purposes. Oxy-Acetylene Tubing is recommended for bending purposes. Electric for straight tubing or slight bends. Also fully equipped for Butt Seam Tubing. Tubing made hot or cold-rolled finish. Our plant is fully equipped for slitting all gauges of stock from sheets or coils. **Enquiries solicited.**

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THE TUBE COMPANY OF CANADA LIMITED

We are prepared to give expert advice on the selection of tubing for various purposes. This service costs you nothing and may save you a lot of expense.

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SIMONDS HACK SAWS

CUT CUTTING COST

NON-BREAKING BLADES

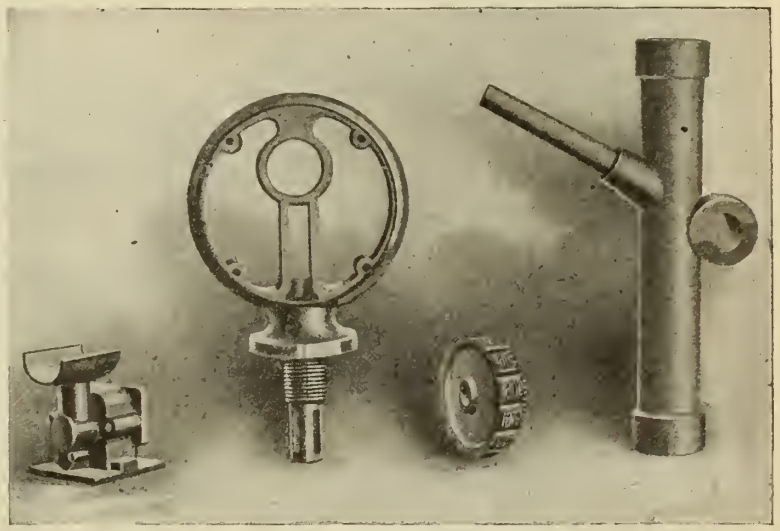
For Machine or Hand Use
Any Size or Length

Simonds Canada Saw Co.
LIMITED
MONTREAL
St. John Vancouver

Do You Appreciate the Benefit of Die-Castings?

Do you know that die-castings are delivered to you ready to assemble? No machining! They come to you clean, and accurately made. They save a lot of time and expense. The accompanying illustration shows a number of die-cast parts.

Where parts are required in quantities die-castings are the most economical. Send us blue prints or samples for estimates.



Die-Casting Chat No. 21

Have you some portion of your product that is cast by the ordinary method and will persist in being slightly different in spite of careful workmanship? If you have, then you should write us direct, for we can give you the solution to your difficulty.

When you use die-castings, you are assured of a duplicate product, for there can be no variation in a die-casting. They are made, as the term implies, in a Die, and that Die cannot change its shape, as it is made from the finest steel.

THE FISHER MOTOR CO., LIMITED, ORILLIA, ONT.

Largest Makers of Die-Castings in Canada

A new and large assortment of the finest diamonds for dressing emery wheels has been added to our stock. Canadian manufacturers will do well to let us know their requirements.

Canadian Desmond-Stephan Mfg. Co., Limited
Hamilton, Ontario, Canada

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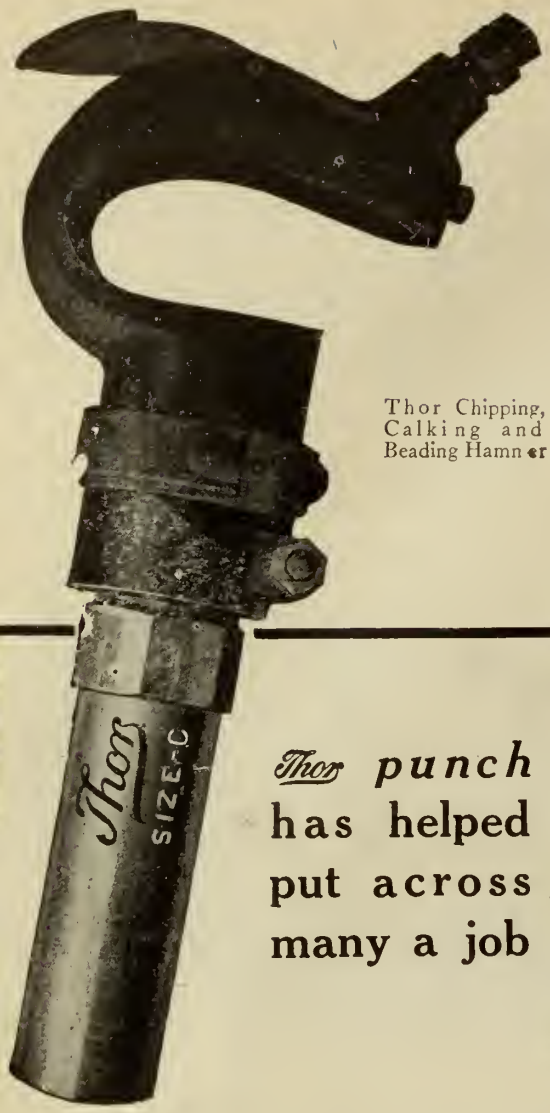

Thor Chipping, Calking and Beading Hammer

Thor **punch has helped put across many a job**

Time is one of the most important items involved in every contract job.

The speed with Thor Hammers, Drills and other Tools work has pulled many a contract through on time.

Write for our Thor Catalog No. 10

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Thor

—for a large variety of grinding

if your variety of grinding is large invest in a Manhattan Universal Grinder. It is capable of handling cylindrical or internal grinding with the utmost in speed and accuracy.

Write for details.

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Manhattan All-Around UNIVERSAL TOOL GRINDER

Foreign Representatives The Oliver Machinery Co., Ltd., Manchester, Eng. Farmer & Co., Clerkenwell, London, E.C.

2

The Hammer With The Human Stroke

HEADS RIVETS COLD

Heads 'em tight or loose, flush, countersunk, or finishes heads any shape desired, and at the rate of:—

A rivet a second, sizes up to 3/16".
A rivet in two seconds, size ¼" to ⅜".
A rivet in three seconds, size 7/16" to ½".

And on special order we build machines to handle rivets up to 1¼" with proportionate rapidity.

Built in eight sizes.

Besides riveting, the High Speed Riveting Hammer does all kinds of peining, swaging, upsetting, etc.

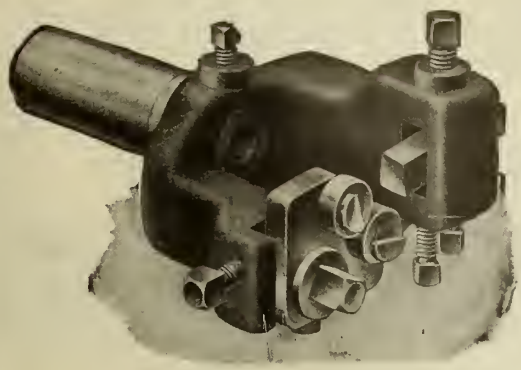
Send us sample assembly parts with rivets or sketch of your work.

and

Let us shoulder your riveting problems.
Send for the High Speed Hammer Book.

THE HIGH SPEED HAMMER COMPANY, INC.
ROCHESTER, N.Y.

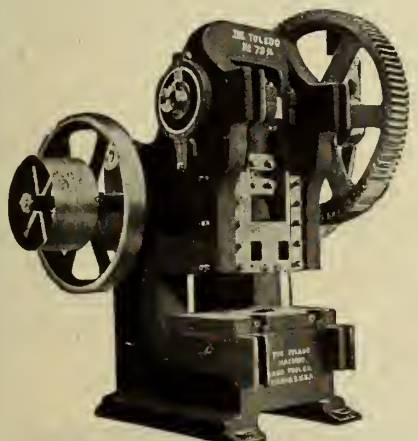
TURRET-LATHE
TOOLS & HOLDERS



COMPLETE EQUIPMENT FOR CAPSTAN LATHES FULLY ILLUSTRATED IN OUR TOOL LIST E.

J. ACKWORTHIE LTD.
COLESHILL STREET,
BIRMINGHAM
ENGLAND

The "TOLEDO"
OPEN BACK PRESSES



The "Toledo" No. 79½

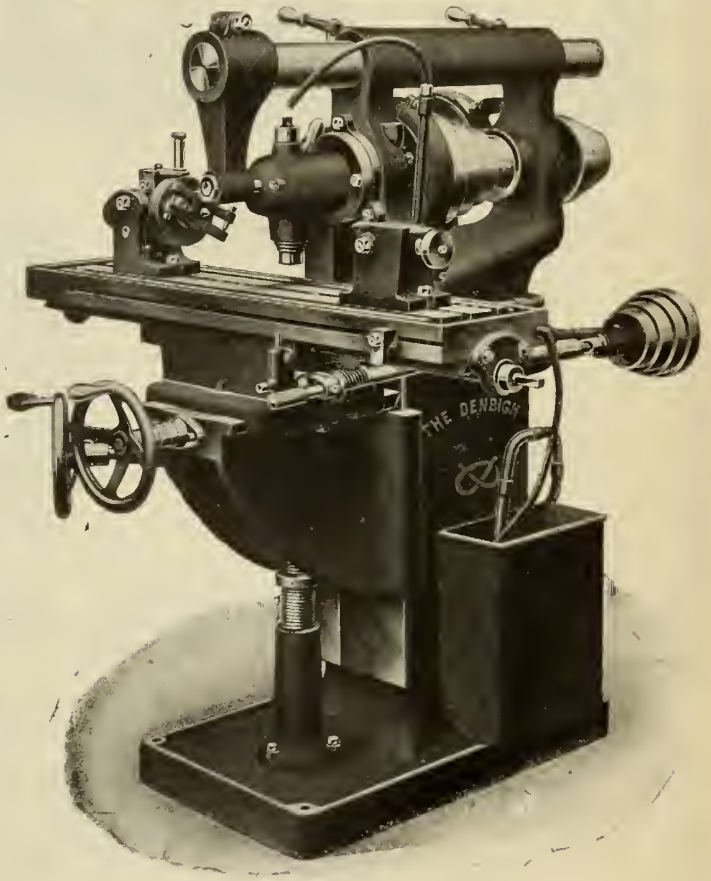
Establish a new basis of economy and volume of production.

Being extremely rugged and well proportioned, they can be operated at fullest capacity day after day for months and years without reduction of quality. Particularly suited for punching, shearing, perforating, binding and forming operations; trimming drop forgings, etc.

The Toledo Machine & Tool Co.
Toledo, Ohio

Representatives: Allied Machinery Co. of America, 19 Rue de Rocroy, Paris, France; Via XX Settembre 12, Turin, Italy; 16 Siedengasse, Zurich, Switzerland.

The
DENBIGH
Famous
MANUFACTURING
MILLERS



Enormous war demands enabled us to lay down a large and highly co-ordinated organization for the quantity production of Denbigh Manufacturing Millers.

This extensive experience has resulted in machines perfect in design and construction. We are now in a position to place them on the market at a very low price.

Nine types and sizes—to suit any miller requirement—**and the delivery is right.**

John M. Terry & Company
19-21 Queen Victoria Street
LONDON, ENGLAND
Cables: Athenian, Cannon, London.

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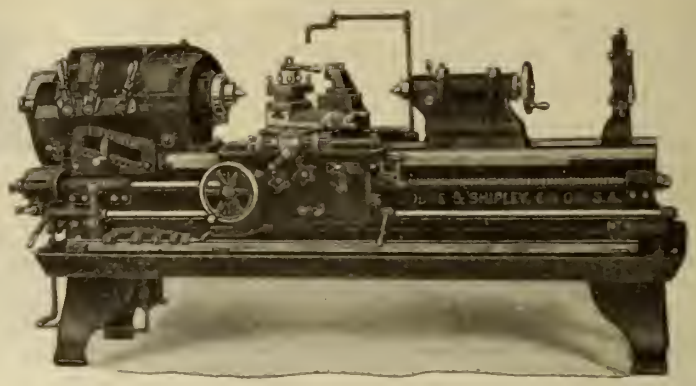
LATHES

A Real Cost-Cutting Tool



Should you be interested in saving twenty-five to fifty per cent. of the time usually taken in manufacturing duplicate parts, further consideration of the

Lodge & Shipley Manufacturing Lathe

will be to your advantage. The progressive manufacturer of to-day realizes that in order to show any margin of profits on his books, particular attention must be given to the time per piece of each job. More and more attention is being paid to this item, especially where duplicate pieces of work are manufactured. Let us tell you how this high-grade lathe will serve you.

H. W. PETRIE LIMITED TORONTO

Machinery and Supplies

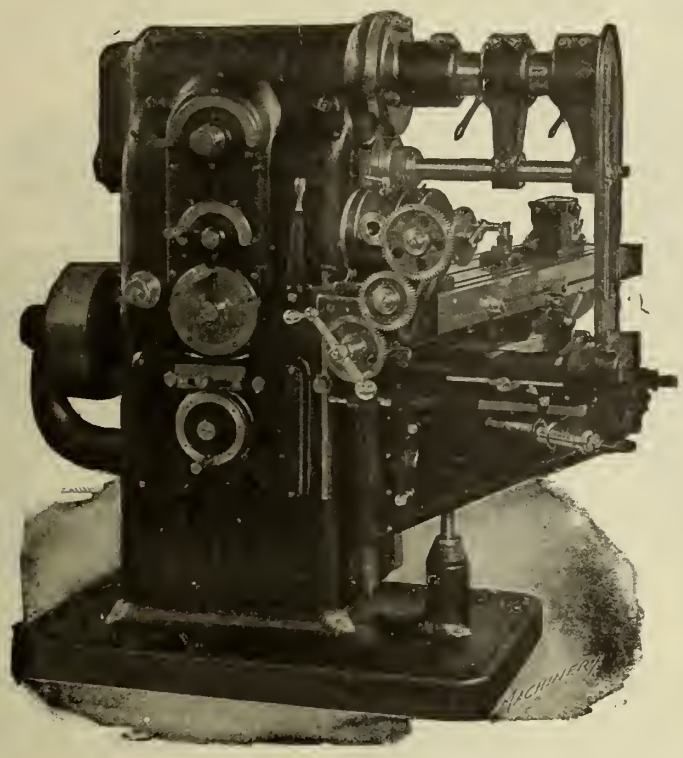
We can not only supply you with Lodge & Shipley Lathes but every other kind of machine tool you may require in your shop. Remember, *Petrie* is Canada's Dependable Machinery and Supply House.

H. W. PETRIE

Toronto LIMITED Hamilton

For work requiring the utmost accuracy—

ROCKFORD MILLERS



have established an enviable reputation among prominent manufacturers for accuracy, simplicity in construction and ease of operation. That they have been able to do this is credited to the great care exercised in their design, and the high-grade workmanship used in their construction.

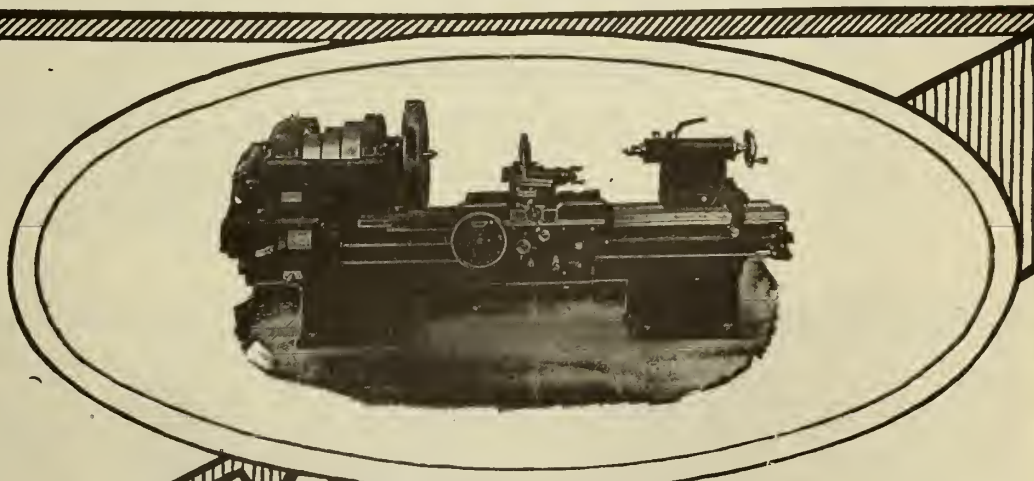
All feeds on the Rockford are controlled by one lever — the main spindle is instantly adjustable by a single nut, and the operator can complete a job without leaving the front of his machine. These are a few of the points that have made the Rockford a favorite with the men as well as their employers. We would like to tell you more about these machines. Write us for full information.

Rockford Milling Machine Co.
Rockford, Ill.

Canada: Rudel-Belnap Machinery Co.
Toronto, Ont.

FOREIGN REPRESENTATIVES: Great Britain, A. A. Jones & Shipman, Ltd., Leicester, England. France and Belgium, Louis Besse, Paris, France. Italy and Colonies, Societa Anonima Adler & Co., Milano. Scandinavia, Rylander & Asplund, Stockholm, Sweden. Spain and Portugal, Casamitjana Hermanos, Barcelona, Spain. Australia, Selson Engineering Co., Melbourne, Australia. Russia, M. Mett Engineering Co., Petrograd, Russia.

Heavy Duty Lathes



SIDNEY For Service

Easy Masters of Big Jobs

Dependence put upon Sidney Lathes is never misplaced. Very heavy work can be done without apprehension.

The 25-inch Heavy Duty Quick Change Sidney here shown is the last word in lathe construction. Every possible improvement will be found in this model. Bed lengths of 10, 12, 14, 16, 18 and 20 feet are available. Build also with 27 inch swing.

Write for full particulars of the more suitable machine to-day.

Canadian Agents:
THE YEATES MACHINERY & SUPPLY CO.
Montreal, Quebec
H. W. PETRIE, LIMITED, Toronto, Ontario

The Sidney Tool Co.
Sidney, Ohio, U.S.A.

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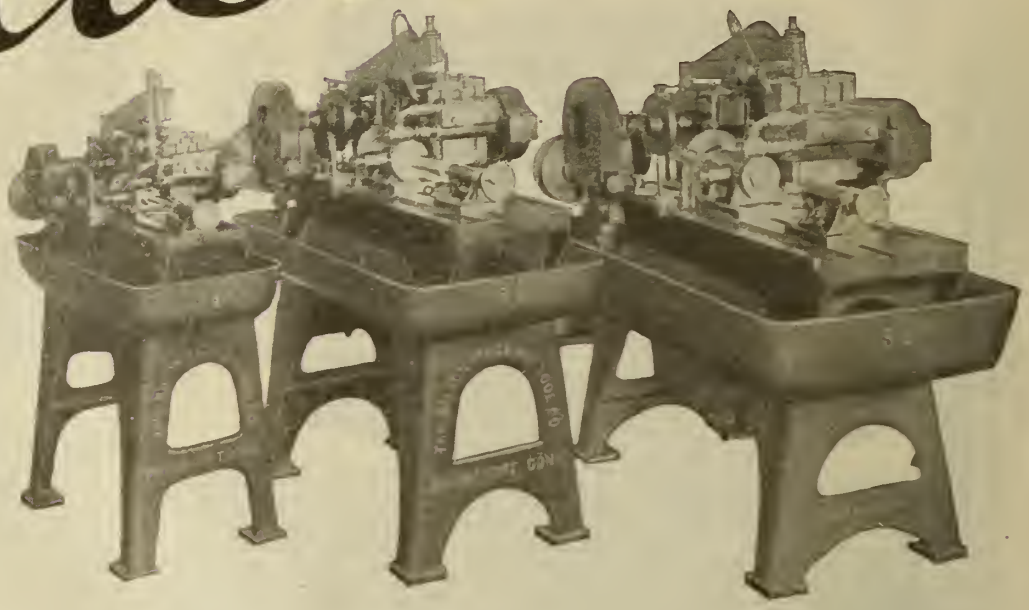
Bilton GEAR MILLERS



Fully Automatic

Their adaptability is almost unlimited on small work—such as cutting spur, bevel, miter, angle gears, saws, ratchets, sprockets, cutters, knurls, taps, cylinders, form cutting, manufacturing, milling, etc.

A big time saver, as indexing takes place during return stroke of cutter — which is removing metal 90% of the time.

Write us for Catalog 30-6

Over 500 leading manufacturers now use the Bilton for high production on accurate work

Bilton Machine Tool Co. Housatonic Avenue **Bridgeport, Conn., U.S.A.**

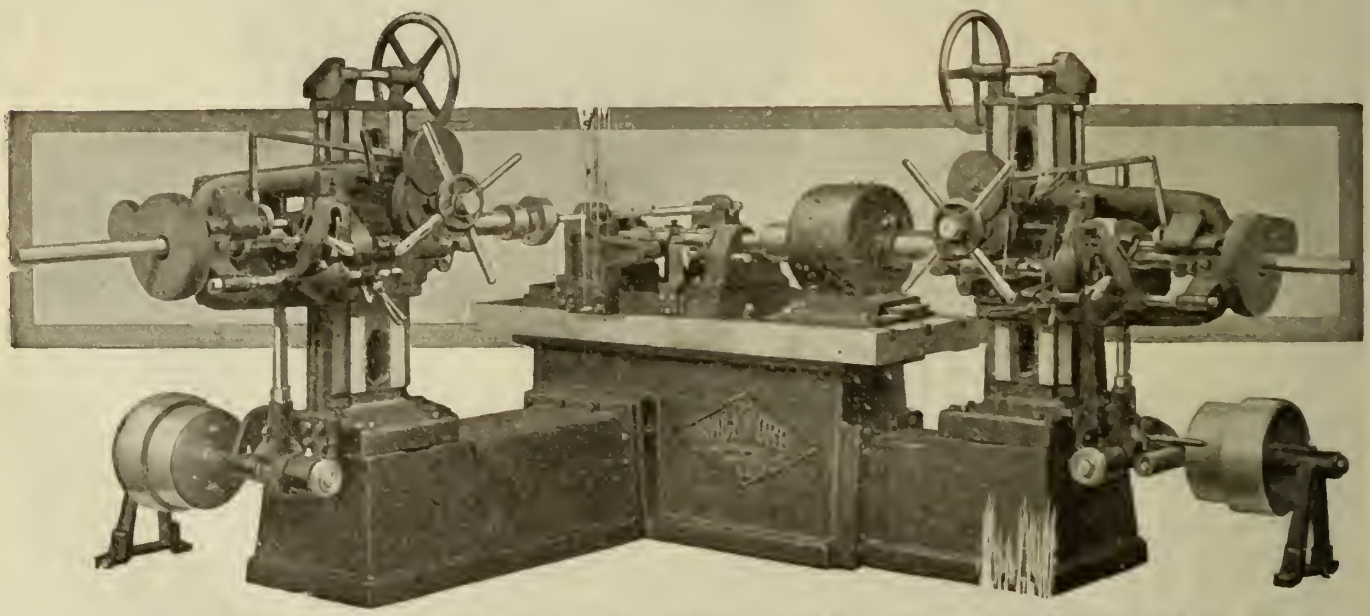
Foreign Agents: Alfred Herbert, Ltd. Chas. Churchill & Co., Ltd.

Rockford Horizontal Boring Machine

For Automobile Manufacture

This tool is unusually rapid and accurate in the boring of crank cases, transmission cases and rear axles. Has two heads at right angles to each other. Spindles bore longitudinal and cross holes in work simultaneously.

Send us blue prints of your boring work and we will give you figures on the "Rockford's" ability on it.



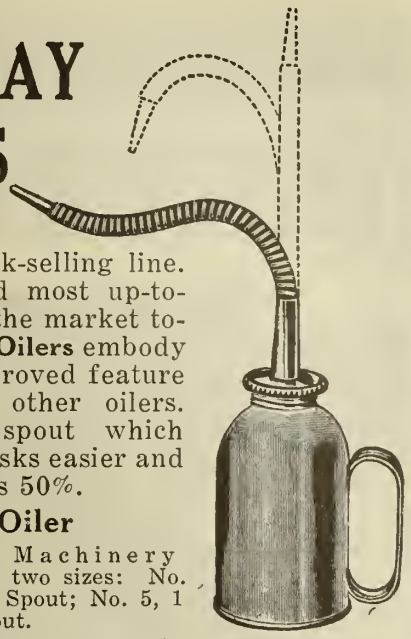
THE ROCKFORD DRILLING MACHINE CO., ROCKFORD, Ill.

CANADIAN AGENTS

RUDEL-BELNAP MACHINERY CO., MONTREAL and TORONTO

FOREIGN REPRESENTATIVES:—Burton Griffiths, London. Buck & Hickman, London E., England. R. S. Stokvis & Zonen, Inc., France, Belgium, Holland, Russia. Allied Machinery Co., 51 Chambers St., New York City, South Africa, China, Italy, Brazil, Portugal, Balkan States, Casamitjana Hermanos, Barcelona, Spain.

ALL-WAY OILERS



Here is a quick-selling line. The latest and most up-to-date oilers on the market today. **All-Way Oilers** embody a new and improved feature not found in other oilers. The flexible spout which makes oiling tasks easier and reduces oil bills 50%.

R.R. Oiler

For Locomotives, Machinery Threshers, etc. In two sizes: No. 4, 1 Pint and 10" Spout; No. 5, 1 Quart and 11" Spout.

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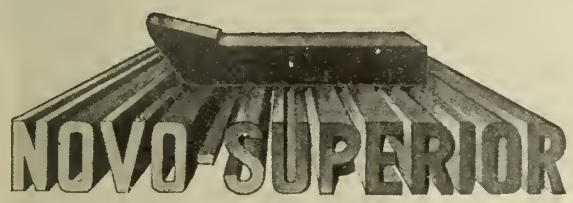
If your jobber cannot supply you, write us:

THE ALLWAY MFG. COMPANY
196 KING STREET WEST, TORONTO, ONT.



HIGH SPEED STEEL
INTRA STEEL GIBRALTAR STEEL
Tool Steel for Every Purpose
Swedish Lancashire Iron

Twist Drills, Taps, Hack Saw Blades, Milling Cutter Files, Etc., Music Wire for Springs, Steel Balls. Cold Rolled Tool Steel in Strips and Sheets Circular Saws, Machine Knives.

PILOT STEEL & TOOL COMPANY,
LIMITED
332 St. James Street, Montreal

Sole Agents for

JONAS & COLVER, LIMITED
Novo and Continental Steel Works, Sheffield, Eng.

H. BOKER & CO., Inc
New York, N.Y.

THE MASTER METAL

Not Steel—but its Master

Stellite has revolutionized the cutting of metals. There is no iron in Stellite—nothing to burn or crumble under high speeds or heavy cuts.

Formerly the production was limited by the speed which the tools would stand. Now, it is the capacity of the lathe which sets the limit!

Stellite makes heavier and cleaner cuts the hotter it gets; cutting continuously at heats up to 2,000° F.

Any information with regard to Stellite is yours for the asking. A demonstrator will be sent upon request.

Deloro Smelting & Refining Co., Limited

Head Office and Works :
DELORO CANADA

Branch Warehouses :
200 King St.W. Toronto, Ont., Can.
174 Corporation St. Birmingham, Eng.

THE MASTER METAL

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The Sign of Efficiency

MORSE DRIVES

The Sign of Durability

THE MORSE ROCKER JOINT

Positive as Gears

Flexible as a Belt

Longer Life

THE WORLD AROUND

Investigated, endorsed, installed by Engineers and Industrial Leaders of all nations as the World's most efficient (98.6%) Power Tranmission.

MORSE Silent Chain Drive has attained its leading position by results, has proven its efficiency, its durability, its low maintenance, it has increased production and lowered cost, it has brought out the concealed profits of slipping belts wherever the 3,000,000 h.p. now in use has been installed.

MORSE CHAIN CO., LARGEST MANUFACTURERS OF SILENT CHAINS IN THE WORLD **ITHACA, N. Y.**

Morse Engineering Service *Write for Booklet* *Assistance Without Obligation*

Address Nearest Office

ATLANTA, GA., Candler Bldg., Earl F. Scott, M.E.
BALTIMORE, MD. ..... 1402 Lexington Bldg.
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CANADA ..... Jones & Glasco, Registered
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CHICAGO, ILL. ..... Merchants L. & T. Bldg.
CLEVELAND, OHIO ..... Engineers Bldg.
DETROIT, MICH. ..... 1003 Woodward Ave.
KANSAS CITY, MO., Finance Bldg. ..... Morse Engineering Co.
MINNEAPOLIS, MINN., 413 3rd St., S. .... Strong-Scott Mfg. Co.
MONTREAL, St. Nicholas Bldg. ... Toronto, Traders' Bank Bldg.
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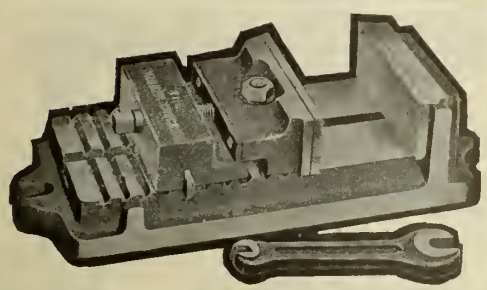
SAN FRANCISCO, CALIF. ..... Monadnock Bldg.
ST LOUIS MO., Chemical Bldg. ..... Morse Engineering Co

"Morse" is the Guarantee Always Behind the Efficiency, Durability and Service

SKINNER DRILL PRESS VISES



Designed for holding either straight or taper work this vise is portable, convenient and durable.

It is truly **THE HANDY TOOL.**

It may be bolted to a drill, planer, miller or shaper by the ears at both ends, clamped as desired by the flange or used at right angles.

THE SKINNER CHUCK COMPANY

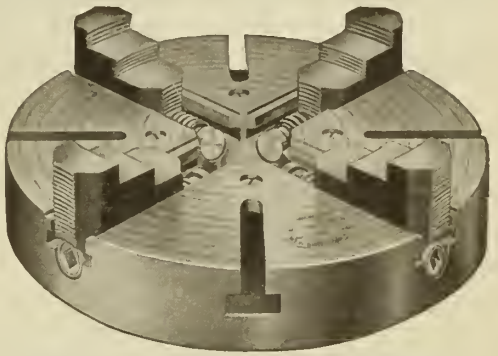
NEW BRITAIN, CONN.

New York Office: 94 Reade St.
San Francisco Office: Rialto Bldg.
London Office: 139 Queen Victoria St., London, E. C. 4.

ALL STEEL

INDEPENDENT CHUCKS

are not an experiment—they have come to stay. They are a necessity with the modern machinery and high-speed steel cutting tools.



THE UNION STEEL BODY CHUCKS

are well designed and have all the elements of strength and durability for which they are designed. We make other types in steel also, including the Geared Scroll Chucks and the Geared Scroll Combination—all designed for heavy work and hard usage.

UNION MANUFACTURING COMPANY

New Britain, Conn.

New York Office: 26 Cortlandt Street

Makers of a complete line of chucks

The Leading Chuck

Irrefutable evidence of the leadership of Jacobs Chucks is the fact that the people who know most about drilling — mechanics, foremen, superintendents and drill makers alike—prefer them by a large majority.

Equip your drills with them.

DEPT. IA.

THE JACOBS MFG. CO. HARTFORD, CONNECTICUT, U.S.A.

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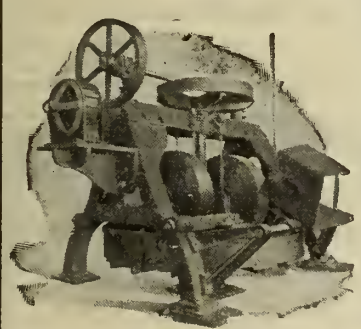

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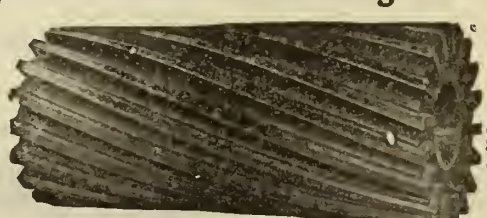

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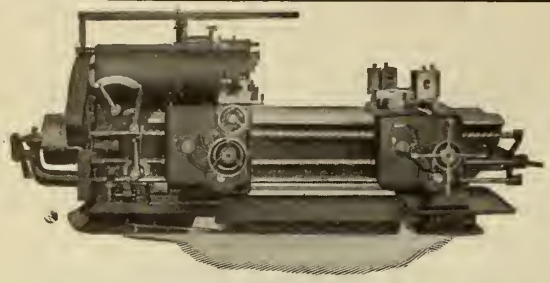

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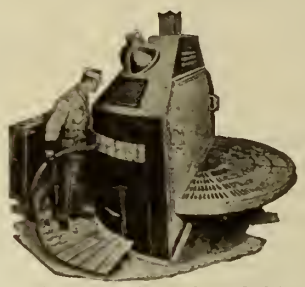

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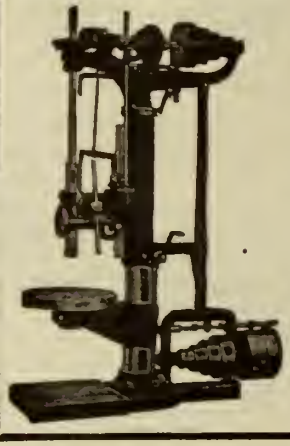

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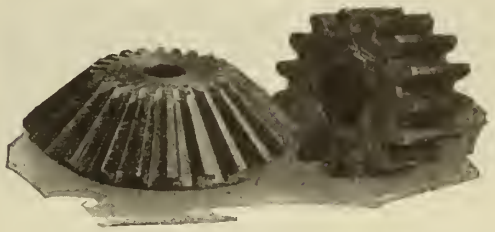

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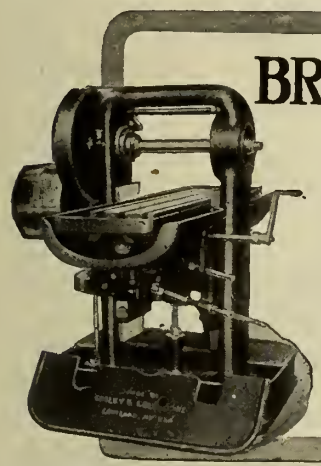

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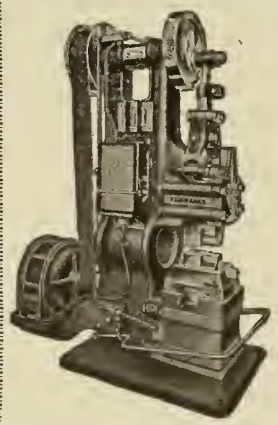

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Bertram & Sons Co., John, Dundas
Brown-Boggs Co., Ltd., Hamilton, Ont.
Can. Blower & Forge Co., Kitchener.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Mach. Co., Toronto.
Petrie, Ltd., H. W., Toronto.

BLAST GATES
W. S. Rockwell Co., New York N.Y.

BLASTING MACHINES, SAND
Garlock-Walker Machinery Co., Toronto
Jardine, A. B., & Co., Hespeler, Ont.
National Mach. Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Toledo Machine & Tool Co., Toledo
Williams Mchy Co., A. R., Toronto, Ont

BILLET MARKERS
Matthews & Co., Jas. H., Pittsburgh, Pa

BILLETS
Atkins & Co., Ltd., Wm., Sheffield, Eng
Swedish Steel & Importing Co., Ltd., Montreal.
Algoma Steel Corp., Sault Ste. Marie
Kayser-Ellison & Co., Ltd., Montreal
Marshall, Son & Bunney, Toronto.
United Alloy Steel Corp., Canton, Ohio.

BILLETS, FORGING
Dominion Foundries & Steel Ltd., Hamilton, Ont.
Kayser-Ellison & Co., Ltd., Montreal

BINS, STEEL
Dennis Wire & Iron Works, London, Ont
Dominion Bridge Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Toronto Iron Works, Ltd., Toronto, Ont
Wilkes & Hamilton Co., Peterboro, Ont.

BLACKSMITH WORK
The Thos. Pink Co., Ltd., Pembroke

BLOCKS, CHAIN
Oliver Engineering Co., Montreal.

BLOOMS AND SLABS
Algoma Steel Corp., Sault Ste. Marie
United Alloy Steel Corp., Canton, Ohio.

BLOWERS
Can. Blower & Forge Co., Kitchener, Ont
Chicago Flexible Shaft Co., Chicago, Ill.
Garlock-Walker Machinery Co., Toronto.
MacGovern & Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto.
Sturtevant Co., B. F., Galt, Ont.

BLOWING ENGINES
General Combustion Co., Ltd., Montreal, Que.

BLOW PIPES AND REGULATORS
Carter Welding Co., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Welding & Supplies Co., Montreal, Que.

BLUE PRINTING MACHINERY
Commercial Camera Co., Providence, R.I.

BLUE PRINT PAPER
Hughes, Owens Co., Ltd., Montreal, Que.

BOARDS, GLASS CUTTING
Lufkin Rule Co., of Can., Windsor, Ont

BOARTZ
Joyce, Koebel & Co. Inc., New York

BOLT CUTTERS
Greenfield Tap & Die Corp., Greenfield Mass

BOILER TUBES
Lyman Tube & Supply Co., Montreal, Que.

BOILER BREECHINGS
Que.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
William Hamilton Co., Peterboro, Ont.

BOLT CUTTERS
Fellows Gear Shaper Co., Springfield, Vt
Greenfield Tap & Die Corp., Greenfield Mass.
Wells Bros., of Can., Galt, Ont.
Petrie, Ltd., H. W., Toronto.

BOILERS, RANGE
Can. John Wood Mfg. Co., Ltd., Toronto Ont.

BOILERS
Dominion Bridge Co., Montreal, Que.
MacGovern & Co. Montreal Que

BOILERMAKERS' TOOLS
Holden Co., Ltd., Montreal, Que.

BOLT CUTTERS AND NUT TAPERS
Aikenhead Hardware Co., Toronto, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Landis Machine Co., Waynesboro, Pa.
A.B. Jardine & Co., Ltd., Hespeler, Ont
Rice Lewis & Son, Toronto, Ont.
Wells Bros. Co. of Canada, Galt, Ont.
Petrie, Ltd., H. W., Toronto

BOLTS
Aikenhead Hardware Co. Toronto, Ont.
London Bolt & Hinge Wks., London, Ont.
Morrow Screw & Nut Co., John, Ingersoll.
Rice, Lewis & Son, Toronto, Ont.
Steel Co., of Canada, Ltd, Hamilton.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Co., J. H. Brooklyn, N.Y.

BOLTS, COUPLING
Galt Machine Screw Co., Ltd., Galt, Ont.

BOLTS, STAY
Morrow Screw & Nut Co., John, Ingersoll.

BOLTS, SPRING SHAKLE
Can. Winkley Co., Ltd., Windsor, Ont.
Morrow Screw & Nut Co., John, Ingersoll

BOLTS, PATCH
Morrow Screw & Nut Co., John, Ingersoll.

BOLT AND NUT MACHINERY
Barber Mchy. Co., Ltd., Toronto, Ont.
Bertram & Sons Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Gardner & Son, Robt., Montreal.
Landis Machine Co., Waynesboro, Pa.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ohio.
Universal Mach. Co., Bowling Green, O.
Williams Machinery Co., A. R., Toronto

BOLT THREADING MACHINERY
Jardine & Co., Ltd., B., Hespeler.
Landis Machine Co., Waynesboro, Pa.
National Acme Co., Cleveland, Ohio.
Victor Tool Co., Waynesboro, Pa.

BONDING MACHINES (Electric Railway)
The Lincoln Electric Co., Toronto, Ont.

BORING MACHINES, PNEUMATIC CYLINDER
Cleveland Pneumatic Tool Co., Toronto.
Canadian Fairbanks-Morse Co., Montreal
Can. Ingersoll-Rand Co., Sherbrooke Que
Garlock-Walker Mach. Co., Toronto.

BORING MACHINES, UPRIGHT AND HORIZONTAL
Barber Mchy. Co., Ltd., Toronto, Ont.
Bertram & Sons Co., John, Dundas.
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto
Gisholt Machine Co., Madison, Wis.
Herbert, Ltd., Alfred, Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Hoefer Mfg., Co., Freeport, Ill.
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Oliver Mach'y Co., Grand Rapids, Mich.
Roelofson Machine & Tool Co., Toronto.
Rockford Drilling Mchs. Co, Rockford, Ill
Strelinger, Chas. A. Co., Windsor, Ont.

BORING AND TURNING MILLS
Barber Mchy. Co., Ltd., Toronto, Ont.
Bertram & Sons Co., John, Dundas.
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Foss Mch. & S'ply Co., Geo. F., Montreal
Herbert, Ltd., Alfred, Toronto, Ont.
Kingsbury Metal Products, Toronto.
Oliver Mach. Co., Grand Rapids, Mich.
Niles-Bement-Pond Co., New York.
Strelinger, Chas. A. Co., Windsor, Ont.

BOXES, CAST IRON
Brown & Sharpe Mfg. Co., Providence, R.I.

BOXES, STEEL SHOP AND TOTE
Cleveland Wire Spring Co., Cleveland.

BRAKES
Brown, Boggs & Co., Hamilton, Can.
Electric Steel & Metals, Ltd., Welland.

BRASS—SHEETS, ROLLS, PLATES, and RODS
Brown's Copper and Brass Rolling Mills, New Toronto.

BRASS ALLOYS
British Smelting & Refining Co., Ltd., Montreal, Que.

BRASS AND COPPER TUBING
Lyman Tube & Supply Co., Montreal, Que.

BRASS FOUNDERS
Canada Metal Co., Toronto.
St. Lawrence Welding Co., Montreal.
Tallman Brass & Metal Co., Hamilton.

BRASS GOODS
Crane, Ltd., Montreal, Que.

BRASS PIPE AND TUBE
Crane, Ltd., Montreal, Que.

BRASS WORKING MACHINERY
Barber Mchy. Co., Ltd., Toronto, Ont.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machinery Co., Toronto.
Warner & Swasey Co., Cleveland, O.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Prest-O-Lite Co., Inc., Toronto, Ont.
Wood Turret Machine Co., Brazil, Ind.
Williams Mchy. Co., A. R., Toronto.
Brown's Copper and Brass Rolling Mills, New Toronto.

BRAZING EQUIPMENT
Chicago Flexible Shaft Co., Chicago, Ill.

BRICKS, FIRE
Elk Fire Brick Co., Can., Ltd., Hamilton, Ont.

BRIDGES, RLY. AND HIGHWAY
Canadian Mead-Morrison Co., Limited, Montreal, Que.
Dominion Bridge Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.

BROACHING MACHINES
Strelinger Co., C. A., Windsor, Ont.

BRONZE—SHEETS, ROLLS, PLATES, and RODS
Brown's Copper and Brass Rolling Mills, New Toronto.

BRONZE, NAVAL
Canada Metal Co., Toronto.
Tallman Brass and Metal Co., Hamilton.

BRONZE COPPER
Canada Metal Co., Toronto.

BRUSHES, CARBON
Lyman Tube & Supply Co., Montreal, Que.

BUFFING AND POLISHING MACHINERY
Ford-Smith Mach. Co., Hamilton.
Foss Mchy. & S'ply Co., Geo. F. Montreal
Garlock-Walker Machinery Co., Toronto.
Petrie, Ltd., H. W., Toronto.

BUCKETS, DUMP
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
St Lawrence Welding Co, Ltd, Montreal

BUCKETS, ELEVATOR
Can. Link-Belt Co., Toronto, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
[illegible]nce Welding Co. Ltd., Montreal

BUCKETS, CLAM SHELL, CRAB, DUMP
Brown Hoisting Machinery Co., Cleveland, Ohio.
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Ltd, Walkerville.

BULLDOZERS
Bertram & Sons Co., John, Dundas.
Canada Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machinery Co., Toronto.
Lourie Manufacturing Co., Springfield, Ill
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

BURNERS, OIL AND NATURAL GAS
Northern Crane Works, Ltd., Walkerville.
W. S. Rockwell Co., New York, N.Y.

BURRS, IRON AND COPPER
Parmenter & Bulloch Co., Gananoque,.

BUSHINGS, BRONZE
Morrow Screw & Nut Co., John, Ingersoll.

CALIPERS
Brown & Sharpe Mfg. Co., Providence, R.I.
Pangborn Corporation, Hagerstown, Md.

CABINETS, SAND BLAST
Pangborn Corporation, Hagerstown, Md.

CABLE, ELECTRIC
International Machinery & Supply Co., Ltd., Montreal, Que.

CABLES, TRANSMISSION AND TELEPHONES
Northern Electric Co., Ltd., Montreal.

CALKS, BOOT
Lufkin Rule Co., of Can., Windsor, Ont.

CANNERS' MACHINERY
Bliss, E. W. Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Can.

CANNERS' CONVEYORS
Can. Link-Belt Co., Toronto, Ont.

CARBIDE
Carter Welding Co., Ltd., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.
Union Carbide Co., of Canada, Limited, Weland, nt.

CARBONIZING BOXES
Can. Driver-Harris Co., Ltd., Walkerville
Kelly Foundry, Galt, Ont.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.
Swedish Crucible Steel Co. Windsor.

CARRIERS, PNEUMATIC TUBE
Jones & Glassco, Montreal.

CARS, INDUSTRIAL
Can. Blower & Forge Co., Kitchener, Ont
Can. Fairbanks-Morse Co., Ltd. Montreal
Elec. Steel & Metals, Welland, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

CAR MOVERS
Holden Co., Ltd., Montreal, Que.

CASES, FILING
Economy Drawing Table Co., Adrian, Mich.

CASTINGS, ALUMINUM, BRASS BRONZE, COPPER, AND GUN METAL
Algoma Steel Corp., Sault Ste. Marie.
Franklin Mfg. Co., Syracuse, N.Y.
Canada Metal Co., Ltd., Toronto, Ont.

CASTINGS, DIE CAST
Canada Metal Co., Ltd., Toronto, Ont.
Franklin Mfg. Co., Syracuse, N.Y.
Fisher Motor Co., Ltd., Orillia, Ont.
Tallman Brass & Metals Ltd., Hamilton, Ont.

CASTINGS, STEEL—ALL KINDS
Canada Electric Castings, Ltd., Orillia, Ont.
Dominion Foundries & Steel Ltd., Hamilton, Ont.
Electric Steel & Metals Co., Welland.
Meeks Machine Co., Pittsburgh, Pa.

CASTINGS, ELECTRIC AND ALLOY STEEL
Can. Elec. Castings Co. Ltd., Orillia, Ont
Dominion Foundries & Steel Ltd., Hamilton, Ont.

CARRIERS COUPLING BOLTS
John Morrow Screw & Nut Co., Ingersoll
Alexander Fleck Ltd., Ottawa.
Tallman Brass & Metal Co., Hamilton.

CASTINGS, BENCH LEG.
Brown & Sharpe Mfg. Co., Providence, R.I.

CASTINGS, BRASS AND IRON
Algoma Steel Corp., Sault Ste. Marie.
International Machinery and Supply Co., Ltd., Montreal, Que.

CASTINGS, BUILDING
Katie Foundry, Galt, Ont.

CASTINGS, GRAY IRON
Bernard Industrial Co., A., Fortierville, Q.
Brown & Sharpe Mfg. Co., Providence, R.I.
Brown, Boggs Co., Ltd., Hamilton.
Can. Elec. Castings Co, Ltd., Orillia, Ont
Alexander Fleck, Ltd., Ottawa.
Gardner & Son, Robt., Montreal.
Hull Iron & Steel Foundries, Ltd., Hull
International Malleable Iron Co., Guelph
Kennedy & Sons, Ltd., Wm., Owen Sound.
Katie Foundry, Ltd., Galt, Ont.
Hamilton Co., Wm., Peterboro.
McFarlane Engineering Ltd., G. W., Paris, Ont.

CASTINGS, PLUMBERS'
Katie Foundry, Galt, Ont.

CASTINGS, NICHROME
Can. Driver-Harris Co., Ltd., Walkerville

CASTINGS, HARDWARE
Katie Foundry, Galt, Ont.

CASTINGS, STEEL CHROME AND MANGANESE STEEL
Thos. Davidson Mfg. Co., Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Hull Iron & Steel Foundries, Ltd., Hull.
Kennedy & Sons, Ltd, Owen Sound.

CASTINGS, MALLEABLE
International Malleable Iron Co., Guelph

CASTINGS, NICKEL STEEL
Hull Iron & Steel Foundries, Ltd., Hull.

CEMENT MACHINERY
Can. Fairbanks-Morse Co., Ltd., Montreal.
Gardner, Robt., & Son, Montreal.

CEMENT HANDLING MACHINERY
Can. Link-Belt Co., Toronto, Ont.

CEMENT TOOLS
Atkins & Co., E. C., Hamilton, Ont.

CENTERING MACHINES
Victoria Foundry Co., Ottawa, Ont.

CENTRE REAMERS
Bertram & Sons Co., John, Dundas.
Butterfield & Co., Inc., Rock Island, Que
Gardner, Robt. & Son, Montreal.
Hurlburt, Rogers Mch. Co., South Sudbury, Mass.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co., of Canada, Galt, Ont.

CHAIN, WELDED COIL
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

CHAIN BLOCKS
Aikenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Ford Chain Block & Mfg. Co., Phila., Pa.
Garlock-Walker Machy. Co., Toronto.
Lyman Tube & Supply Co., Montreal, Que.
Morris Crane & HoistCo., Herbert, Niagara Falls, Ont.
Oliver Engineering Co., Montreal.
Rice Lewis & Son, Toronto, Ont.
Jones & Glassco, Montreal, Que.

CHAINS, AGRICULTURAL
Canadian Link-Belt Co., Ltd., Toronto, Ont.
Morse Chain Co., Ithaca, New York.
Renold of Canada Ltd., Montreal.

CHAINS, AUTOMOBILE ENGINE
Can. Link-Belt Co., Ltd., Toronto, Ont.
Morse Chain Co., Ithaca, New York.
Renold of Canada Ltd., Montreal.

CHAINS, BICYCLE, DRIVE AND BLOCK
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold of Canada Ltd., Montreal.

CHAINS, FOR ELEVATORS AND CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Petrie, Ltd., H. W., Toronto.
Renold of Canada Ltd., Montreal.
Williams Mchy Co., A. R., Toronto, Ont.

CHAIN, MALLEABLE, DETACHABLE AND RIVETED
Can. Link-Belt Co., Toronto, Ont.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

CHAINS, POWER TRANSMISSION
Canadian Link-Belt Co., Ltd., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, New York.
Glasgow N.S.
Renold of Canada Ltd., Montreal.

CHAINS, SPROCKET WHEEL
Can. Link-Belt Co., Ltd., Toronto, Ont.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca N.Y.

CHAIN DRIVES
Can. Link-Belt Co., Toronto, Ont.
Coventry Chain Co., Coventry, England.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold of Canada Ltd., Montreal.

CHASERS
National Acme Co., Cleveland Ohio.
Taylor, J. A. M., 318 Stair Bldg., Toronto, Ont.

CHEMISTS
Toronto Testing Lab'tory, Ltd., Toronto

CHUCKS, AERO, AUTOMATIC
Garvin Machine Co., New York

CHUCKS, CENTERING
Hoggson & Pettis Mfg. Co., New Haven Conn.

CHUCKS, COLLET, AIR
Elliott & Whitehall Mach. & Tool Co Galt, Ont.
Smalley-General Co., Inc., Bay City, Mich
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto Ont

CHUCKS, DRILL, LATHE AND UNIVERSAL
Aikenhead Hardware Co., Toronto, Ont
Bertram & Sons Co., John, Dundas.
Can. Blower & Forge Co., Kitchener, Ont
Can. Fairbanks-Morse Co., Ltd., Montreal
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Ltd., Brantford.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Mach'y Co., Toronto.
Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Chicago, Ill.
Herbert Ltd., Alfred, Toronto, Ont.
Jacobs Mfg. Co., Hartford, Conn.
Ker & Goodwin Machine Co., Ltd., Knight Metal Products, Toronto.
Modern Tool Co., Erie, Pa.
Rice Lewis & Son, Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

CHUCKS, DRILL, AUTOMATIC AND KEYLESS
Aikenhead Hardware Co., Toronto, Ont
Can. Blower & Forge Co., Kitchener.
McCrosky Tool Corp., Meadville, Pa., U. S. A.
Strelinger, Chas. A. Co., Windsor, Ont.

CHUCKS, FRICTION AND TAP
Victor Tool Co., Waynesboro, Pa.

CHUCKS, MAGNETIC
Heald Machine Co., Worcester, Mass.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co, Ltd., A. R., Montreal

CHUCKS, RING WHEEL
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.

CHUCKS, WHEEL, CAR
Hoggson & Pettis Mfg. Co., New Haven Conn.

CHUCKING MACHINES
Barber Mchy. Co., Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Garvin Machine Co., New York.
Gisholt Machine Co., Madison, Wis.
National Acme Co., Windsor, Vt.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Warner & Swasey Co., Cleveland, O.
Wood Turret Mach. Co., Brazil, Ind.
Williams Mchy Co., A. R., Toronto, Ont.

CIRCULATING SYSTEMS FOR LUBRICATING OIL
Bowser Co., Ltd., S. F., Toronto, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

CLAY FIRE
Elk Fire Brick Co., Can., Ltd., Hamilton, Ont.

CLEANERS, METER, WASTE, GENERAL
Oakley Chemical Co., New York, N.Y.

CLEANING COMPOUND
Oakley Chemical Co., New York.

CLOCK SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

CLOCKS, WATCHMAN, PORTABLE
Gisholt Machine Co., Madison, Wis.

CLOSETS
Crane, Ltd., Montreal, Que.

CLUTCHES, CHAIN
Wright Mfg. Co., Lisbon, Ohio.

CLUTCHES, FRICTION AND PULLEY
Bernard Industrial Co., A., Fortierville, Q
Can. Link-Belt Co., Toronto, Ont.
Carlyle Johnson Mach. Co., Manchester, Conn.
Positive Clutch & Pulley Wks., Aurora, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.

COAL CRUSHERS
Canadian Link-Belt Co., Ltd., Toronto, Ont.
Canadian Mead-Morrison Co., Limited, Montreal, Que.

COAL HANDLING MACHINERY
Brown Hoisting Machinery Co., Cleveland, Ohio.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Canadian Mead-Morrison Co., Limited, Montreal, Que.
Dominion Bridge Co., Montreal, Que.
MacGovern & Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont
Nova Scotia Steel & Coal Co., New

COLD ROLLED STRIP, ALL METAL COLLARS, SHAFTING
Can. Driver-Harris Co., Ltd., Walkerville
Williams & Co., J. H., Brooklyn, N.Y.

COLLECTORS, PNEUMATIC
Can. Blower & Forge Co., Kitchener.
Sturtevant Co., B. F., Galt, Ont.

COLLETS
Becker Milling Machine Co., Boston.

COMPOSITION INGOT
Canada Metal Co., Toronto, Ont.

COMPOUNDS, CUTTING AND GRINDING, DRAWING, STAMPING
Oakley Chemical Co., New York, N.Y.

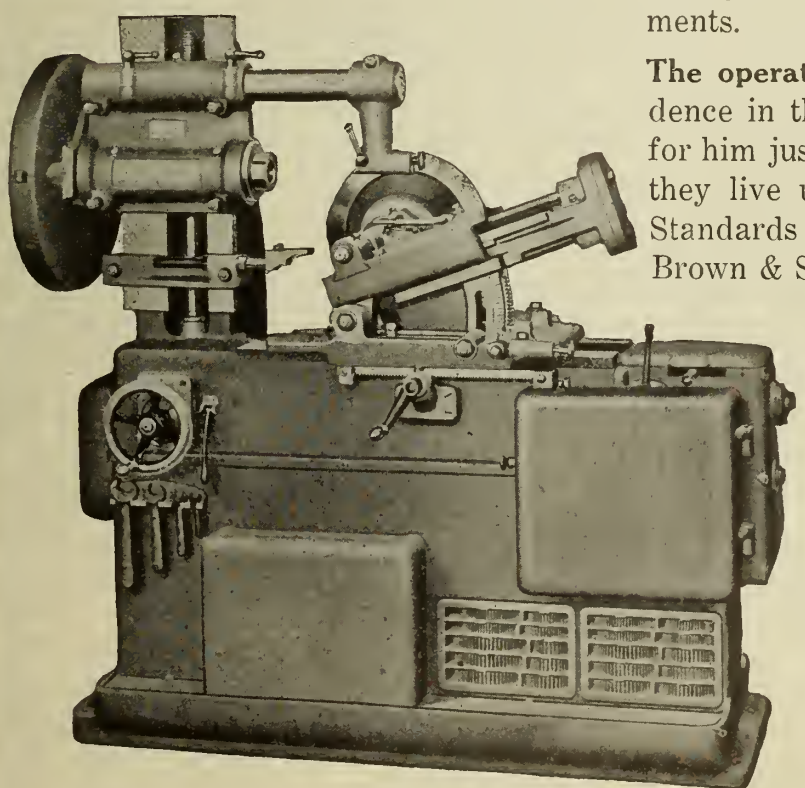
COMPRESSORS, AIR
Atkins & Co., E. C., Hamilton, Ont.
Can. Ingersoll-Rand Co., Sherbrooke.
Cleveland Pneumatic Tool Co., Toronto.
Curtis Pneumatic Machy. Co., St. Louis
Elliott & Whitehall, Galt, Ont.
Garlock-Walker Machy. Co., Toronto.
Holden Co., Ltd., Montreal, Que.
MacGovern & Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto.

BROWN & SHARPE
GEAR CUTTING MACHINES

THEY SATISFY MANUFACTURER AND OPERATOR

The manufacturer knows that they are producers—that they assure him high, uninterrupted production and that the accuracy of finished work meets requirements.

The operator knows he can place confidence in them—that they turn out work for him just as he would have it and that they live up in every way to the High Standards of Quality maintained by Brown & Sharpe Products.



No. 13. A convenient size for all-round use. Cuts both spur and bevel gears. One of the seven in the line.

Brown & Sharpe Gear Cutting Machines have been cutting gears for over 40 years and daily are producing results which satisfy. Being automatic in their operation, one workman can easily run several machines.

Whether it be the largest machine with a capacity for spur gears to 72 in. in diameter with 13-in. face, or the smallest—or perhaps one of the bevel gear cutting machines, the work produced is typical of that by which Brown & Sharpe maintain their High Standards of Quality.

BROWN & SHARPE MFG. CO.
PROVIDENCE, R.I., U.S.A.

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Williams Mchy Co., A. R., Toronto, Ont.

CONDENSERS

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
MacGovern & Co., Montreal, Que.
Smalley-General Co., Inc., Bay City, Mich.

CONDUITS

Northern Electric Co., Ltd., Montreal Que

CONNECTING RODS

Canada Found'a & Forgings, Ltd., Welland, Ont.

CONNECTING ROD CUTTERS INTERCHANGEABLE

Eclipse Counterbore Co., Ltd., Walkerville, Ont.

CONTRACTORS' HOISTS

Canadian Mead-Morrison Co., Limited, Montreal, Que.

CONTRACT WORK

Brown Engineering Corp., Toronto.
Ford-Smith Machine Co., Hamilton, Ont.
Globe Engineering Co., Hamilton, Ont.
Homer & Wilson, Hamilton, Ont.
Katie Foundry, Ltd., Galt, Ont.
Victoria Foundry Co., Ottawa.

CONTROLLERS, MAGNETIC BRAKES, ELEC. WINCHES, MONO RAIL HOISTS

Volta Mfg. Co., Welland, Ont.

CONTROLLERS AND STARTERS

Williams Mach'y Co., A. R., Toronto.

CONTROLLING INSTRUMENTS

Taylor Instrument Co., Rochester, N Y

CONVERTERS, ROTARY

MacGovern & Co., Montreal, Que.
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal.

CONVEYORS—McCASLIN GRAVITY BUCKET

Canadian Mead-Morrison Co., Limited, Montreal, Que.

COOLERS, WITH DRINKING FOUNTAINS

Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

COPING MACHINES

Bertram & Sons Co., John, Dundas, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machinery Co., Toronto.
Niles-Bement-Pond Co., New York.
Can. Blower & Forge Co., Kitchener.

COPPER, BUS BAR, SHEET, PATES, RODS

British Smelting & Refining Co., Ltd., Montreal, Que.
Brown's Copper and Brass Rolling Mills, New Toronto.
Brown's Copper and Brass Rolling Mills, New Toronto.

CORE OIL

Swan & Finch, Inc., 165 Broadway.

COUNTERBORES AND COUNTERSINKS

Aikenhead Hardware Co., Toronto, Ont.
Cleveland Twist Drill Co., Cleveland.
Eclipse Counterbore Co., Ltd., Walkerville.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
McCrosky Tool Corp., Meadville, Pa., U. S. A.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.

COUNTERSINKS, INTERCHANGEABLE

Eclipse Counterbore Co., Ltd., Walkerville, Ont.

COUNTERBORES, INVERTED, INTERCHANGEABLE

Eclipse Counterbore Co., Ltd., Walkerville, Ont.

COUNTERSHAFTS

Almond Mfg. Co., Ashburnham, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Gray Ball Bearing Co., Ltd., Toronto.
Baird Machine Co., Bridgeport, Conn.
Ford-Smith Machine Co., Hamilton, Ont.
Foster Machine Co., Elkhart, Ind.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co, Ltd., A. R., Montreal
Williams Mchy Co., A. R., Toronto, Ont.

COUPLINGS, FRICTION

Bernard Industrial Co., The A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

COUPLINGS, RAPID HOSE

Int. Machinery & Supply Co., Ltd., Montreal, Que.

COILING MACHINERY, WIRE AND SPRING

Garlock-Walker Machinery Co., Toronto.

COKE AND COAL

Hanna & Co., M. A., Cleveland, O.

COUPLINGS, PLAIN, FLEXIBLE AND CUT OFF

Cleveland Pneumatic Tool Co., of Canada, Toronto.

CRANES, OVERHEAD, HAND AND

Gardner, Robt. & Son, Montreal.
Independent Pneumatic Tool Co., Chicago

CRANES, LOCOMOTIVE

Can. Link-Belt Co., Toronto, Ont.
Northern Crane Works, Walkerville.

ELECTRIC

Volta Manufacturing Co., Welland, Ont.

CUPS, OIL

Can. Winkley Co., Ltd., Windsor, Ont.

COVERS, OIL HOLE

Can. Winkley Co., Ltd., Windsor, Ont.

CRANES, GANTRY

Brown Hoisting Machinery Co., Cleveland, Ohio.
Can. Link-Belt Co., Toronto, Ont.
Canadian Mead-Morrison Co., Limited, Montreal, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.

CRANE RUNWAYS

MacKinnon Steel Co., Sherbrooke, Que.

CRANES, JIB

Brown Hoisting Machinery Co., Cleveland, Ohio.

CRANES, LOCOMOTIVE

Brown Hoisting Machinery Co., Cleveland, Ohio.
Holden Co., Ltd., Montreal, Que

CRANES, GOLIATH, PNEUMATIC AND PORTABLE

Brown Hoisting Machinery Co., Cleveland, Ohio.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Morris Crane and Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Petrie, Ltd., H. W., Toronto.

CRANES, PILLAR

Brown Hoisting Machinery Co., Cleveland, Ohio.

CRANES, TRAVELLING, ELECTRIC AND HAND POWER

Brown Hoisting Machinery Co., Cleveland, Ohio.
Can. Link-Belt Co., Toronto, Ont.
Curtis Pneumatic Machy. Co., St. Louis.
Dominion Bridge Co., Montreal.
Hepburn, John T., Ltd., Toronto.
Lyman Tube & Supply Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Niles-Bement-Pond Co., New York.
Northern Crane Works, Walkerville.
Oliver Engineering Co., Montreal.

CRANK SHAFTS

Canada Found'a & Forgings Ltd., Welland
Williams & Co., J. H., Brooklyn, N.Y.

CRANES, PORTABLE

Aikenhead Hardware Co., Toronto, Ont.
Brown Hoisting Machinery Co., Cleveland, Ohio.
Can. Link-Belt Co., Toronto.
Lyman Tube & Supply Co., Montreal, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Rice Lewis & Son, Toronto, Ont.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

CRIMPS, LEATHER

Graton & Knight Mfg. Co., Worcester, Mass.

CRUSHERS

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Elec. Steel & Metals, Welland, Ont.

CUPOLAS

Can. Blower & Forge Co., Kitchener.
Northern Crane Works, Walkerville.

CURB PUMPS FOR OIL, GASOLINE

Bowser Co., Ltd., S. F., Toronto, Ont.

CURRENT TRANSFORMERS

Volta Manufacturing Co., Welland, Ont.

CUT-OFF COUPLINGS, FRICTION

Petrie, Ltd., H. W., Toronto.

CUTTERS, BOLT

See Bolt Cutters.

CUTTERS, GEARS

Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Fellows Gear Shaper Co., Springfield, Vt.

CUTTERS, FLUE

Cleveland Pneumatic Tool Co., Toronto.

CUTTER HEADS

Oliver Machinery Co. Grand Rapids, Mich

CUTTERS, PIPE (See Pipe Cutters)

CUTTERS, MILLING

Becker Milling Mach. Co., Boston, Mass.
Butterfield & Co., Rock Island, Que.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Cleveland Twist Drill Co., Cleveland.
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.
Foss Mchy. & Sply Co., G. F., Montreal.
Garvin Machine Co., New York.
Illinois Tool Works, Chicago, Ill.
Ingersoll Mache. Co., Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Toronto, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Whitney Mfg. Co., Hartford, Conn.
Wilt Twist Drill Co. Walkerville, Ont.

CUTTER RELIEVING MACHINES

Cleveland Milling Machine Co., Cleveland.

CUTTING-OFF MACHINES

Armstrong Bros., Tool Co., Chicago.
Atkins & Co., E. C., Hamilton, Ont.
Bertram & Sons Co., John, Dundas.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Foss Mchy & Sply Co., Geo. F. Montreal
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield, Mass
Hurlburt, Rogers Machy. Co., South Sudbury, Mass.
Kennedy & Sons, Wm., Owen Sound.
Lyman Tube & Supply Co., Montreal, Que.
Niles-Bement-Pond Co., New York, N.Y.
Pratt-O-Lite Co., Inc., Toronto, Ont.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Wells Bros. of Can., Galt, Ont.
ford, Ont.
Williams Tool Corp. of Can. Ltd., Brantford, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

CUTTING COMPOUND AND CUTTING OIL

Cataract Refining Co., Ltd., Toronto.
Swan & Finch, Inc., New York.

CUTTING OIL, RECLAIMING SYSTEM

Bowser Co., Ltd., S. F., Toronto, Ont.

CUTTING AND WELDING PLANTS

Davis-Bournonville Co., Jersey City, N.J.
Prest-O-Lite Co., Inc., Toronto, Ont.
Welding & Supplies Co., Montreal, Que.

CYANIDE AND LEAD BATH POTS

Swedish Crucible Steel Co., Windsor.

CYLINDERS, AIR

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Ford-Smith Machine Co., Hamilton, Ont.
Smalley General Co., Inc., Bay City, Mich

CYLINDERS, AUTOMATIC REBORING JIGS AND REAMERS

Kelley Reamer Co., Cleveland, O.

DEHUMIDIFYING

B. F. Sturtevant Co, Galt, Ont.

DERRICKS

Aikenhead Hardware Co., Toronto, Ont.
Dominion Bridge Co., Montreal.
Hepburn Co., Ltd., J. T., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont

DERRICK HOISTS

Canadian Mead-Morrison Co., Limited, Montreal, Que.

DIAMOND (BORTZ)

Furniss, Clarke & Co., Montreal, Que.

DIAMOND TOOLS

Can. Desmond-Stephan Mfg. Co., Hamilton
Ford-Smith Machine Co., Hamilton, Ont.
Furniss, Clarke & Co., Montreal, Que.
Joyce-Koebel Co., Inc., New York City.
Wheel Trueing Tool Co., Detroit.
Petrie, Ltd., H. W., Toronto.

DIAMONDS, CARBON AND BORTZ

Joyce Koebel Co., Inc., New York, N.Y.
Wheel Trueing Tool Co., Detroit.

DIAMONDS, BLACK AND ROUGH

Joyce, Koebel & Co., Inc., New York.
Wheel Trueing Tool Co., Windsor, Ont

DIE CASTINGS

Fisher Motor Co., Ltd., Orillia, Ont.
Tallman Brass & Metals Ltd., Hamilton, Ont.

DIE HEADS, AUTOMATIC

Greenfield Tap & Die Corp., Greenfield Mass.
Wells Bros. of Can., Galt, Ont.
Petrie, Ltd., H. W., Toronto.

DIES, BRASS PRINTING, EMBOSSING AND LETTERING

Matthews, Jas. H., & Co., Pittsburgh, Pa

DIES FOR BIT BRACE USE

Butterfield & Co., Rock Island Que.
Crescent Mche. Co., Ltd., Montreal, P.Q.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Wells Brothers Co., of Canada, Galt.

DIES AND DIE STOCKS

Ackworthle Ltd., J., Birmingham, Eng.
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Ltd., Wm., Sheffield, Eng
Butterfield & Co., Rock Island, Que.
Brown, Rogers Co., Hamilton, Ont.
Crescent Mche. Co., Ltd., Montreal, P.Q.
Can. Fairbanks-Morse Co., Montreal
Foss Mchy. & Sply Co., G. F., Montreal
Gardner, Robt. & Son, Montreal.
Herbert Ltd., Alfred, Toronto, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Jones & Lamson, Springfield, Vt.
Landis Machine Co., Waynesboro, Pa.
Marshall, Son & Bunney, Toronto.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Acme Co., Cleveland, Ohio.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Rickert-Shafer Co., Erie, Pa.
Stoll Co., Inc., D. H., Buffalo, N Y
Strelinger, Chas. A. Co., Windsor, Ont.
Wells Brothers of Canada, Galt, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

DIES, HAMMERED

Kimber & Hillier Mfg., Co., St. Catharines, Ont.

DIES, DROP FORGE.

Kimber & Hillier Mfg., Co., St. Catharines, Ont.

DIES, METAL STAMPING

Ackworthie Ltd., J., Birmingham, Eng.
Crescent Mche. Co., Ltd., Montreal, P.Q.
Elliott & Whitehall, Galt, Ont.

DIES, PIPE THREADING

Ackworthie Ltd., J., Birmingham, Eng.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Crescent Mche. Co., Ltd., Montreal P.Q.
Landis Machine Co., Waynesboro, Pa.

DIES, THREADING

Ackworthie Ltd., J., Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Crescent Machine Co., Ltd., Montreal.
Greenfield Tap & Die Corp., Greenfield Mass.
Wells Bros. of Can. Galt, Ont.

DIE SINKERS

Ackworthie Ltd., J., Birmingham, Eng.
Becker Milling Machine Co., Boston
Garvin Machine Co., New York.
Kimber & Hillier Mfg., Co., St. Catharines, Ont.
Pratt & Whitney Co., Dundas, Ont.
Walcott Lathe Co., Jackson Mich

DIES FOR MACHINES

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Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Rock Island, Que.
Firth & Sons, Thos., Montreal, Que.
Landis Machine Co., Waynesboro, Pa.
Wells Brothers Co. of Canada, Galt.

DIE HEADS

Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Canada, Galt, Ont.

DIES, SELF-OPENING

Geometric Tool Co., New Haven.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Wells Brothers Co. of Can., Galt, Ont.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.

DIE FILING MACHINES

Oliver Mach. Co., Grand Rapids, Mich.

DIE STEEL, HOT AND COLD WORK

Armstrong-Whitworth of Can., Montreal.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall, Son & Bunney, Toronto.
Firth & Sons, Thos., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.

DIES FOR SCREW PLATES

Ackworthie Ltd., J., Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Wells Bros. Co. of Can., Galt, Ont.

DIES, SHEET METAL WORKING

Ackworthie Ltd., J., Birmingham, Eng.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada
Globe Engineering Co., Hamilton, Ont.
Stoll Co., D. H., Buffalo, N.Y.

DIES, SCREW AND THREAD

Ackworthie Ltd., J., Birmingham, Eng.
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
National-Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros., Co., of Can., Galt, Ont

DISCS, LEATHER, STEEL

Graton & Knight Mfg. Co., Worcester, Mass.
Swedish Steel & Importing Co., Montreal.

DIRECT CONNECTED UNITS

MacGovern & Co., Montreal, Que.

DRAFT, MECHANICAL

Butterfield & Co., Rock Island, Que.
Can. Blower & Forge Co., Kitchener.
A. B. Jardine & Co., Hespeler, Ont.
Pratt & Whitney Co., Dundas, Ont.
Sturtevant Co., B. F., Galt, Ont.

DRAINAGE FITTINGS

Crane, Ltd., Montreal, Que.

DRAWING INSTRUMENTS

Hughes, Owens Co., Ltd., Montreal, Que.

DRAWING OFFICE SUPPLIES

Hughes, Owens Co., Ltd., Montreal, Que.

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Atkins & Co., E. C., Hamilton, Ont.
Can. Desmond-Stephan Mfg. Co., Hamilton
Dominion Abrasive Co., Ltd., Mimico, Ont
Petrie, Ltd., H. W., Toronto.
Wheel Trueing Tool Co., Windsor, Ont.

DRILL PRESSES

Aurora Tool Works, Aurora, Ind.
Barber Mchy. Co., Ltd., Toronto, Ont.
W. F. & John Barnes Co., Rockford.
Can. Blower & Forge Co., Kitchener.
Canada Machinery Corp., Galt, Ont.
Foss Mchy. & Sply Co., G. F., Montreal.
Garlock-Walker Machinery Co., Toronto
Garvin Machine Co., New York.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
U. S. Mach. Tool Co., Cincinnati, Ohio.
A. R. Williams Machinery Co., Toronto.

DRILL RODS

Atkins & Co., Ltd., Wm., Sheffield, Eng
Kayser-Ellison & Co., Ltd., Montreal.
Lincoln Electric Co. of Canada, Ltd., Toronto, Ont.
Marshall, Son & Bunney, Toronto.
Swedish Steel & Importing Co., Ltd., Montreal.

DRILLING MACHINES, GANG

Barnes, W. F. & John, Co., Rockford, Ill
Barber Mchy. Co., Ltd., Toronto, Ont.
Bilton Mach. Tool Co., Bridgeport, Conn
Canada Machinery Corp., Galt, Ont.
Petrie, Ltd., H. W., Toronto.
Oliver Mfg Co., Salem, Ohio.
Strelinger, Chas. A. Co. Windsor, Ont.

DRILLING MACHINES, LOCOMOTIVE AND MULTIPLE SPINDLE

Barber Mchy. Co., Ltd., Toronto, Ont.
John Bertram & Sons Co., Dundas.
Bilton Mach. Tool Co., Bridgeport, Conn.
Can. Blower & Forge Co., Kitchener, Ont
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & Sply Co., G. F., Montreal
Garlock-Walker Mach. Co., Toronto.
Garvin Machine Co., New York.
Hoeder Mfg. Co., Freeport, Ill.
Henry & Wright Mfg. Co., Hartford, Conn
A. B. Jardine & Co., Hespeler, Ont.
Landis Tool Co., Waynesboro, Pa.
Nat. Automatic Tool Co., Richmond, Ind.
Niles-Bement-Pond Co., New York.
Rockford Drilling Mach. Co., Rockford, Ill
Strelinger, Chas. A. Co., Windsor, Ont.

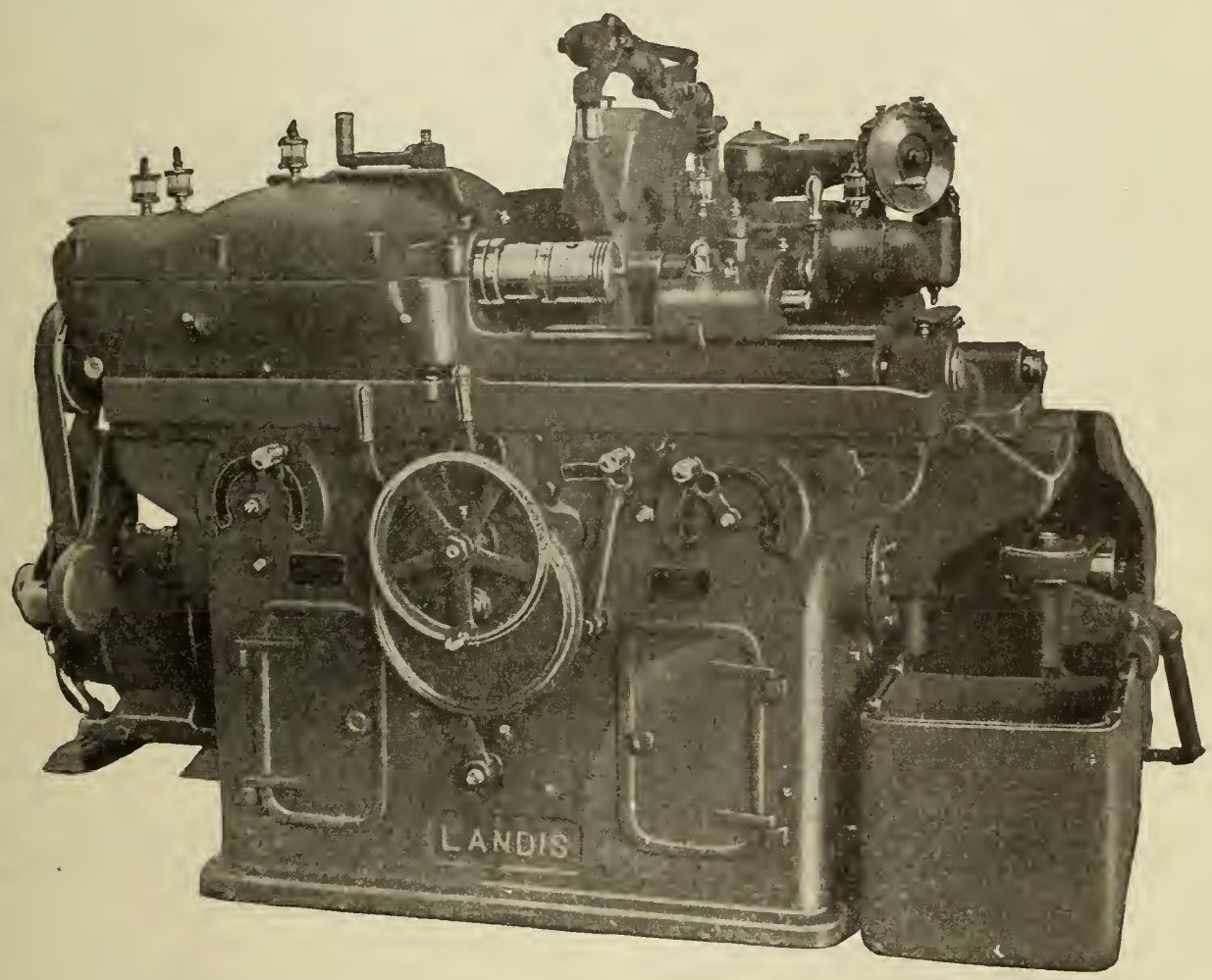
DRILLING MACHINES, RADIAL AND TURRET

Barber Mchy. Co., Ltd., Toronto, Ont.
John Bertram & Sons Co., Dundas.
Canadian Fairbanks-Morse Co., Montreal
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto
Henry & Wright Mfg. Co., Hartford.
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Strelinger Chas. A. Co., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

LANDIS

Two Essentials of Present-Day Piston Grinding—

ACCURACY AND PRODUCTION



The New Landis Piston Grinding Machine meets both essentials 100% strong.

A brief summary of the principal features and what they accomplish in better pistons and greater production:—

Cylinder part and relief, ground complete without removing from the machine, insuring concentricity of all grinding operations.

Work practically remains in plane with grinding wheel center at all times as the work swings directly over the fulcrum point.

A number of different sized or shaped cams can be placed in attachment at the same time, thus enabling different shaped pistons to be ground with slight adjustment.

Universal driver furnished with each attachment, facilitating round and accurate work.

Write to-day for complete description.

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Geo. F. Foss Mch. & S'ply Co., Montreal
Garlock-Walker Mach. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
United States Mach. Tool Co., Cincinnati
Williams Mchy Co., A. R., Toronto, Ont.

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Aurora Tool Works, Aurora, Ind.
John Bertram & Sons Co., Dundas.
Garlock-Walker Mach. Co., Toronto, Ont
Can. Blower & Forge Co., Kitchener.
Canada Mach. Corp., Galt, Ont.
Garvin Machine Co., New York.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mach. Co., Toronto, Ont.
Hosfer Mfg. Co., Freeport, Ill.
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Landis Tool Co., Waynesboro, Pa.
R. McDougall Co., Galt.
Nat. Automatic Tool Co., Richmond, Ind.
Rockford Drilling Mach. Co., Rockford, Ill.
Niles-Bement-Pond Co., New York.
Silver Mfg. Co., Salem, Ohio.
Strelinger, Chas. A. Co., Windsor, Ont.
A. R. Williams Machinery Co., Toronto.

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Hosfer Mfg. Co., Freeport, Ill.

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Aikenhead Hardware Co., Toronto, Ont.
Keystone Mfg. Co., Buffalo, N.Y.
Rice Lewis & Son, Toronto, Ont.
Silver Mfg. Co., Salem, Ohio.

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Aikenhead Hardware Co., Toronto.
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Can. Blower & Forge Co., Kitchener.
Can. Fairbanks-Morse Co., Montreal.
Geo. F. Foss Mch. & S'ply Co., Montreal
Garlock-Walker Machinery Co., Toronto.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
U.S. Electrical Tool Co., Cincinnati, O.

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A. B. Jardine & Co., Hespeler, Ont.
Morrow Screw & Nut Co., John, Ingersoll
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
Whitman & Barnes Mfg. Co., Akron, O.
Wilkinson & Kompass, Hamilton, Ont.
Wilt Twist Drill Co. of Can., Walkerville

DRILLS, CENTRE
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
Morrow Screw & Nut Co., John, Ingersoll
Morse Twist Drill & Machine Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto.
Rice Lewis & Son, Toronto, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
Wilt Twist Drill Co., of Can., Walkerville

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Eclipse Counterbore Co., Ltd., Walkerville, Ont.

DRILLS, CARBON
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Marshall, Son & Bunney, Toronto.
John Morrow Screw & Nut Co., Ingersoll

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DRILLS, ELECTRIC, PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener.
Cincinnati Electrical Tool Co., Cincinnati
Geo. F. Foss Mch. & S'ply Co., Montreal
Haskins Co., R. C., Chicago, Ill.
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
Pilot Steel & Tool Co., Montreal, Que.
Prest-O-Lite Co., Inc., Toronto, Ont.
Strelinger Co., C. A., Windsor, Ont.
U. S. Electrical Tool Co., Cincinnati, O.
A. R. Williams Mach. Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

DRILLS, HAMMER
Samuel Osborne, Ltd., Montreal, P.Q.

DRILLS, EMERY
Garlock-Walker Mach. Co., Toronto, Ont.

DRILLS, HIGH SPEED TWIST
Aikenhead Hardware Co., Toronto, Ont.
Armstrong-Whitworth of Can., Montreal.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
Canadian Fairbanks-Morse Co., Montreal
H. A. Drury Co., Montreal.
Geo. F. Foss Mch. & S'ply Co. Montreal
Herbert, Ltd., Alfred, Toronto, Ont.
Jessop Steel Co., Montreal, Que.
Marshall, Son & Bunney, Toronto.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
W. F. & John Barnes Co., Rockford, Ill.
Osborne, Samuel, Montreal, P.Q.
Pratt & Whitney Co., Dundas, Ont.
Petrie, H. W. Toronto.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.
Strelinger Co., Chas. A., Windsor, Ont.
Taylor J. A. M., Stair Bldg., Toronto.
Wilt Twist Drill Co. of Can., Walkerville
Wilkinson & Kompass, Hamilton, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

DRILLS, OIL TUBE
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.

DRILLS, PNEUMATIC
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co., Toronto.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
Williams Mchy Co, Ltd., A. R., Montreal
Greenfield Tap & Die Corp., Greenfield, Mass.

DRILLS, PNEUMATIC CORNER
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool Co., Chicago.

DRILLS, RATCHET AND HAND
Aikenhead Hardware Co., Toronto, Ont.
Armstrong Bros. Tool Co., Chicago, Ill.
Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cincinnati Electrical Tool Co., Cincinnati.
Cleveland Twist Drill Co., Cleveland.
Garlock-Walker Mchy. Co., Toronto, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
Wilt Twist Drill Co. of Can., Walkerville.

DRILLS, ROCK
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co., Toronto.
The Foss Mchy. & Supply Co., Montreal.
Holden Co., Ltd., Montreal, Que.
Samuel Osborne Ltd., Montreal, P.Q.
Strelinger, Chas. A. Co., Windsor, Ont.
A. R. Williams Machy. Co., Toronto.

DRILLS, SQUARE & HEXAGON
Globe Engineering Co.

DRILLS, TRACK
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
The Foss Mchy. & Supply Co., Montreal.
Holden Co., Ltd., Montreal, Que.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Wilt Twist Drill Co. of Can., Walkerville.

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Crane, Ltd., Montreal, Que.
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

DRIVES, CHAIN
See Belting, Chain.

DRIVING TOOLS
The Thos. Pink Co., Ltd., Pembroke, Ont.

DRY CLEANING SYSTEM
Bowser Co., Ltd., S. F., Toronto, Ont.

DRYERS, SAND
Lyman Tube & Supply Co., Montreal, Que.
Pangborn Corporation, Hagerstown, Md.

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Sturtevant Co., B. F., Galt, Ont.
W. S. Rockwell Co., New York, N.Y.

DRUM CONTROLS
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MacKinnon Steel Co., Sherbrooke, Que.

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DUST HANDLING EQUIPMENT
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Sturtevant Co., B. F., Galt, Ont.

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MacGovern & Co., Montreal, Que.
Strelinger Co., Chas. A., Windsor, Ont.
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Lyman Tube & Supply Co., Montreal, Que.
Northern Electric Co. Ltd. Montreal Que

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Curtis Pneumatic Machy. Co., St. Louis.

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Petrie, Ltd., H. W., Toronto.

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Oliver Machinery Co., Grand Rapids, Mich

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Cleveland Pneumatic Tool Co., Toronto.
Ford-Smith Machine Co., Hamilton, Ont.
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EMERY PAPER
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Garvin Machine Co., New York.
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Canada Emery Wheels Co., Hamilton.
Dominion Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Mach. Co., Hamilton, Ont.
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Wilkinson & Kompass, Hamilton, Ont.
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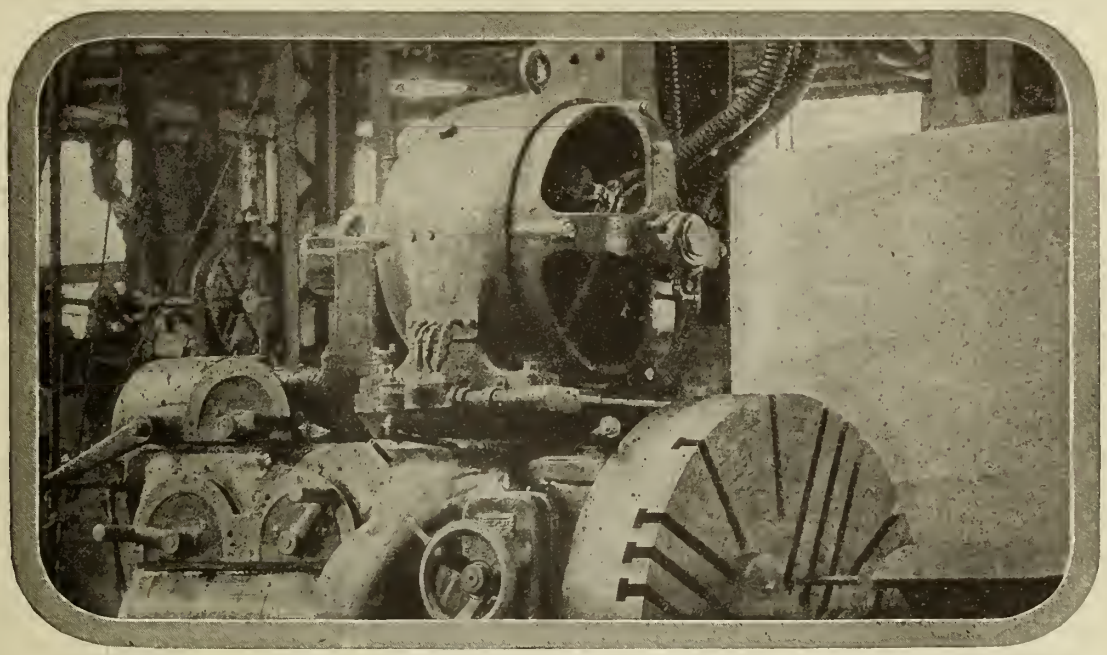

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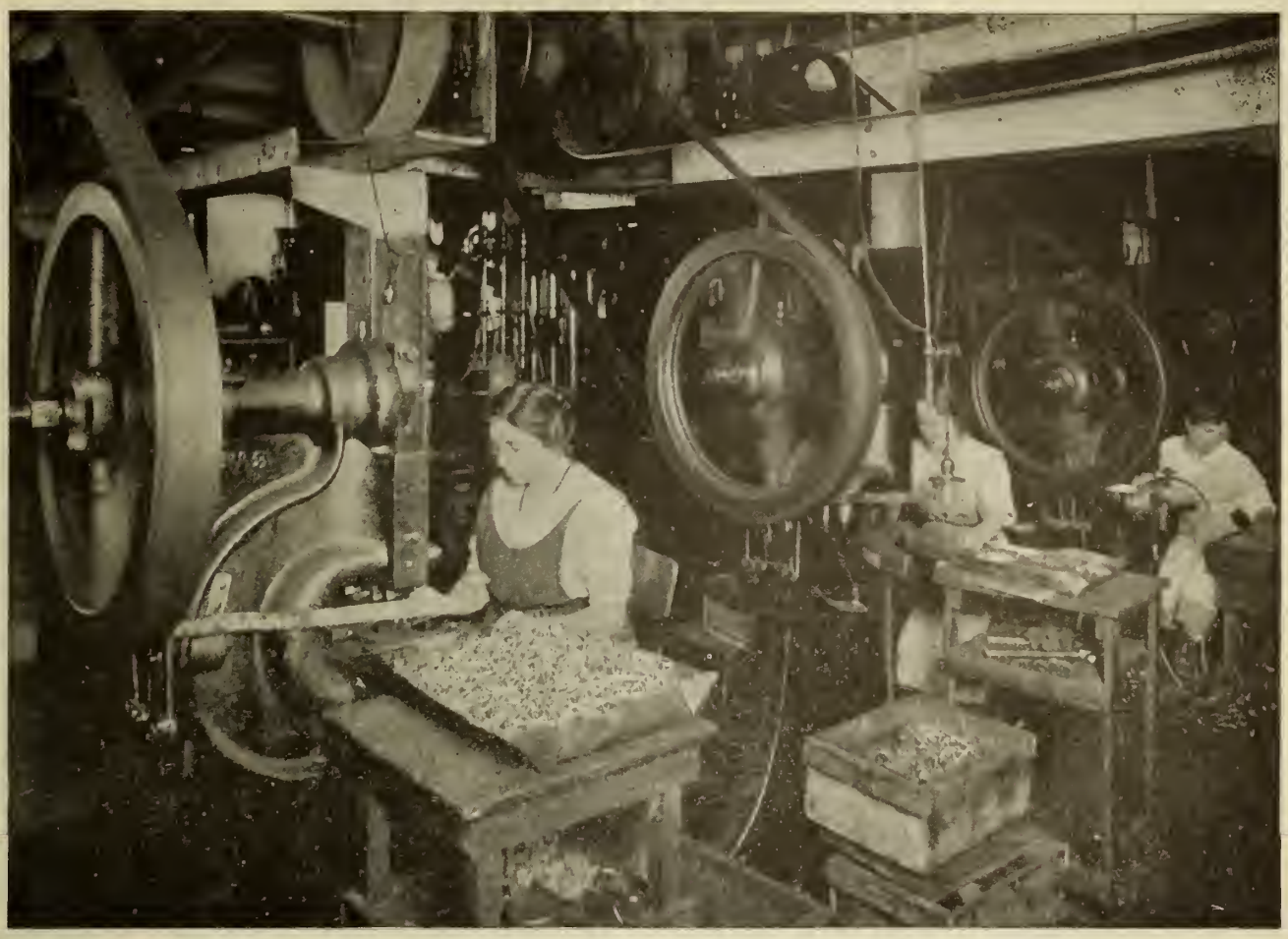

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Cincinnati Milling Machine Co., Cincinnati
Ford-Smith Mach. Co., Hamilton, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal
Hardinge Bros., Inc., Chicago, Ill.
Hendey Mach. Co., Torrington, Conn.
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Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Taft-Peirce Mfg. Co., Woonsocket, R.I.

MILLING MACHINES, AUTOMATIC

Bilton Mach. Tool Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Betts Machine Co., Rochester, N.Y.
Petrie, Ltd., H. W., Toronto.
Standard Equipment & Tool Wks., Montreal, P.Q.

MILLING CUTTERS

Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Milling Machine Co., Cleveland.
Delore Smelting & Refining Co., Ltd, Toronto, Ont.
Herbert, Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Marshall, Son & Bunney, Toronto.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

MILLING MACHINES, HAND

Bristol Machine Tool Co., Bristol, Conn.

MILLING MACHINES, THREAD

Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Inc., Chicago, Ill.
Gray Ball Bearing Co., Ltd., Toronto.
United States Mach. Tool Co., Cincinnati.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Smalley Gen. Co., Inc., Bay City, U.S.A.
Standard Equipment & Tool Wks., Montreal, P.Q.
Strelinger, Chas. A. Co., Windsor, Ont.

MILLING MACHINES, HORIZONTAL AND VERTICAL

Barber Mchy. Co., Ltd., Toronto, Ont.
Becker Milling Machine Co., Boston, Mass
Bristol Machine Tool Co., Bristol, Conn
Brown & Sharpe Mfg. Co., Providence.
Bertram & Sons Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Cochrane-Bly Co., Rochester, N.Y., U.S.A.
Ford-Smith Mach. Co., Hamilton, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Knight Metal Products, Toronto.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Rockford Milling Mach. Co., Rockford, Ill
Strelinger, Chas. A. Co., Windsor, Ont.
United States Mach. Tool Co., Cincinnati.
Whitney Mfg. Co., Hartford, Conn.
Williams Machy. Co., A. R., Toronto.

MILLING MACHINES, PLAIN, BENCH AND UNIVERSAL

Barber Mchy. Co., Ltd., Toronto, Ont.
Becker Milling Machine Co, Boston, Mass.
Bilton Mach. Tool Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence.
Canada Machinery Corp., Galt, Ont.
Cleveland Milling Machine Co., Cleveland.
Cincinnati Milling Machine Co., Cincinnati
Ford-Smith Mach. Co., Hamilton, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal
Garlock-Walker Machy. Co., Toronto, Ont.
Garvin Machine Co., New York.
National Machy. Co., Tiffin, Ohio.
Gooley & Edlund, Inc., Cortland, N.Y.
Hardinge Bros., Inc., Chicago, Ill.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Knight Metal Products, Toronto.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Standard Equipment & Tool Wks., Montreal, P.Q.
Strelinger, Chas. A. Co., Windsor, Ont

MILLING MACHINES, PROFILE

Barber Mchy. Co., Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Mach. Co., Toronto, Ont.
Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

MILLING TOOLS

Aikenhead Hardware Co., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence.
Ford-Smith Mach. Co., Hamilton, Ont.
Geometric Tool Co., New Haven, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
Rice Lewis & Son, Toronto, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

MINE CARS

Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Dominion Bridge Co., Montreal, Que.
Elec. Steel & Metals, Welland, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.

MINING MACHINERY

Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Elec. Steel & Metals, Welland, Ont.
Holden Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto.
Williams Machy. Co., A. R., Toronto.
Williams Mchy Co., A. R., Toronto, Ont

MIXERS, SAND

Frost Mfg. Co., Chicago, Ill.

MORTISING CHAINS

Renold of Canada Ltd., Montreal.

MORTISING MACHINES

Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Taft-Peirce Mfg. Co., Woonsocket, R.I.

MILLING MACHINES, AUTOMATIC

Bilton Mach. Tool Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Betts Machine Co., Rochester, N.Y.
Petrie, Ltd., H. W., Toronto.
Standard Equipment & Tool Wks., Montreal, P.Q.

MILLING CUTTERS

Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Milling Machine Co., Cleveland.
Delore Smelting & Refining Co., Ltd, Toronto, Ont.
Herbert, Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Marshall, Son & Bunney, Toronto.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

MILLING MACHINES, HAND

Bristol Machine Tool Co., Bristol, Conn.

MILLING MACHINES, THREAD

Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Inc., Chicago, Ill.
Gray Ball Bearing Co., Ltd., Toronto.
United States Mach. Tool Co., Cincinnati.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Smalley Gen. Co., Inc., Bay City, U.S.A.
Standard Equipment & Tool Wks., Montreal, P.Q.
Strelinger, Chas. A. Co., Windsor, Ont.

MILLING MACHINES, HORIZONTAL AND VERTICAL

Barber Mchy. Co., Ltd., Toronto, Ont.
Becker Milling Machine Co., Boston, Mass
Bristol Machine Tool Co., Bristol, Conn
Brown & Sharpe Mfg. Co., Providence.
Bertram & Sons Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Cochrane-Bly Co., Rochester, N.Y., U.S.A.
Ford-Smith Mach. Co., Hamilton, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Knight Metal Products, Toronto.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Rockford Milling Mach. Co., Rockford, Ill
Strelinger, Chas. A. Co., Windsor, Ont.
United States Mach. Tool Co., Cincinnati.
Whitney Mfg. Co., Hartford, Conn.
Williams Machy. Co., A. R., Toronto.

MILLING MACHINES, PLAIN, BENCH AND UNIVERSAL

Barber Mchy. Co., Ltd., Toronto, Ont.
Becker Milling Machine Co, Boston, Mass.
Bilton Mach. Tool Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence.
Canada Machinery Corp., Galt, Ont.
Cleveland Milling Machine Co., Cleveland.
Cincinnati Milling Machine Co., Cincinnati
Ford-Smith Mach. Co., Hamilton, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal
Garlock-Walker Machy. Co., Toronto, Ont.
Garvin Machine Co., New York.
National Machy. Co., Tiffin, Ohio.
Gooley & Edlund, Inc., Cortland, N.Y.
Hardinge Bros., Inc., Chicago, Ill.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Knight Metal Products, Toronto.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Standard Equipment & Tool Wks., Montreal, P.Q.
Strelinger, Chas. A. Co., Windsor, Ont

MILLING MACHINES, PROFILE

Barber Mchy. Co., Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Mach. Co., Toronto, Ont.
Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

MILLING TOOLS

Aikenhead Hardware Co., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence.
Ford-Smith Mach. Co., Hamilton, Ont.
Geometric Tool Co., New Haven, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
Rice Lewis & Son, Toronto, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

MINE CARS

Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Dominion Bridge Co., Montreal, Que.
Elec. Steel & Metals, Welland, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.

MINING MACHINERY

Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Elec. Steel & Metals, Welland, Ont.
Holden Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto.
Williams Machy. Co., A. R., Toronto.
Williams Mchy Co., A. R., Toronto, Ont

MIXERS, SAND

Frost Mfg. Co., Chicago, Ill.

MORTISING CHAINS

Renold of Canada Ltd., Montreal.

MORTISING MACHINES

Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.

MOTORS, ELECTRIC

Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
Lincoln Electric Co. of Canada, Ltd., Toronto, Ont.
MacGovern & Co., Montreal, Que.
Northern Elec. Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Sturtevant Co., B. F., Galt, Ont.
U. S. Ordnance, Toronto, Ont.
Volta Mfg. Co., Welland, Ont.
Williams Mach'y Co., A. R., Toronto.

MOTOR SPRINGS

The Dunbar Brothers Co., Bristol, Conn.

MOTORCYCLE FRAME AND FORK

The Dunbar Brothers Co., Bristol, Conn.

MOTORS, PNEUMATIC

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto.
Holden Co., Ltd., Montreal, Que.

MOULDS, RUBBER

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

MULTIPLE INDEX CENTRES

Garvin Machine Co., New York.
Heaton & Knight Mfg. Co., Worcester Mass.

MULTI-DRILLING, MULTI-BORING, MULTI-TAPPING MACHINERY

Nat. Automatic Tool Co., Richmond, Ind

MUNICIPALITIES

City of St. John, Quebec.

NAIL SETS

Morrow Screw & Nut Co., J. Ingersoll, Ont

NAME PLATES, BRONZE, ETCHED AND STAMPED

Matthews & Co., Jas. H., Pittsburgh, Pa.
Turner Brass Works, Sycamore, Ill.

NICHROME CASTINGS

Can. Driver-Harris Co., Ltd., Walkerville

NICKEL

Pilot Steel & Tool Co., Montreal, Que.

NICKEL STEEL

See Steel.

NICKEL SILVER—SHEETS, ROLLS, PLATES and RODS

Brown's Copper and Brass Rolling Mills, New Toronto.

NIPPLE THREADING MACHINES

Landis Machine Co., Waynesboro, Pa
Williams Tool Corp. of Can. Ltd., Brantford, Ont.

NITROGEN

Carter Welding Co., Toronto, Ont.

NUTS, STEEL, CASTELLATED AND COLD PRESSED

Galt Machine Screw Co., Ltd., Galt, Ont
Morrow Screw & Nut Co., J. Ingersoll, Ont
Williams & Co., J. H., Brooklyn, N.Y

NUTS, SEMI-FINISH AND FINISHED

Galt Machine Screw Co., Galt, Ont
National-Acme Co., Cleveland, Ohio.
Wilkinson & Kompass, Hamilton.

NUT LOCKS

Edw. W. Robinson Co., Ltd., Montreal.

NUT BURRING AND NUT MACHINES (HOT)

National Machy. Co., Tiffin, Ohio.

NUT FACING AND BOLT SHAVING MACHINES

Garvin Machine Co., New York.
National Machinery Co., Tiffin, Ohio.
Petrie, Ltd., H. W., Toronto.
Victor Tool Co., Waynesboro, Pa.

NUT TAPPERS

Bertram & Sons Co., John Dundas, Ont.
Canada Machinery Corp., Galt, Ont
Garvin Machine Co., New York.
Jardine & Co., A. B., Hespeler
Landis Machine Co., Waynesboro, Pa
National Machinery Co., Tiffin, Ohio.
Petrie, Ltd., H. W., Toronto
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Tool Corp. of Can. Ltd., Brantford, Ont.

OILERS

All-Way Oiler Mfg. Co., Toronto, Ont.

OIL SEPARATORS

Can. Fairbanks-Morse Co., Montreal.

OIL STONES

Aikenhead Hardware Co., Toronto, Ont.
Carborundum Co., Niagara Falls, N.Y.
Norton Co., Worcester, Mass.
Rice Lewis & Son, Toronto, Ont.

OIL STONE GRINDERS

Oliver Machy. Co., Grand Rapids, Mich

OIL STORAGE SYSTEMS

Bowser Co., Ltd., S. F., Toronto, Ont.
St. Lawrence Welding Co., Ltd., Montreal.

OPENING DIE HEADS

Greenfield Tap & Die Corp., Greenfield
Wells Bros. of Canada, Galt, Ont.

OPTICAL SUPPLIES

Consolidated Optical Co., Toronto, Ont

ORE HANDLING EQUIPMENT

Brown Hoisting Machinery Co., Cleveland, Ohio.
Canadian Link-Belt Co., Ltd., Toronto, Ont.
Canadian Mead-Morrison Co., Limited, Montreal, Que.

OSCILLATING VALVE GRINDERS (PNEUMATIC)

Cleveland Pneumatic Tool Co. of Canada, Toronto.

OVEN, FOR BAKING, RUBBING, DRYING ENAMELING JAPANNING AND LACQUERING

Brantford Oven & Rack Co., Brantford

OVEN TRUCKS, STEEL

Brantford Oven & Rack Co., Brantford.
MacKinnon Steel Co., Sherbrooke, Que.

OVENS FOR DRYING, TEMPER AND OXYGEN, ELECTROLYTIC CELLS UNDER TRUCKS

Welding & Supplies Co., Montreal, Que.
Brantford Oven & Rack Co., Brantford.

OXY-ACETYLENE WELDING AND CUTTING AND OUTFITS

Carter Welding Co., Toronto, Ont.
Hofden Co., Ltd., Montreal, Que.
L'Air Liquide Society, Toronto, Ont.
Prest-o-Lite Co., Inc. Toronto, Ont.
Davis-Bournonville Co., Toronto, Ont.

OXYGEN

Carter Welding Co., Ltd., Toronto, Ont.
Dominion Oxygen Co., Ltd., Toronto, Ont.
Nat. Electro Products Ltd., Toronto, Ont
L'Air Liquide Society, Toronto, Ont.

OXYGEN PLANTS (ELECTROLYTIC)

Davis-Bournonville Co., Toronto, Ont.

PACKINGS, ASBESTOS

Cleveland Wire Spring Co., Cleveland.

PACKING, ROD AND SHEET

Dunlop Tire & Rubber Goods Co., Ltd. Toronto.
Goodyear Tire & Rubber Co., Can., Ltd. Toronto
Gutta Percha & Rubber, Ltd., Toronto.
International Mach. Sply., Ltd., Montreal
Petrie, Ltd., H. W., Toronto.
Quaker City Rubber Co., Philadelphia, Pa

PANS, WET AND DRY

Frost Mfg. Co., Chicago, Ill.

PAPER MILL CONVEYORS AND DRIVES

Bertrams, Ltd., Edinburgh, Scotland.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Gutta Percha & Rubber, Ltd., Toronto.
MacKinnon Steel Co., Sherbrooke, Que.

PARTITIONS, WIRE

See Guards

PAPER MILL MACHINERY

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Machinery Co., Toronto.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

PATTERN SHOP EQUIPMENT

Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Oliver Machy. Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.

PATTERN MAKERS' LATHES

See Lathes.

PATENT SOLICITORS

Buchan, Hanbury A., Montreal.
Fetherstonhaugh & Co., Ottawa.
Marion & Marion, Montreal.
Ridout & Maybee, Toronto.

PECK CARRIERS FOR POWER PLANTS

Can. Link-Belt Co., Toronto, Ont.

PENSTOCKS

William Hamilton Co., Peterboro, Ont.

PERFORATED METALS AND ORNAMENTAL IRON GOODS

Canada Wire & Iron Goods Co., Hamilton

PHOSPHOR TIN, COPPER AND BRONZE

British Smelting & Refining Co., Ltd., Montreal, Que.

PHOTOSTATS

Commercial Camera Co., Providence, R.I.

PIG IRON

Hanna & Co., M. A., Cleveland, O.
Steel Co. of Canada, Ltd., Hamilton, Ont.

PINS, TAPER

Morrow Screw & Nut Co., J., Ingersoll, Ont

PINS, BELT-LACING

Clipper Belt Lacer Co., Grand Rapids.

PIPE, BLACK & GALVANIZED

Crane, Ltd., Montreal, Que.

PIPE FITTINGS, MALLEABLE AND CAST IRON

International Malleable Iron Co., Guelph.

PIPE CUTTING AND THREADING MACHINES

Barber Mchy. Co., Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Curtis & Curtis Co., Bridgeport, Conn.
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
McDougall Co., R., Galt.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Wells Bros. Co. of Canada, Galt, Ont.
Williams Tool Co., Erie, Pa.
Williams Machy. Co., A. R., Toronto
Williams Tool Corp. of Can. Ltd., Brantford, Ont.

PIPE, JOINT COMPOUNDS

Crane, Ltd., Montreal, Que

PIPE RIVETED STEEL

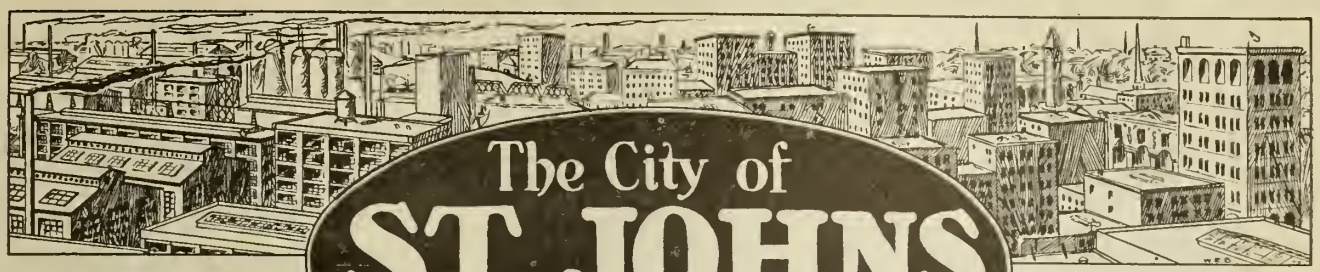
Toronto Iron Works, Ltd., Toronto.
William Hamilton Co., Peterboro, Ont.

PIERCING

Oliver Machy. Co., Grand Rapids, Mich.

PIPE CUTTERS, ROLLING

Curtis & Curtis Co., Bridgeport, Conn.
Greenfield Tap & Die Corp., Greenfield
Wells Bros. Co. of Canada, Galt, Ont.
Williams Tool Corp. of Can. Ltd., Brantford, Ont.



The City of ST. JOHNS QUEBEC

Locate in this Real Transportation Centre

St. Johns is a nerve centre of the network of railways connecting Central and Western Canada with the Maritime Provinces and with the Eastern States. Seven railways, including the C.P.R. and G.T.R., run through the city and are interconnected in the St. Johns yards by a terminal switching company. The manufacturer locating in St. Johns enjoys the advantages of competitive freight rates and dispatch in the assembling of raw materials and distribution of the finished product. The city in fact commands lower freight rates and a cheaper coal supply than any other centrally located manufacturing city on the North American continent.

St. Johns is directly connected by rail with the Montreal docks, 27 miles distant, affording first-class facilities for foreign trade. The city is an ideal location for the American manufacturer opening a branch plant in Canada; having direct connections by water with New York, the St. Lawrence and Great Lakes and the Eastern Seaboard of the United States.

Unlimited electric power is developed at Chambly, eleven miles north-east of the city, and distributed at prices that will compete with any city or town in the Dominion.

Cheap living conditions and low rents and taxes have resulted in cheap labor and an abundant supply of both skilled and unskilled workers is always available. Labor troubles are quite unknown.

In addition to the natural advantages of St. Johns as an industrial site the city also offers extraordinary inducements, such as: Tax exemptions; street extensions; bonus of five per cent. on your payroll for five years, making it an unusual industrial opportunity.

Without a knowledge of your business or the conditions affecting it, we do not claim that St. Johns is rationally your location; but we know that St. Johns possesses extraordinary advantages, that in all probability it is the best site for your plant from every point of view, that you will be running the risk of serious mistake if you do not include this city in your investigations.

Seven railroads, including Canada's great transcontinental lines.
Finest ocean shipping facilities.
Canal connections with New York, the Eastern States, and the Great Lakes.
Cheapest labor market in Canada.
Plentiful supply of skilled and unskilled labor.
Cheap and abundant electric power.
Cheap coal and lower freight rates.
Desirable factory sites with all public conveniences immediately available.
Extraordinary inducements to new industries.

For more specific information write

The Secretary, City Council
ST. JOHNS, QUE., CAN.

If interested, tear out this page and keep with letters to be answered.

PIPE TOOLS AND DIES
Ackworthie Ltd., J., Birmingham, Eng.
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PIPE CUTTERS AND REAMERS
Greenfield Tap & Die Corp. Greenfield.
Strelinger, Chas. A. Co., Windsor, Ont.
Wells Bros. of Canada, Galt, Ont.

PIPE STOCKS AND THREADERS
Greenfield Tap & Die Corp., Greenfield.
Strelinger, Chas. A. Co., Windsor, Ont.
Wells Bros. of Canada, Galt, Ont.

PIPE TAPS AND VISES
Ackworthie Ltd., J., Birmingham, Eng.
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PIPE WRENCHES
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PISTON AND PISTON RING MACHINES
National Acme Co., Windsor, Vt.

PLANER BOLTS
Atkins & Co., E. C., Hamilton, Ont.
Lassow Screw & Nut Co., J., Ingersoll, Ont

PLANER JACKS
Armstrong Bros. Tool Co., Chicago.

PLANERS, STANDARD AND ROTARY
Betts Machine Co., Rochester, N.Y.
Barber Mchy. Co., Ltd., Toronto, Ont.
Bertram & Sons Co., John, Dundas.
Oliver Machy. Co., Grand Rapids, Mich.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Pass Mchy. & S'ply Co., G. F., Montreal
Gardiner & Son, Robt., Montreal.
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Herbert Ltd., Alfred, Toronto, Ont.
Morton Mfg. Co., Muskegon Heights, Mich
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
Standard Equipment & Tool Wks., Montreal.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.

PLANING AND SHAPING MACHINERY
Barber Mchy. Co., Ltd., Toronto, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Pass Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machinery Co., Toronto
Garvin Machine Co., New York.
Niles-Bement-Pond Co., New York.
Ohio Mach. Tool Co., Kenton, Ohio.
Perrin, Ltd., William, Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co. Ltd., A. R., Montreal

PLANER-SHAPER, COMBINED OPEN SIDE
Lond-Farquhar Co., Boston.
Petrie, Ltd., H. W., Toronto.

POWER HAMMERS
Quickwork Co., St. Marys, Ohio.

PLANING MILL EXHAUSTERS
Can. Blower & Forge Co., Kitchener, Ont.
MacGovern & Co., Montreal, Que.
Niles-Bement-Pond Co., New York.
Sturtevant Co., B. F., Galt, Ont.

PLATES, Q.M., SHEARED AND CHEQUERED
Pedlovers, Ltd., Toronto, Ont.

PLATING, PLANTS & SUPPLIES
Can. Hanson Van Winkle Co., Ltd., Toronto, Ont.

PLIERS
Aikenhead Hardware Co., Toronto.
Can. Billings & Spencer, Ltd., Welland.
Bice Lewis & Son, Toronto, Ont.

PNEUMATIC CYLINDERS
Holden Co., Ltd., Montreal, Que.

PNEUMATIC EQUIPMENT
Strelinger Co., C. A., Windsor, Ont.

PNEUMATIC TOOLS
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co., Can., Toronto.
Curtis Pneumatic Machy. Co., St. Louis
Garlock-Walker Machy. Co., Toronto.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool Co., Chicago
Int. Mach. & Supply Co., Ltd., Montreal.
Strelinger, Chas. A. Co., Windsor, Ont.

POWER CRANES, HAND
MacKinnon Steel Co., Sherbrooke, Que.

POLISHING MACHINES
Ackworthie Ltd., J., Birmingham, Eng.
Brown & Sharpe Mfg. Co., Providence, R.I.
Ford-Smith Machine Co., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto.

POLISHING PLATES
Greenfield Tap & Die Corp., Greenfield.
Petrie, Ltd., H. W., Toronto.
Wells Bros. of Canada, Galt, Ont.

POLISHING PAPER
H. H. Barton & Son Co., Philadelphia.

POTS AND KETTLES, CAST STEEL
Elec. Steel & Metals, Welland, Ont.

POWER HOUSE CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

PORTABLE MACHINERY
Hastings & Co., R. C., Chicago, Ill.

POWER TRANSMISSION MCHY.
Canadian Link-Belt Co., Ltd., Toronto, Hamilton Co., Ltd., Wm., Peterborough, Ont.
Petrie, Ltd., H. W., Toronto.

PRECISION MACHINES
Herbert Ltd., Alfred, Toronto, Ont.

PRESSED STEEL PARTS
Ackworthie Ltd., J., Birmingham, Eng.
Gray Ball Bearing Co., Ltd., Toronto.

PRESSERS, ARBOR
Atlas Press Co., Kalamazoo, Mich.
Metalwood Mfg. Co., Detroit, Mich.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
Lourie Manufacturing Co., Springfield, Ill.

PRESSES, BROACHING, FORGING AND FLANGING
Atlas Press Co., Kalamazoo, Mich.
Bliss Co., E. W., Brooklyn, N.Y.
Dom. Steel Products Co., Ltd., Brantford
Eastern Production Co., Detroit, Mich.
Metalwood Mfg. Co., Detroit, Mich.
Petrie, Ltd., H. W., Toronto.
Toledo Machine & Tool Co., Toledo.
Stoll Co., D. H., Buffalo, N.Y.
Williams Mchy Co., Ltd., A. R., Montreal

PRESSES, CAM, TOGGLE, EYELET
Baird Machine Co., Bridgeport, Conn.
Bliss Co., E. W., Brooklyn N.Y.
Toledo Machine & Tool Co., Toledo.
Stoll Co., D. H., Buffalo, N.Y.

PRESSES, FILTER
Perrin, Ltd., William R., Toronto.
Smalley-General Co., Inc., Bay City, Mich.

PRESSES, PNEUMATIC
Dom. Steel Products Co., Ltd., Brantford.
Eastern Production Co., Detroit, Mich.
Metalwood Mfg. Co., Detroit, Mich.
Toledo Machine & Tool Co., Toledo.

PRESSES, DROP AND FORGING
Barber Mchy. Co., Ltd., Toronto, Ont.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs Co, Ltd., Hamilton.
Can. Fairbanks-Morse Co., Montreal.
Niles-Bement-Pond Co., New York.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co, Toledo.

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Barber Mchy. Co., Ltd., Toronto, Ont.
Bertram & Sons Co., John, Dundas.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Dom. Steel Products Co., Ltd., Brantford.
Eastern Production Co., Detroit, Mich.
Lourie Manufacturing Co., Springfield, Ill.
Metalwood Mfg. Co., Detroit, Mich.
Niles-Bement-Pond Co., New York.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.
Toledo Machine & Tool Co., Toledo.
Stoll Co., Inc., D. H., Buffalo, N.Y.
Williams Machy. Co., A. R., Toronto.

PRESSES, HYDRAULIC, HORIZONTAL
Eastern Production Co., Detroit, Mich.

PRESSES, HYDRAULIC, VERTICAL
Eastern Production Co., Detroit, Mich.

PRESSES, HYDRO-PNEUMATIC
Eastern Production Co., Detroit, Mich.

PRESSES, BALING
Perrin, Ltd., William R., Toronto.

PRESSES, POWER
Baird Machine Co., Bridgeport, Conn.
Barber Mchy. Co., Ltd., Toronto, Ont.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machinery Co., Toronto.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Machy. Co. A. R., Toronto.

PRESSES, SPRING FOOT
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Ont.
Toledo Machine & Tool Co., Toledo.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., Ltd., A. R., Montreal

PRESSES, SCREW
Barnes & Co., W. F. & Jno., Rockford, Ill
Bliss Co., E. W., Brooklyn, N.Y.
Manhattan Machine & Tool Co., Grand Rapids, Mich.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.

PRESSES, TIRE
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,

PRESSES, TRIMMING
Bliss Co., E. W., Brooklyn, N.Y.
Canada Machinery Corp., Galt, Ont.
Petrie, Ltd., H. W., Toronto.
Stoll Co., D. H., Buffalo, N.Y.

PROFILING MACHINES
Herbert Ltd., Alfred, Toronto, Ont.

PROJECTORS, FLOOD LIGHTING
Holden Co., Ltd., Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que

PROPELLERS
Kennedy & Sons, Wm., Owen Sound.

PROTECTIVE COATINGS
H. H. Robertson, Ltd., Sarnia, Ont.

PSYCROMETERS, SLING
Taylor Instrument Co., Rochester, N.Y.

PULLEYS
Algoma Steel Corp., Sault Ste. Marie, Ont
American Pulley Co., Philadelphia.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., Fortierville, Que.
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Diamond State Fibre Co., Bridgeport, Pa.
Ford-Smith Machine Co., Hamilton, Ont.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Kennedy & Sons, Ltd., W., Owen Sound.
Positive Clutch & Pulley Works Ltd., Toronto.
Petrie, Ltd., H. W., Toronto.

PULLEYS, STEEL SASH, STEEL BELT
American Pulley Co., Philadelphia, Pa.

PULLEYS, FRICTION, CLUTCH
American Pulley Co., Philadelphia, Pa.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., A., Fortierville, Q
Can. Link-Belt Co., Toronto, Ont.
Carlyle Johnson Mch. Co., Manchester, Ct.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Jones & Glasco, Montreal.
Positive Clutch & Pulley Works, Toronto.
Petrie, Ltd., H. W., Toronto.

PULP MILL MACHINERY
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Hamilton Co., Ltd., Wm., Peterborough, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

PUMPS, AIR LIFT
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Holden Co., Ltd., Montreal, Que.

PUMPS, BOILER FEED
Can. Ingersoll-Rand Co., Ltd. Sherbrooke,

PUMPS, CENTRIFUGAL
Bowser Co., Ltd., S. F., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Ingersoll-Rand Co., Montreal, Que.
Darling Bros., Ltd., Montreal, Que.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

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Brown & Sharpe Mfg. Co., Providence, R.I.
Darling Bros., Ltd., Montreal, Que.
Prahern Pump Co., Rockford, Ill.

PUMPS, GEARED
Darling Bros., Ltd., Montreal, Que.
Globe Engineering Co., Hamilton, Ont.

PUMPS, HIGH PRESSURE
Perrin, Ltd., William R., Toronto.

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Clarke & Co., Furnies, Montreal, Que.
Garlock-Walker Machinery Co., Toronto.
Darling Bros., Ltd., Montreal, Que.
Elec. Steel & Metals, Welland, Ont.
Metalwood Mfg. Co., Detroit, Mich.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

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Bowser Co., Ltd., S. F., Toronto, Ont.

PUMPS, RETURN AIR
Can. Ingersoll-Rand Co. Ltd., Sherbrooke,

PUMPS, SPECIAL
Elec. Steel & Metals, Welland, Ont.

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Bowser Co., Ltd., S. F., Toronto, Ont.

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Bowser Co., Ltd., S. F., Toronto, Ont.

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Darling Bros., Ltd., Montreal, Que.
Prahern Pump Co., Rockford, Ill.

PUMPS — ROTARY
General Combustion Co., Ltd., Montreal, Que.

PUMP LEATHERS
Graton & Knight Mfg. Co., Worcester.

PUNCHES AND DIES
Atkins & Co., Ltd., Wm., Sheffield, Eng.
E. W. Bliss Co, Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Can.
Can. Blower & Forge Co., Kitchener, Ont.
Crescent Mach. Co., Ltd., Montreal, P.Q.
Can. Fairbanks-Morse Co., Montreal.
Elliott & Whitehall Machine and Tool Co., Galt, Ont.
Gardiner & Son, Robert, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Marshall, Son & Bunney, Toronto.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, O.
Williams Mchy Co., A. R., Toronto, Ont.

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Canada Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machinery Co., Toronto.
A. B. Jardine & Co., Hespeler, Ont.
Long & Allstatter, Hamilton, Ohio.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
D. H. Stoll Co., Buffalo, N.Y.
Williams Mchy Co., A. R., Toronto, Ont.

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Bertrams & Sons, John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co. Ltd., Hamilton, Ont.
Garlock-Walker Mach'y. Co., Toronto.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

PUNCHES, HAND
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Chess Instrument & Mfg. Co., New York
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Canadian Mead-Morrison Co., Limited, Montreal, Que.
Niles-Bement-Pond Co., New York.

QUARRY HOISTS
Canadian Mead-Morrison Co., Limited, Montreal, Que.

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Garlock-Walker Machinery Co., Toronto.
Holden Co., Ltd., Montreal, Que.
Niles-Bement-Pond Co., New York.
Petrie Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

RASPS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall, Son & Bunney, Toronto.

RAWHIDE PINIONS (See Gears)

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Cleveland Twist Drill Co., Cleveland.
Elliott & Whitehall Machine and Tool Co., Galt, Ont.
Greenfield Tap & Die Corp., Greenfield.
Ingersoll Machy. Co., Ingersoll, Ont.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
McCrosky Tool Corp., Meadville, Pa., U. S. A.
Pierce, Ltd., Winnipeg, Man.
Pratt & Whitney Co., Dundas, Ont.
The Kelly Reamer Co., Cleveland, O.
J. A. M. Taylor, 35 Stair Bldg., Toronto.
Wells Bros. of Can., Galt, Ont.

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Aikenhead Hardware Co., Toronto.
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Elliott & Whitehall Machine and Tool Co., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Lyman Tube & Supply Co., Montreal, Que
Marshall, Son & Bunney, Toronto.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Morse Twist Drill & Mach. Co., New Bedford, Mass.
McCrosky Tool Corp., Meadville, Pa., U. S. A.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Samuel Osborne, Ltd., Montreal, P.Q.
Strelinger, Chas. A. Co., Windsor, Ont.
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Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

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Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Elliott & Whitehall Machine and Tool Co., Galt, Ont.
Greenfield Tap & Die Corp., Greenfield.
Ingersoll Machy. Co., Ingersoll, Ont.
Marshall, Son & Bunney, Toronto.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
Wells Bros. of Canada, Galt, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

REAMERS, HAND
Ackworthie Ltd., J., Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Elliott & Whitehall, Galt, Ont.
Greenfield Tap & Die Corp., Greenfield.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wells Bros. of Can., Galt, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

REAMERS, PIN
Ackworthie Ltd., J., Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield.
Morrow Screw & Nut Co., John, Ingersoll.
Wells Bros. of Can., Galt, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

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Taylor Instrument Co., Rochester, N.Y.

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REGULATORS, PRESSURE, TEMPERATURE
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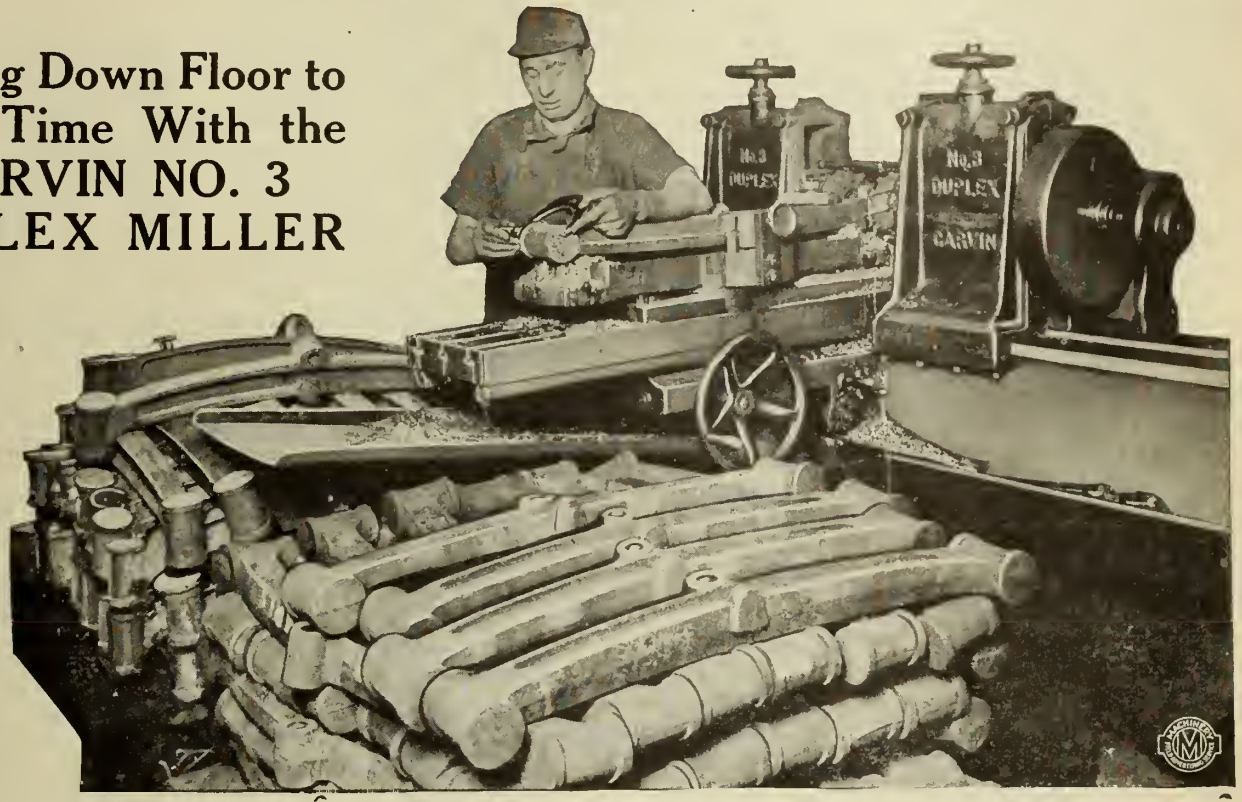
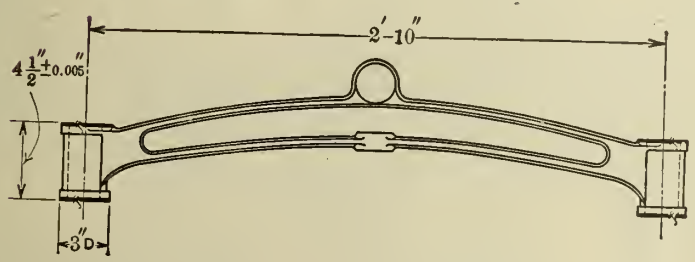
Cutting Down Floor to Floor Time With the GARVIN NO. 3 DUPLEX MILLER





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BUILDER OF BETTER MACHINE TOOLS

Milling Machines **Automatic Tapping Machines** **Duplex Horizontal Drills** **Screw Machines**

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ROLLS, CRUSHING
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Wm. Atkins & Co., Ltd., Sheffield, Eng.
Marshal, Son & Bunney, Toronto.
Plewes Ltd., Winnipeg, Man.
Simonds Mfg. Co., Fitchburgh, Mass.
Tabor Mfg. Co., Philadelphia, Pa.

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Atkins & Co., E. C., Hamilton, Ont.

SAWS — SWING
Atkins & Co., E. C., Hamilton, Ont.

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Can. Kron Scale Co., Montreal, P.Q.

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Lufkin Rule Co. of Can., Windsor.

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Shore Instrument & Mfg. Co., New York.

SCREENING MACHINERY
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Cleveland Twist Drill Co., Cleveland.

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Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Ltd., Toronto
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield.
A. B. Jardine & Co., Hespeler.
National Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto.
Pratt & Whitney Co., Dundas, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
Warner & Swasey Co., Cleveland, O.
Wells Bros. of Can., Galt, Ont.
Wood Turret Mach. Co., Brazil, Ind.

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John Morrow Screw & Nut Co., Ingersoll.
National Acme Co., Montreal.
Rice Lewis & Son, Toronto.
Steel Co. of Canada, Ltd., Hamilton.
Wilkinson & Kompass, Hamilton.

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Wells Bros. of Can., Galt.
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Canadian Machinery Corp., Galt.
Cochrane-Bly Co., Rochester, N.Y., U.S.A.
Geo. F. Foss Mchy. & Sply. Co., Montreal
Robt. Gardner & Son, Montreal.
Garlock-Walker Mach'y. Co., Toronto.
Herbert, Ltd., Alfred, Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Milwaukee Shaper Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto.
Rae Mach. Tool Co., Hamilton.
Strelinger Co., C. A., Windsor, Ont.
Standard Equipment & Tool Wks., Montreal.
Walcott Lathe Co., Jackson, Mich.
Williams Mchy Co., A. R., Toronto, Ont.

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Fellows Gear & Shaper Co., Springfield, V.
Knigh Metal Products, Toronto.

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Can. Fairbanks-Morse Co., Montreal.
Dom. Steel Products Co., Ltd., Brantford
Garlock-Walker Machy. Co., Ltd., Toronto
Jones & Glasco, Montreal.
Niles-Bement-Pond Co., New York.
Can. Drawn Steel Co., Hamilton.
Peckovers, Ltd., Toronto, Ont.
Petrie, Ltd., H. W., Toronto.
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Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Machinery Co., Toronto.
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Globe Engineering Co. Ltd., Hamilton
Hamilton Co., Ltd., Wm., Peterborough
A. B. Jardine & Co., Hespeler, Ont.
Katie Foundry, Galt, Ont.
Ker & Goodwin Machine Co., Ltd., Brantford, Ont.
McCrosky Tool Corp., Meadville, Pa., U. S. A.
National-Acme Co., Cleveland, Ohio.
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Williams Tool Corp. of Can. Ltd., Brantford, Ont.

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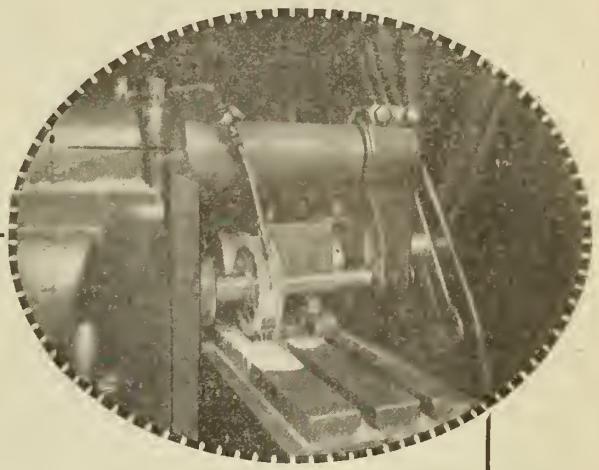
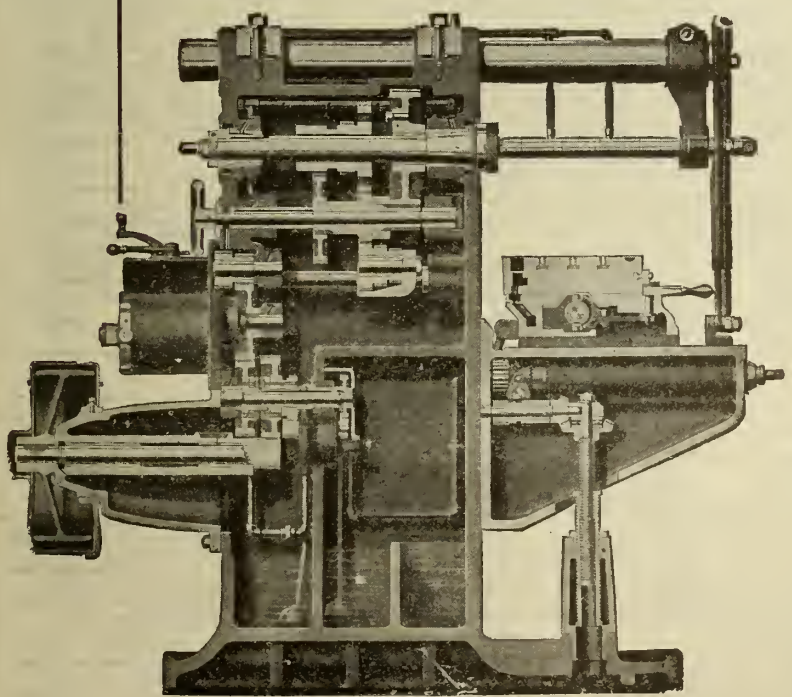
Milwaukee Milling Machines



Automatic Flooded Lubrication

ONE of the most important features of Milwaukee Milling Machines is the AUTOMATIC FLOODED LUBRICATION SYSTEM, which pumps six quarts of lubricant per minute through the bearings and over the hardened steel gearing in the column, feed box and pulley bracket. This system is highly efficient and it takes the responsibility of lubricating these parts of the machine off the operator, foreman or superintendent entirely, as the reservoir containing the lubricant has to be filled only two or three times a year. The pump for supplying lubricant operates whenever the driving pulley or motor revolves.



The CUTTER LUBRICATING SYSTEM, which is also very important, supplies the cutter lubricant or cooling compound to the cutters, through adjustable nozzles, by a pump in the base of the machine. The lubricant or cooling compound is returned from the table by a patented telescopic tubing arrangement instead of a flexible hose. The pump, piping, etc., are included in the price of the machine and are an integral part of the design. The pump for lubricating the cutters is so arranged that it operates only when the spindle revolves, or cutter lubricant may be shut off entirely when desired.

High speed operations may be performed continuously on Milwaukee Milling Machines with minimum supervision of lubrication.

For complete details, write for our catalogue.

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Canadian Representatives: Williams & Wilson, Ltd., Montreal; F. F. Barber Machy. Co., Toronto; A. R. Williams Machy. Co., Vancouver and Winnipeg

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Rice Lewis & Son, Toronto, Ont.
Swedish Steel & Importing Co. Ltd., Montreal.
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United Alloy Steel Corp., Canton, Ohio.

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Marshall, Son & Bunney, Toronto, Ont
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Plewes, Ltd, Winnipeg, Man.
Pilot Steel & Tool Co., Montreal, Que.
Ralph B. Norton, Montreal, Que.
Rice Lewis & Son, Toronto, Ont.
Swedish Steel & Importing Co., Ltd., Montreal,
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Joliette Steel Co., Montreal, Que.

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Greenfield Tap & Die Corp., Greenfield.
Ingersoll Mach. Co., Ingersoll, Ont.
Jardine & Co., A. B., Hespeler, Ont.
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TINSMITHS' TOOLS
Brown, Boggs & Co., Hamilton, Can.
Petrie, Ltd., H. W., Toronto.

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Perrin, Ltd., William R., Toronto
West Tire Setter Co., Rochester, N.Y.

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TOOL HOLDERS
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Armstrong Bros. Tool Co., Chicago.
Cleveland Twist Drill Co., Cleveland.
Deloro Smelting & Refining Co., Ltd Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

TOOL MAKERS
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Williams & Co., J. H., Brooklyn, N.Y.

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TOOL ROOM PARTITIONS
Canada Wire & Iron Goods Co., Hamilton

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Rice Lewis & Son Toronto, Ont.

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Kelly Reamer Co., Cleveland, O.
Petrie, Ltd., H. W., Toronto.

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Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool Co., Chicago
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Machy. Co., A. R., Toronto.
U. S. Electrical Tool Co., Cincinnati, O.

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Deloro Smelting & Refining Co., Ltd. Toronto, Ont.

TOOLS, LUMBERING
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Gisholt Machine Co., Madison, Wis.
Williams & Co., J. H., Brooklyn, N.Y.

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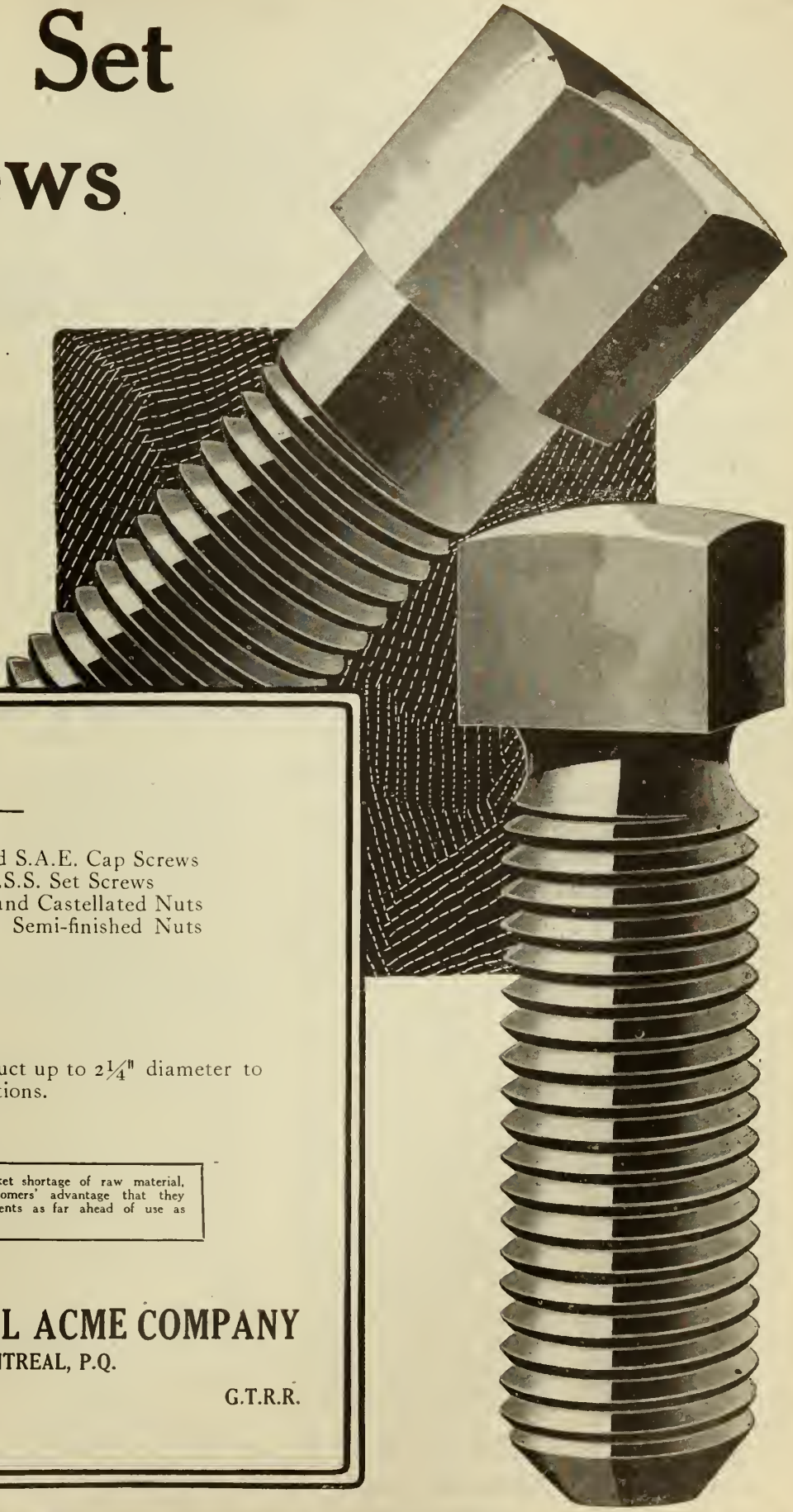
Foster Machine Tool Co. Hilbert, Ind.

TOOLS, SHOP
Strelinger Co., C. A., Windsor, Ont.

Cap & Set Screws



Standard—

V., U.S.S. and S.A.E. Cap Screws
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S.A.E. Plain and Castellated Nuts
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McClean Machine & Tool Co., Ltd., Hamilton, Ont.
McCrosky Tool Corp., Meadville, Pa., U. S. A.

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Turner Brass Works, Sycamore, Ill.

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Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.

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TRAMWAYS, BRIDGE
Brown Hoisting Machinery Co., Cleveland, Ohio.

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Northern Electric Co., Ltd., Montreal.

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Morris Chain Co., Ithaca, New York.
Renold of Canada Ltd., Montreal.

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Can. Fairbanks-Morse Co., Montreal.
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Hamilton Co., Ltd., Wm., Peterborough, Ont.
Hamilton Gear & Machine Co., Toronto.
Jones & Glassco, Montreal.
Kennedy & Sons, Wm., Owen Sound, Ont.
Morse Chain Co., Ithaca, N.Y.
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Renold of Canada Ltd., Montreal.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Machinery Co., A. R., Toronto.

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MacKinnon Steel Co., Ltd., Sherbrooke.

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Tallman Brass & Metal Co., Hamilton.

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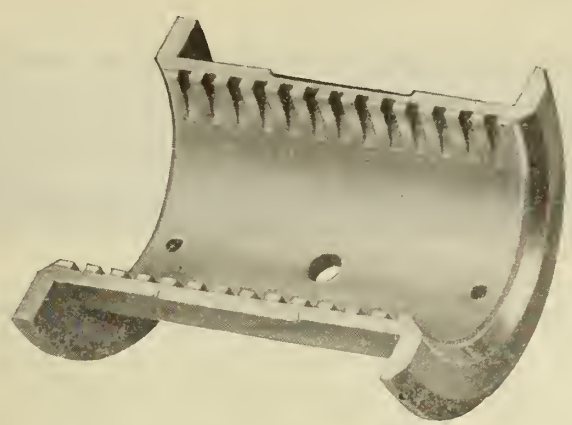

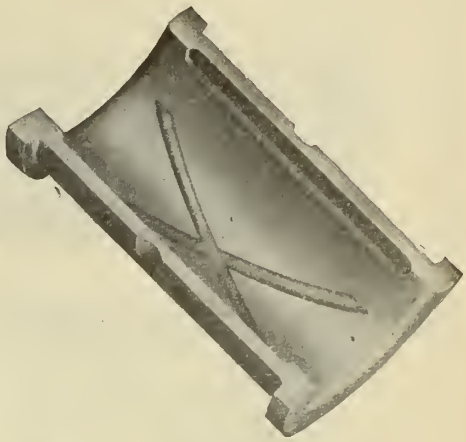

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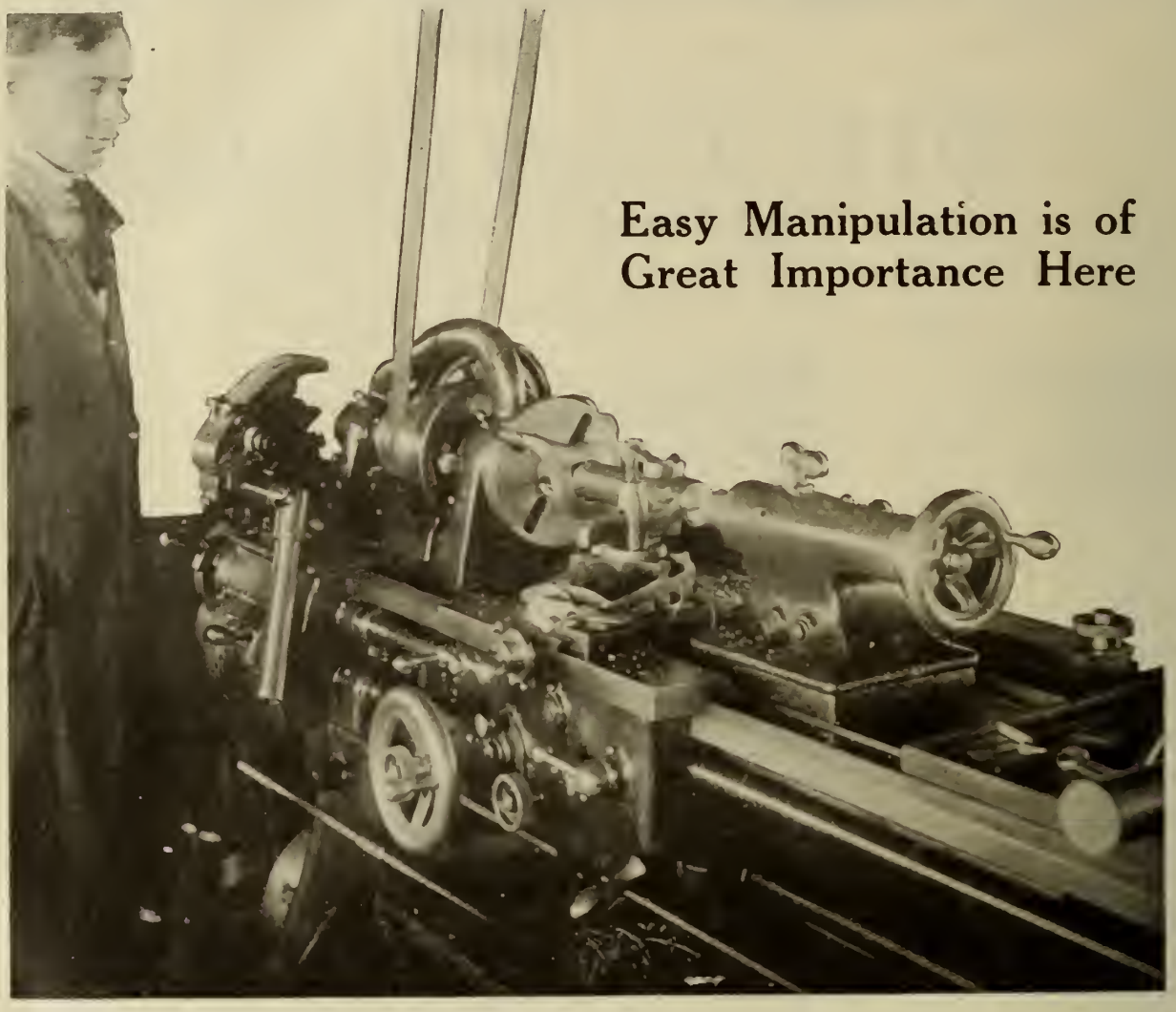
HENDEY



Easy Manipulation is of Great Importance Here

The lathes in the shops of the United Shoe Machinery Co., Montreal, are required for a large variety of work. The photo shows one of the Hendeys in operation. The general run of the work is of special character — intricate cams, machine shapes and jigs, etc. Adaptability, easy manipulation and great accuracy are absolutely necessary to paying production. Such is the faith of the foreman that he recommends that additional lathes be HENDEYS.

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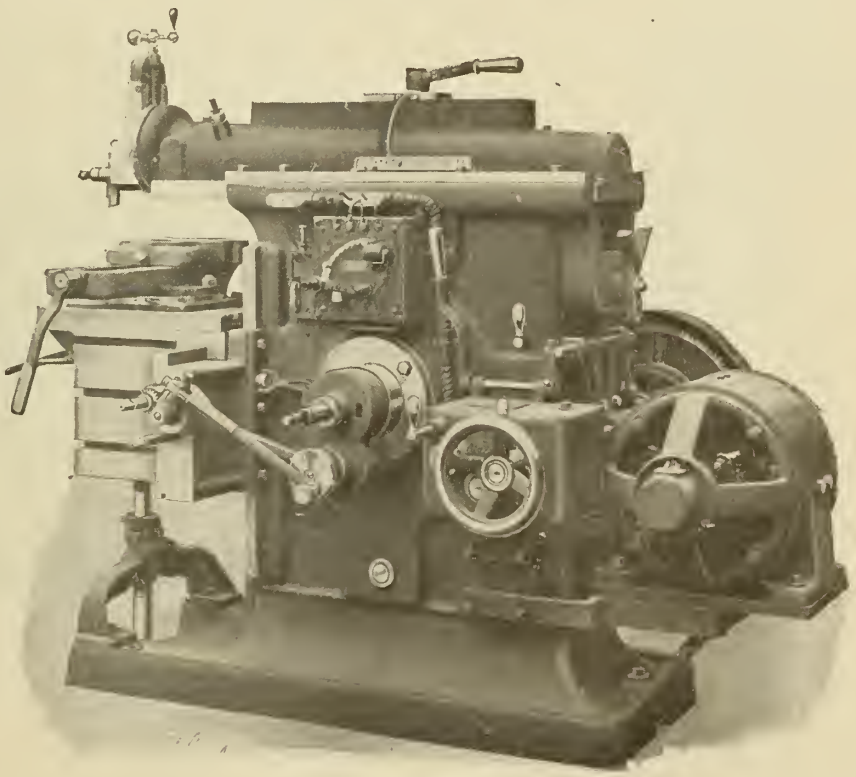

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CANADIAN MACHINERY AND MANUFACTURING NEWS

Vol. XXIV., No. 9 Published by the MacLean Publishing Company, Limited, Toronto August 26, 1920 $4.00 a Year Subscription Price

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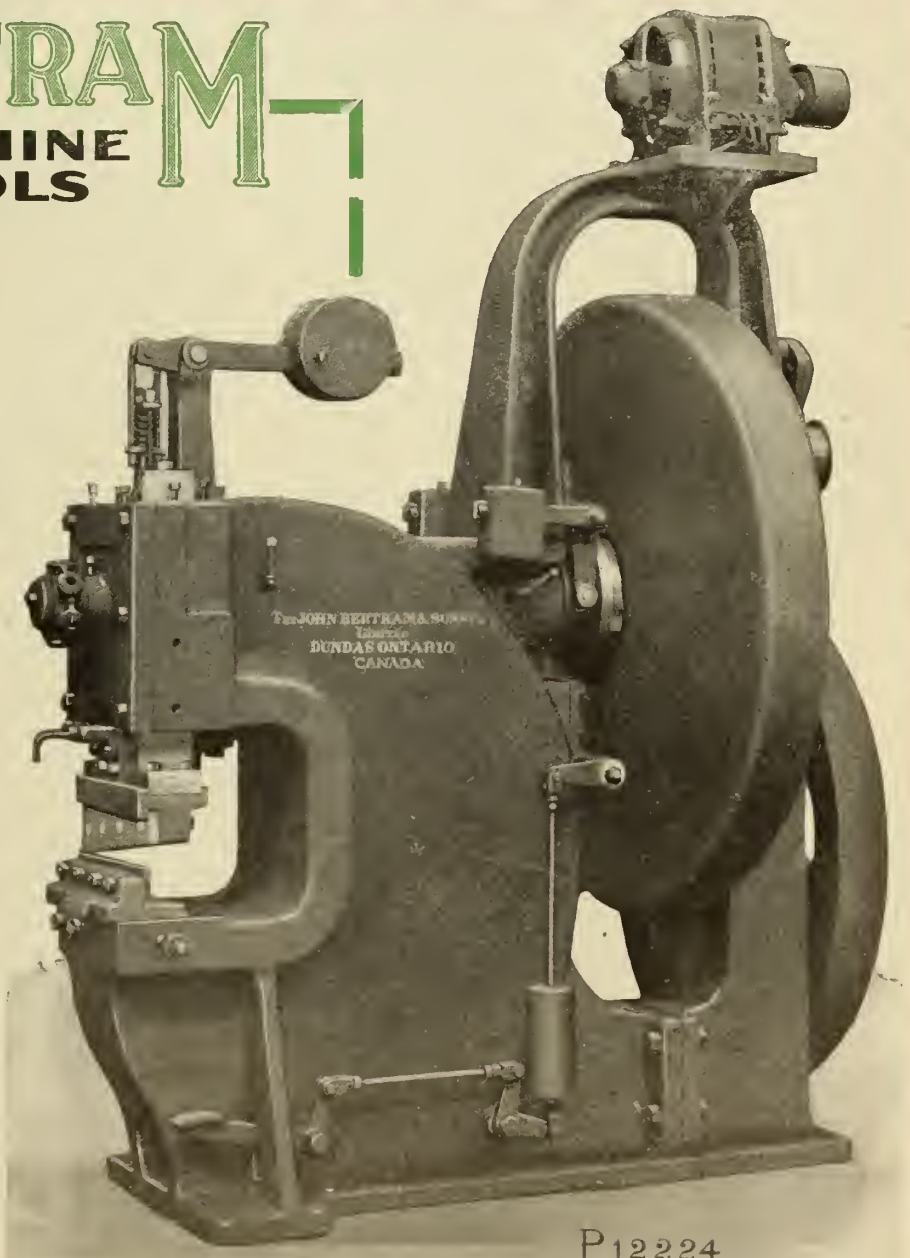

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The BERTRAM Page

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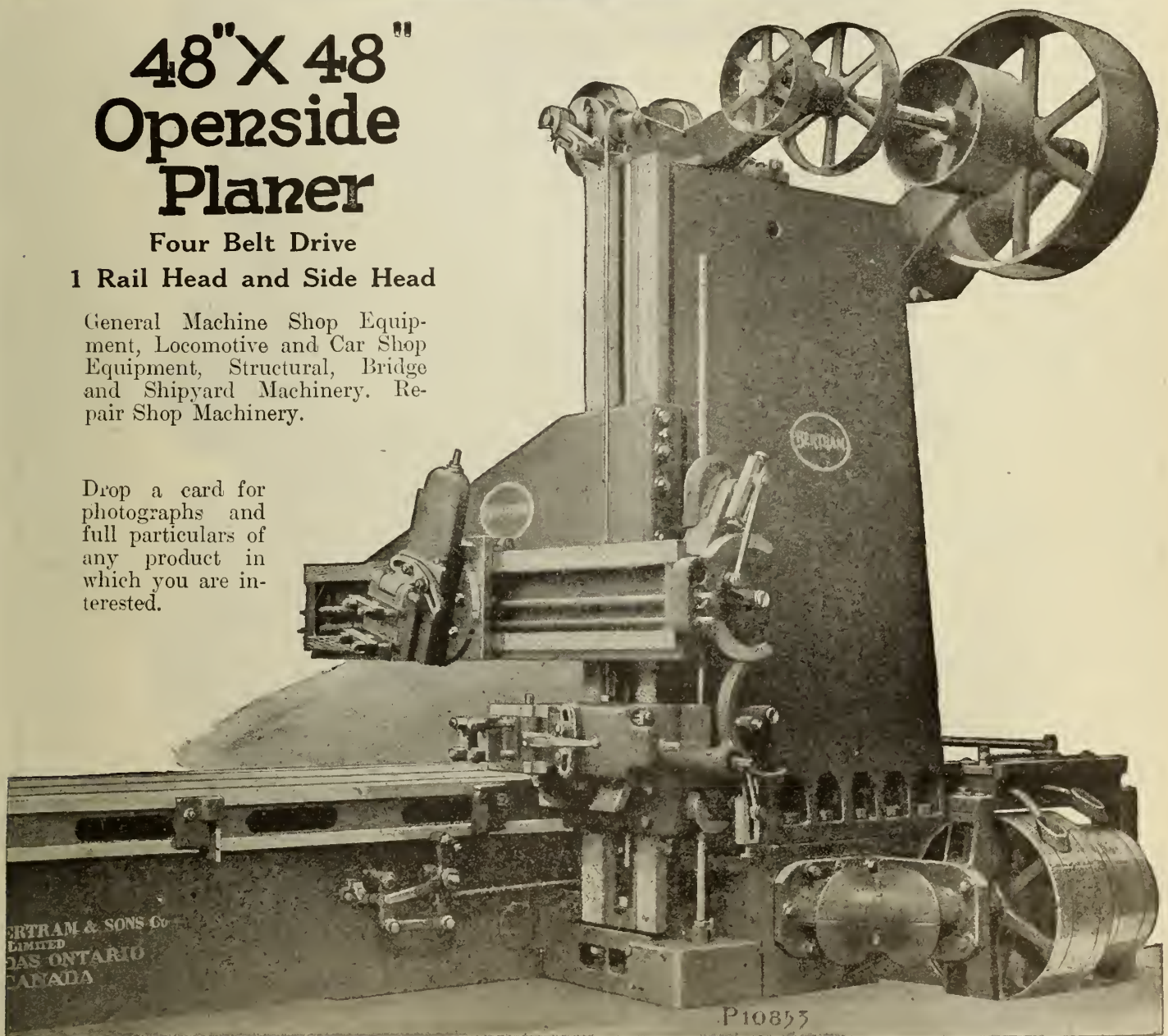

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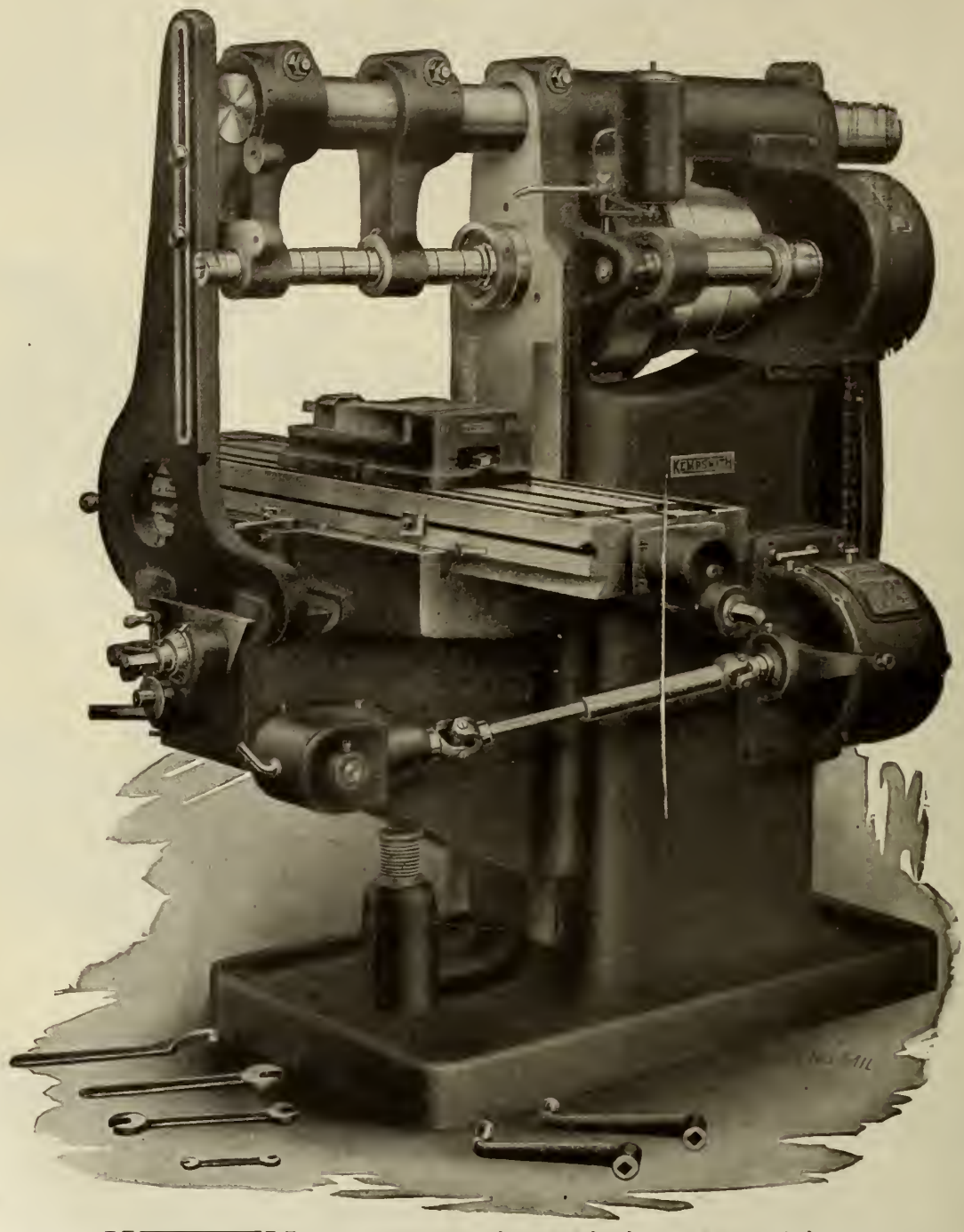

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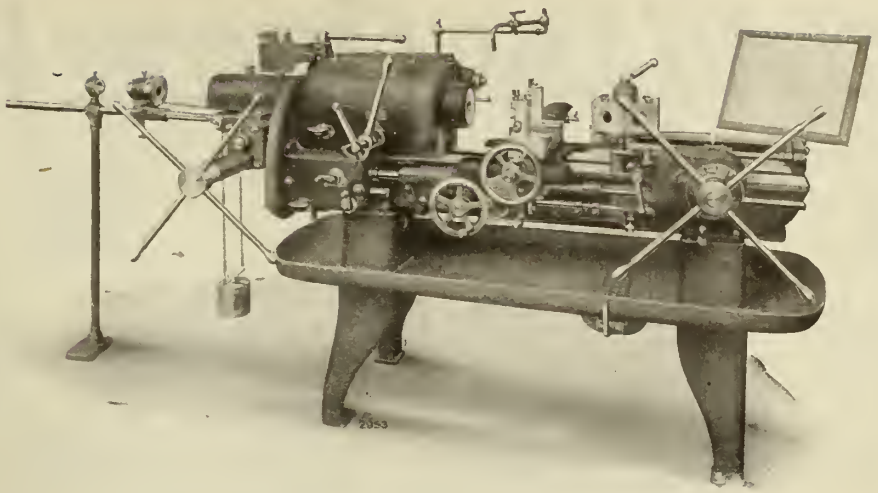

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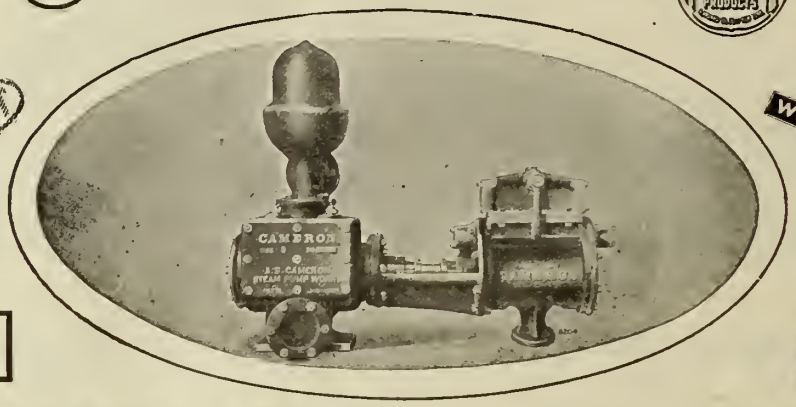

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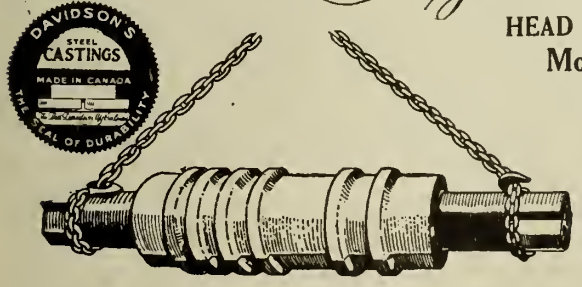

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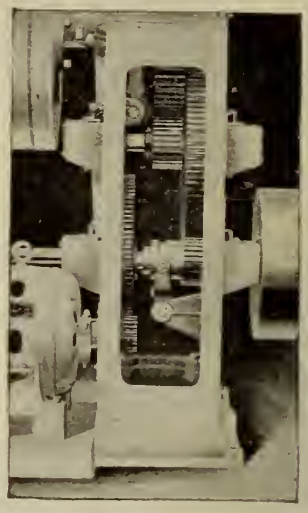

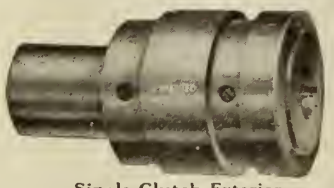

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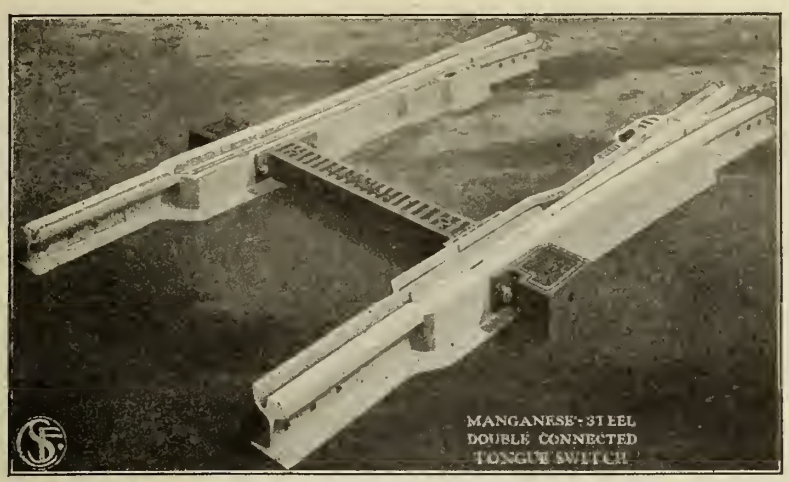

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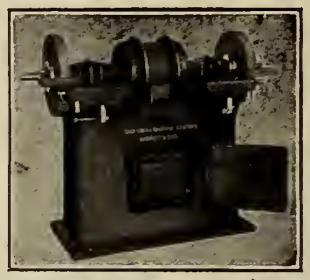
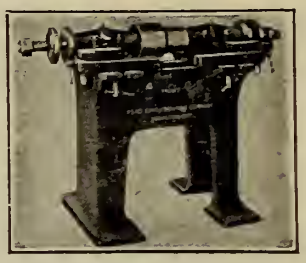


Motor Driven Floor Grinder



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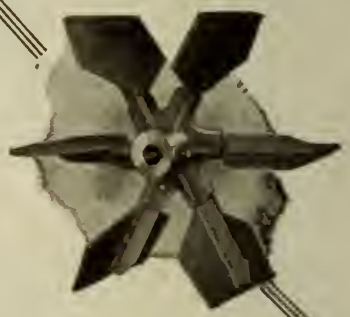

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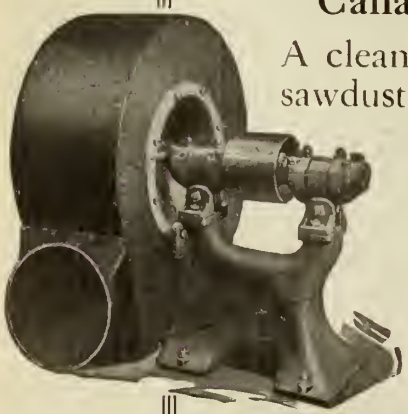

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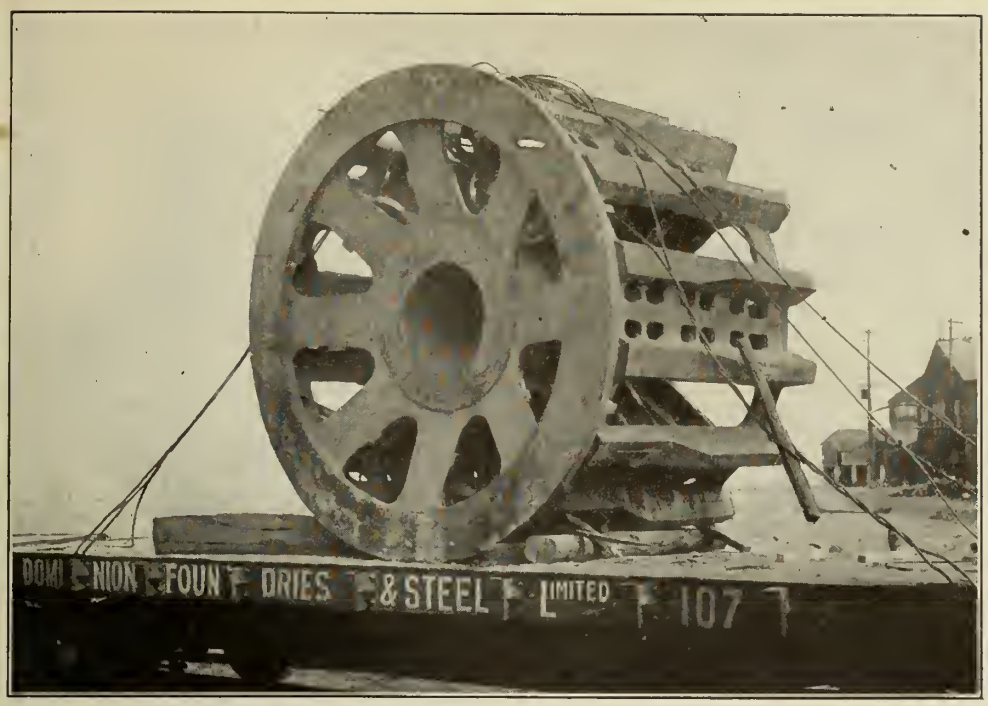

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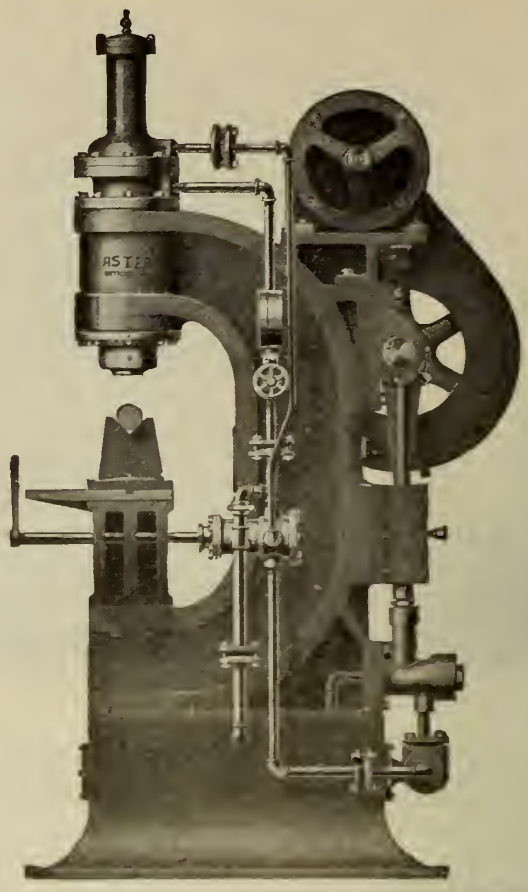

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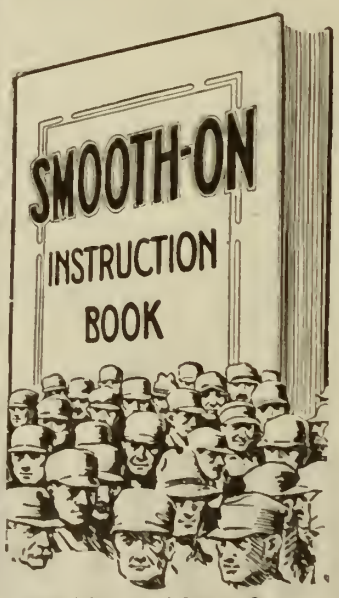

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HIGH-SPEED AND CARBON TOOL STEEL

MISCELLANEOUS SHOP TOOLS

MADE IN CANADA

ARMSTRONG WHITWORTH
OF CANADA, LIMITED

Head Office:
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BRANCHES:
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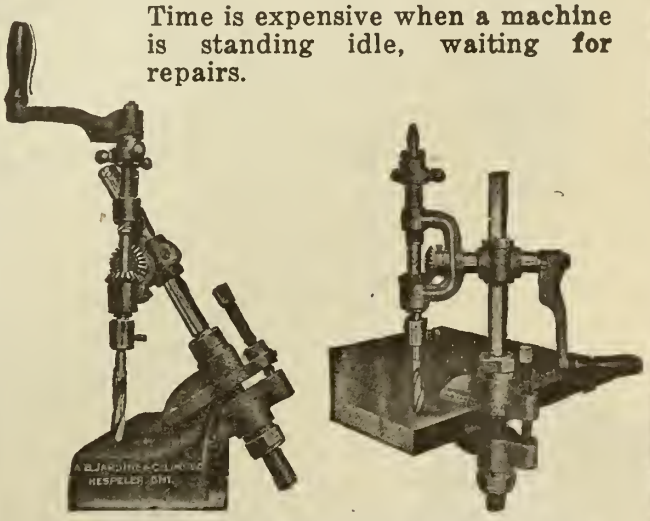
Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.



On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, $26.50 net.

Sold by all Machinery and Supply Houses

A. B. JARDINE & CO., Limited
HESPELER, ONTARIO

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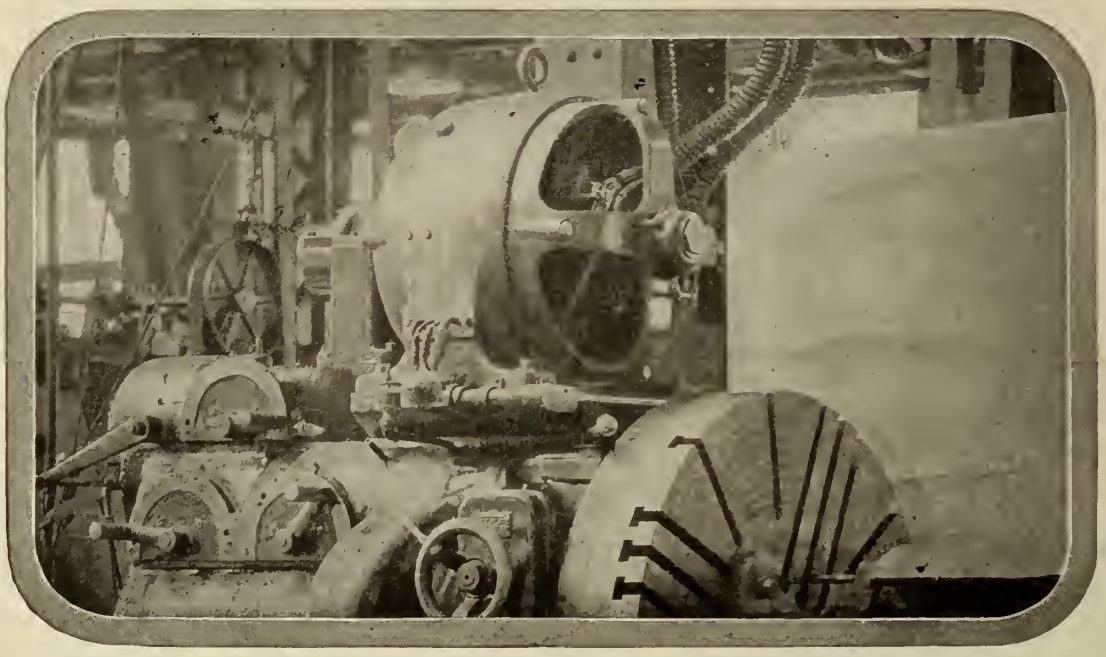
Sturtevant
PUTS AIR TO WORK

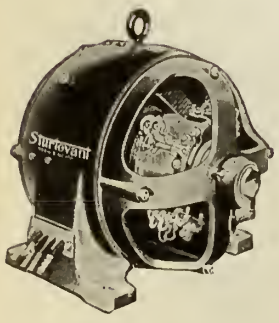


American Tool Works Co.'s engine lathe with 48" swing driven by a 10 H.P. Sturtevant Type "D" Motor

Are You Considering Individual Drive *For Your Machine Tools?*

WHAT do you wish to drive—lathes with a 14" or 48" swing, large boring mill, planer or grinder? Any machine tool in your shop, no matter how large or how small, can be successfully driven by a Sturtevant Direct-Current Motor. They range from ¾ to 50 H.P. and permit very close speed regulation together with ample overload and continuous full-load capacity. Many practical tests have proven these motors splendid individual or group drivers. Facts in the new catalog are impressive.

It is No. 264H—write now for a copy



Sturtevant Type "D" Motor

B. F. STURTEVANT CO. OF CANADA, LTD.
Head Office and Works: GALT, ONTARIO
Sales Offices: TORONTO and MONTREAL

Screw Machine Products -

to specifications

SPECIAL

Screw machine product up to 2¼" diameter to customers' specifications.

STANDARD

V.,U.S.S. and S.A.E. Cap Screws
V. and U.S.S. Set Screws
S.A.E. Plain and Castellated Nuts
V. and U.S.S. Semi-finished Nuts

Owing to the market shortage of raw material, it is to the customers' advantage that they anticipate requirements as far ahead of use as possible.

THE NATIONAL ACME COMPANY

MONTREAL, P. Q.

De Courcelles G. T. R.

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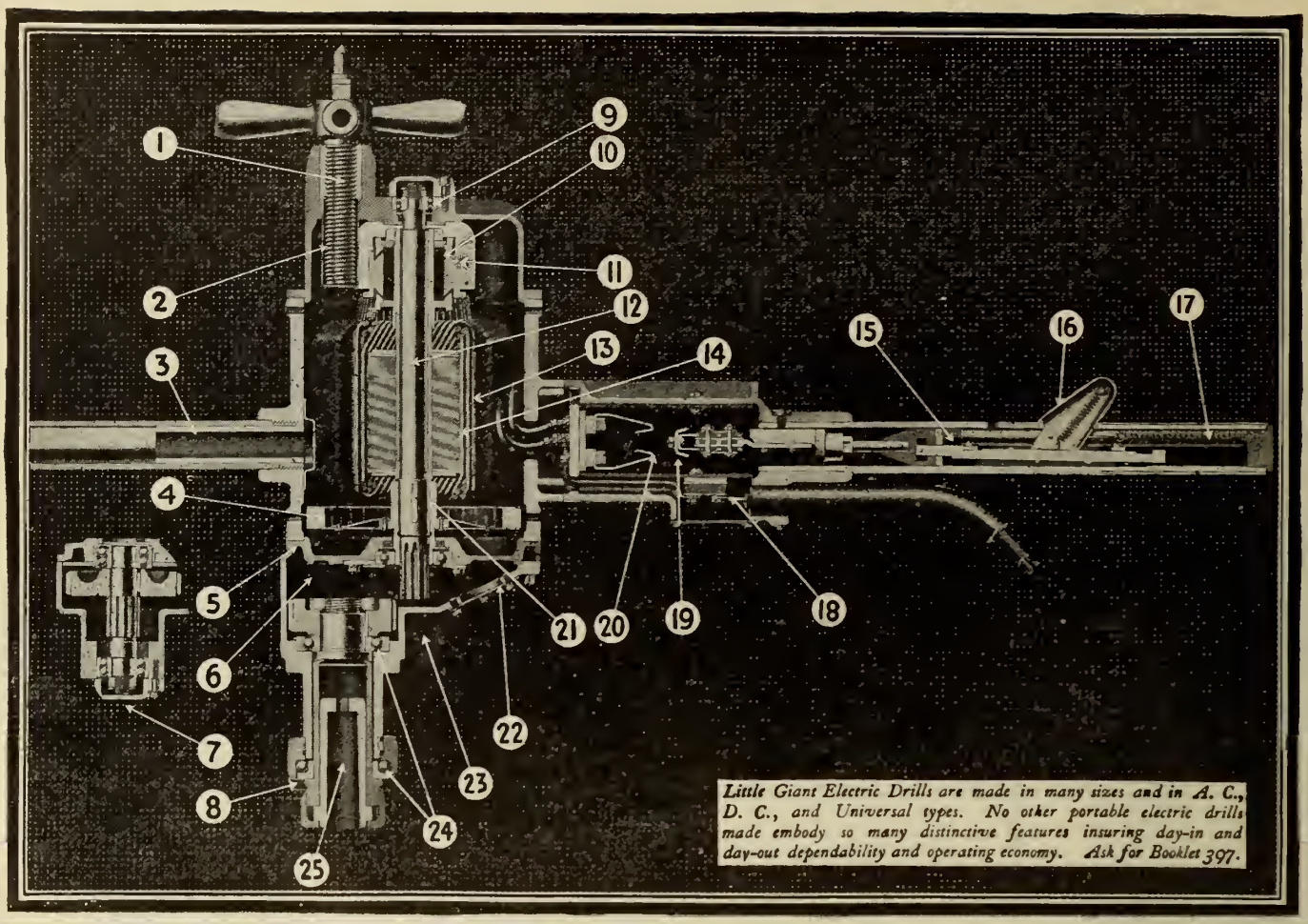

Inside Information

why Little Giant Electric Drills accomplish results

1 Long feed screw entering into body of supporting bracket, thus giving same results as telescopic feed.

2 Protecting sheath, preventing entrance of dirt into drill if feed screw is removed.

3 Dead handle reinforced at point of greatest strain.

4 Sheet steel fan, carefully balanced and reinforced, providing thorough ventilation.

5 Solid transfer plate or diaphragm preventing grease or oil in gear case from entering windings.

6 Liberal grease compartment for providing reliable lubrication of gears and ball bearings.

7 Section thru intermediate gears. Note wide *double* row of ball bearings at each end of gear shaft (used on large drills). Pinion and gears made of special alloy steel carefully heat-treated.

8 Dust protector for excluding dust from lower thrust ball bearing.

9 Ball bearing easily accessible for lubrication and inspection.

10 Commutator of sturdy design and construction, thoroughly insulated with mica.

11 Large opening with well secured and readily removable cover plates providing easy access to brushes and commutator.

12 One-piece armature shaft and pinion of tool steel, hardened and ground, insuring perfect alignment of pinion at all times. On large size drills armature shaft is removable from the armature core and commutator, which are mounted jointly on a quill or spider.

13 Laminated pole pieces, minimizing pole face losses (used on large drills).

14 Armature coils form wound, heavily insulated, and carried in insulated slots in armature core. After winding and connecting to commutator, coils and armature are again dipped in insulating varnish and baked.

15 Quick acting control switch, making slow break impossible and preventing destructive burning of contacts.

16 Conveniently located trigger for operating switch.

17 Safety return spring for automatically opening switch when operator removes hand from switch handle (used on large drills).

18 Terminal block for cable, permitting ready removal of cable without disturbing other connections.

19 Cover plates on each side of switch, providing easy access to switch contacts.

20 Double pole, double break switch. Rugged contacts are readily removable.

21 Long fan-hub of high grade steel, hardened and ground. Press fit on shaft with long key insures permanent rigidity.

22 Cover plate quickly removable for inserting grease in gear case.

23 Reinforcing rib on gear case, insuring proper strength and rigidity.

24 Combined annular and thrust bearing at each end of spindle.

25 Removable socket inserted in spindle. Driving lugs on socket milled from the solid.

Sales Representatives

The Holden Company, Limited

354-356 St. James Street, Montreal, Canada

Sales and Service Branches: TORONTO, 342 Adelaide Street, West WINNIPEG, 150 Princess Street VANCOUVER, 81 Pender Street EL-35-H

Canadian Factory: Canadian Pneumatic Tool Company, Montreal

BOYER PNEUMATIC HAMMERS · LITTLE GIANT PNEUMATIC AND ELECTRIC TOOLS
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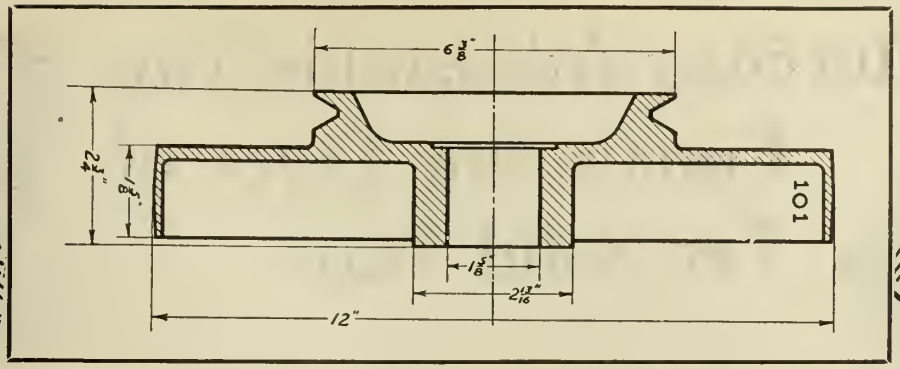
GIANT OIL AND GAS ENGINES ROCK DRILLS · COAL DRILLS

LITTLE GIANT

Electric *Tools*

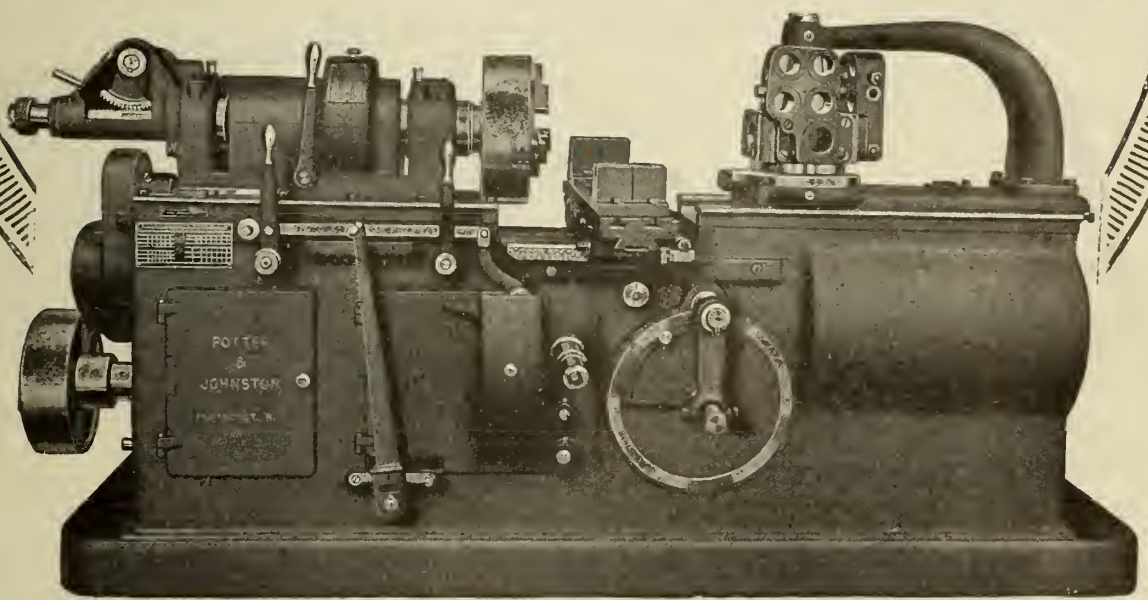


Have You Adopted This Method?

The method of machining parts automatically.

Let the P & J Automatics shoulder the responsibility. They keep production up to the highest notch and bring the cost down.

Ask us.



Canadian Offices: POTTER & JOHNSTON MACHINE CO.

ROELOFSON MACHINE & TOOL CO., LIMITED

Head Office and Showrooms:
11 WELLINGTON ST. EAST, TORONTO, CANADA

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One Murchey Adjustable Tap Equals the Lives of Ten Solid Taps

When a chaser on a Murchey is ground it may be adjusted to compensate for wear. This cannot be done with a solid tap, with the fineness, the finish, the accuracy which characterizes Murchey adjustable taps. A solid tap loses its accuracy with every grinding, and the more grindings the greater the inaccuracy.

Other features of Murchey Adjustable Taps will gladly be sent upon request.

Murchey Machine & Tool Co.

64 Porter Street - - - Detroit, Michigan

The Coats Machine Tool Company, Ltd., 14 Palmer St., Westminster, S. W., London, England.
Fenwick Freres & Company, 8 Rue de Rocroy, Paris, France.

Announcing

the issuance of a new catalog of prime interest to all users of milling and gear cutters and small tools. Herein you will find listed styles and sizes of end mills (special and plain) T-slot cutters. Key cutters, thread mills, gear slots—in fact your needs in the small tool line of this class are sure to be covered. Get your copy and note its completeness.

If your special requirement doesn't appear, Bilton can produce it—and in true Bilton Quality.

Just sign your name and address on a card and post it to

The Bilton Machine Tool Company
Housatonic Ave., Bridgeport, Conn.

What Constitutes a Perfect File?

A perfect file must be made of specially prepared steel, to withstand the chemical re-action of friction and consequent heat.

It must have teeth properly shaped to "bite" cleanly without undue pressure.

It must be thoroughly hardened, so that the teeth won't dull quickly.

It must be well-balanced, so as to be easily handled.

All those qualities you will find in Famous Five Files.

They have been the standard for over fifty years. Specify them when ordering:

KEARNEY & FOOT
GREAT WESTERN
AMERICAN
ARCADE
GLOBE

Made in Canada by

Nicholson File Company

PORT HOPE - ONTARIO

No. 2. TYPE "R" Hartness Automatic Die

WITH SHANK FOR REVOLVING SPINDLES

These dies are designed for use on either vertical or horizontal spindles. Die is re-locked by forward motion of sleeve, which may be actuated by a yoke working in the groove or by a fixed stop making contact with rear edge of sleeve at the return stroke. Die is unlocked in the usual manner by retarding its forward motion or by a fixed stop, making contact with the external tripping button shown on the face of the die. External tripping button is especially desirable in cutting very short threads as it relieves the thread of the strain incidental to unlocking by the pull-off device.

The diameter of the No. 2, Type R die is 3 3-16 in., and its length as shown is 3½ in.

The Die cuts both right and left-hand threads ½ in. to 1 in. in diameter, and from 10 to 40 threads per inch.

Shanks are varied to meet individual requirements.

A set of standard chasers in carbon steel is supplied gratis with each Die.

No tools of any kind need be used in changing chasers.

A chaser grinding jig is supplied gratis on Die orders if desired.

Jones & Lamson Machine Company

(DIE DIVISION)

9-10 Water Lane, Queen Victoria St., LONDON, ENGLAND.

SPRINGFIELD, VERMONT, U.S.A.

503 Market St., SAN FRANCISCO, California, U.S.A.

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Boyer, Campbell Company, Detroit.

E. L. Essley Machy. Co., Chicago, Milwaukee and Moline.

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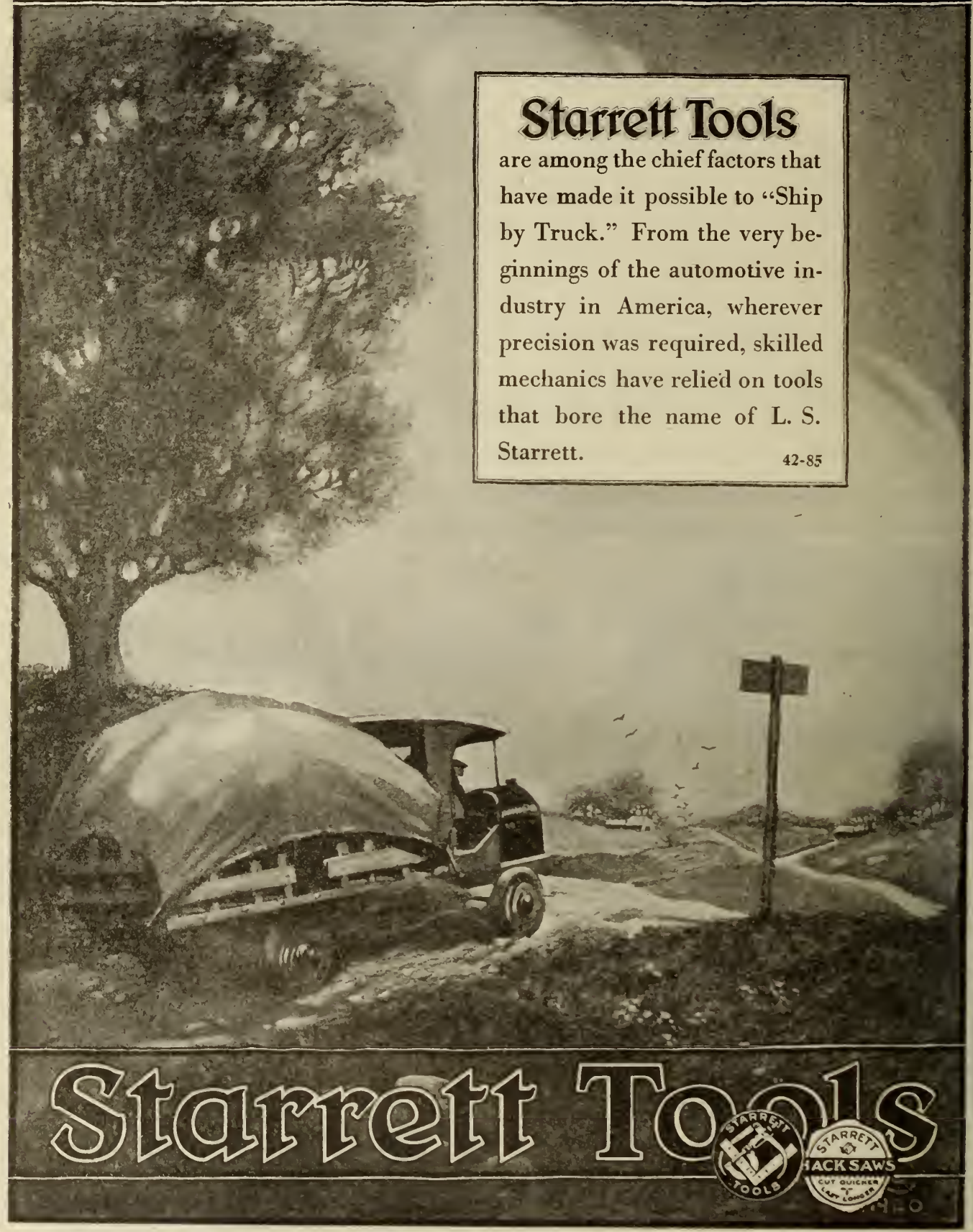
Starrett Hack Saws



Starrett Tools

are among the chief factors that have made it possible to "Ship by Truck." From the very beginnings of the automotive industry in America, wherever precision was required, skilled mechanics have relied on tools that bore the name of L. S. Starrett.

42-85

Starrett Tools

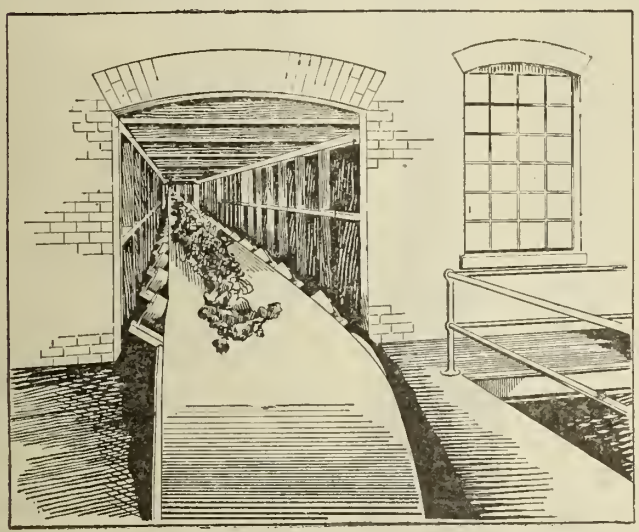
STARRETT TOOLS

STARRETT HACK SAWS CUT QUICKER LAST LONGER

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

BELTING

SCANDINAVIA BELTING

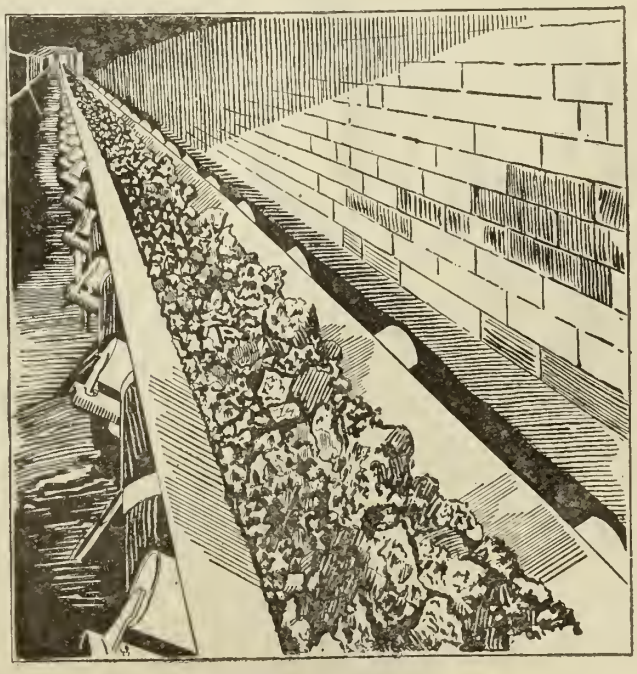


has been used for the past ten years in Canada for *conveying*—

Coal
Ore
Broken Stone
Coal and Coke

and is conveying more material in proportion to its cost than any other belt to the best of our knowledge.

This belt is Solid Woven and has no plies to open up—



This belt is not an experiment, but has made good for years.

For *elevating* the belt is supplied with a special dressing.

Be sure and state whether the belt is to be used for *elevating* or *conveying*.

We solicit your inquiries.

FEDERAL ENGINEERING CO., LIMITED
172 John St., Toronto

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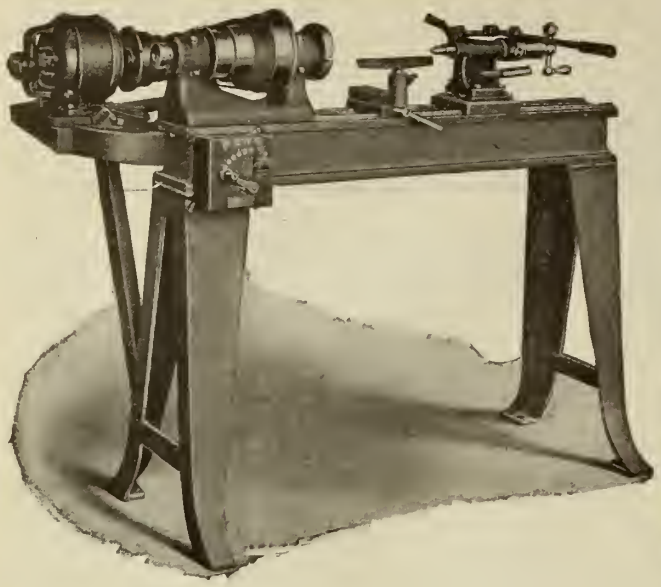


Built For *Service*

This BLOUNT Motor-driven Lathe is well adapted to all speed lathe uses. It is of late design, and has a number of features in which you will be interested. Provided with constant-speed motor. Lathe spindle made of hollow, high-carbon steel, ground to size and bored for Morse taper. Runs in self-oiling bronze bearings.

"We will accept Canadian funds at par"

J. G. Blount Co., Everett, Mass., U.S.A.

Buried in the Work and Broke!

Next time a tap breaks below the surface of a large casting, don't let some make-shift method of removing it injure the thread and waste half an hour of valuable production time. Instead—

Walton it Out in a Jiffy

And save the casting.

Special analysis steel fingers of the Walton Extractor drop into the flutes of the broken tap—and grip. Then a few turns of a wrench applied to the squared end of the Extractor backs out the buried tap.

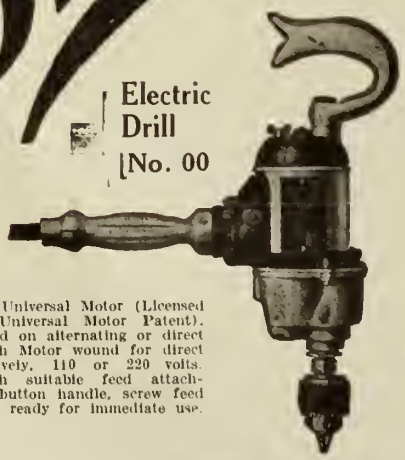
Sixty-day trial offer proves the Walton Extractor pays for itself.

Write

The Walton Co.
Hartford, Conn.

Thor

Save Expensive Delays By Using Thor Tools



Electric Drill No. 00

Equipped with Universal Motor (Licensed under Burke Universal Motor Patent). Can be operated on alternating or direct current, or with Motor wound for direct current exclusively, 110 or 220 volts. Furnished with suitable feed attachment, grip or button handle, screw feed or breast plate, ready for immediate use. Order to-day.

Have you ever experienced the annoyance of having to stop for repairs right at a time when you were most anxious to avoid delays? Nearly everyone who has used a pneumatic or electric tool has had his patience tried time and again by being compelled to stop to tighten up or repair some defect caused through inferior materials or poor workmanship. This means time lost, time lost means reduced production, both mean money lost.

Thor Pneumatic and Electric Tools eliminate all this annoyance, delay and expense. They are made from the very best materials by expert workmen and are designed to overcome the weak points of other similar tools. Their strong, durable construction insures reliability and will save you many dollars in maintenance. Write for the Thor catalogue—it describes the full Thor line.

INDEPENDENT PNEUMATIC TOOL COMPANY
334 St. James St., MONTREAL

TORONTO, 32 Front Street West WINNIPEG, 123 Bannatyne Ave. East
VANCOUVER, 1142 Homer Street

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FOUNDRIES & FORGINGS
LIMITED

If a Bad "Nut" Gets Loose —Use a Wrench

Endurance Brand

Never Wear Out
Ask Your Jobber

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WELLAND, ONTARIO

Harris Heavy Pressure

The Babbitt Metal that's at the Front in Efficiency and Economy

Order a Box from our nearest Factory

Our Guarantee is Back of Every Pound of Babbitt Metal We Make

Manufactured by
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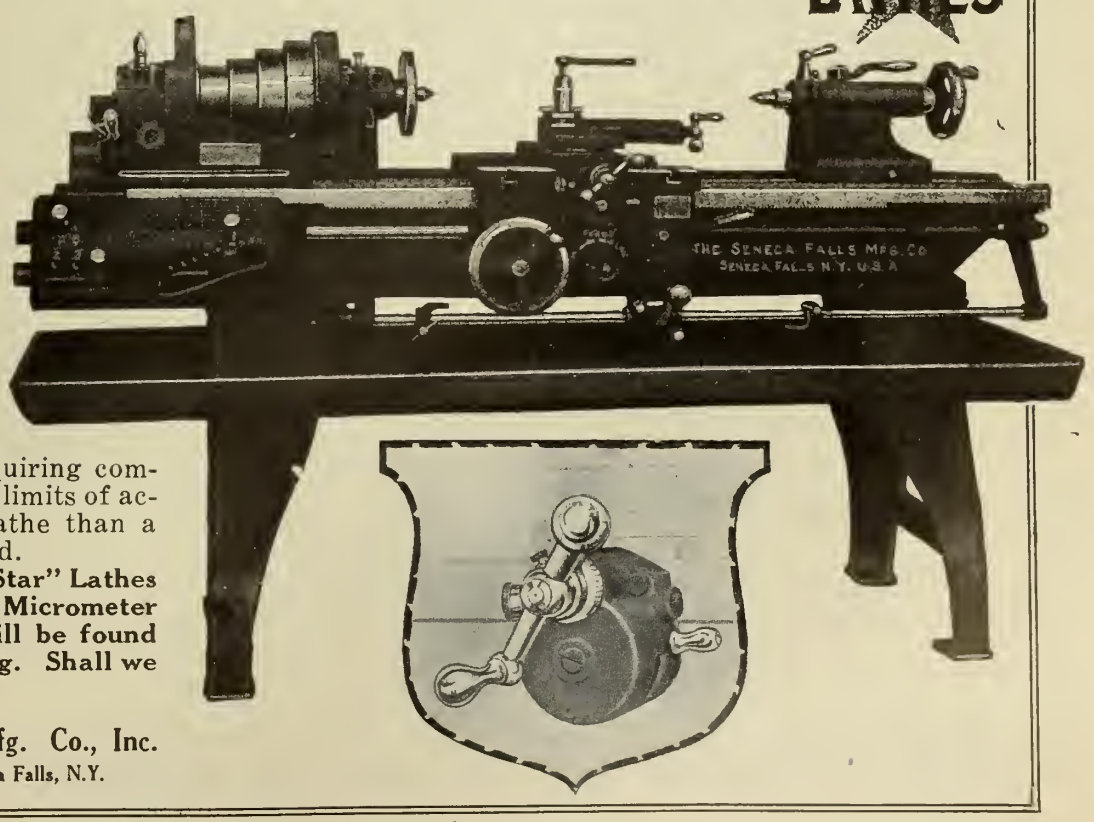
A Positive Stop for Any Depth of Cut

STAR LATHES

The Micrometer Cross-Feed Stop is positively acting. The depth of cut cannot be varied by crowding the machine. On all kinds of inside and outside work it eliminates guessing; it saves stopping the lathe to caliper the work; it insures uniformity in making duplicate parts.

For small work requiring completion within close limits of accuracy no better lathe than a "Star" can be found.

Other features of "Star" Lathes in addition to the Micrometer Cross-Feed Stop will be found in the "Star" catalog. Shall we send you a copy?



The Seneca Falls Mfg. Co., Inc.
366 W. Falls St., Seneca Falls, N.Y.

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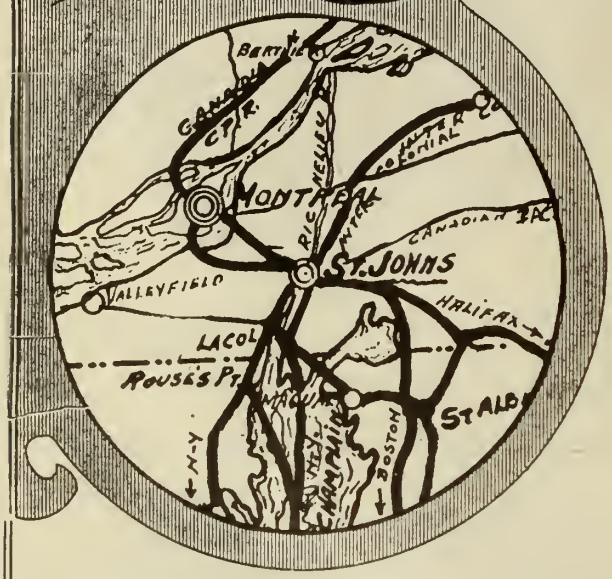
The City of ST. JOHNS, QUEBEC



Power
Labour
Transportation ?

Three Big Questions Already Solved for the Manufacturer Locating in St. Johns

POWER. Almost all the important industries carried on in St. Johns are operated by electric power, developed at Chambly Falls, 11 miles distant. St. Johns is in fact right now in a position to encourage manufacturers and offer power at prices that will compete with any city or town in Canada.

Low freight rates and excellent transportation facilities ensure an abundant supply of coal at lower rates than any other centrally-located manufacturing city in Canada.

LABOUR. St. Johns has long been recognized as the cheapest labour market in Canada. Skilled and semi-skilled labour, both male and female, is plentiful. The workmen are the intelligent, happy and contented kind and labour troubles are practically unknown. St. Johns has this great advantage over larger manufacturing centres because the workingman's cost of living is low—as are also his taxes and house rents.

TRANSPORTATION. St. Johns' transportation facilities are unexcelled by any city of its size in Canada. Seven railroads, including Canada's two great transcontinental lines, run through the city and are interconnected in the St. Johns yards by a terminal switching company at very low rates. St. Johns also enjoys the advantages of water transportation through the Richelieu River, which is a link in the chain of canals from New York to the St. Lawrence, furnishing the city with a direct water route to the eastern seaboard of the U. S. and the Great Lakes.

In addition to these advantages the city offers her assistance by granting many generous concessions such as, exemption from taxes, all public improvements required, and a cash bonus on your payroll. You risk a serious mistake if you do not include St. Johns in your investigations.

For More Specific Information Write to

The Secretary of the City Council

St. Johns, Quebec, Canada

MINISTRY OF G.R. MUNITIONS

The Disposal Board

Have

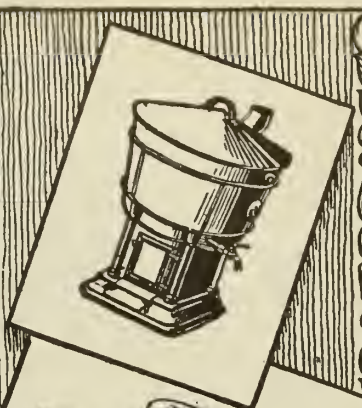
STOCKS

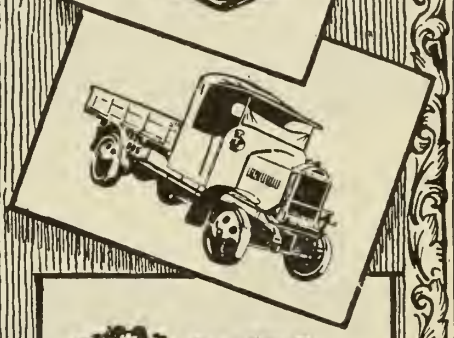
Lying in the United Kingdom and

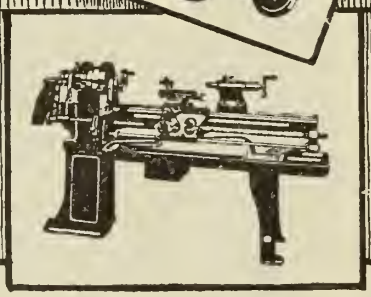
AVAILABLE FOR EXPORT

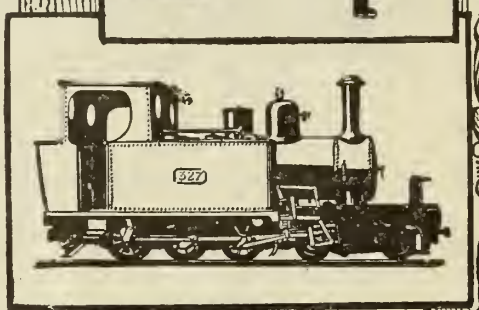
of

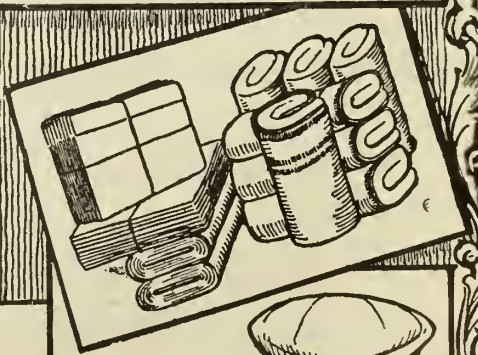
ENGINEERING STORES

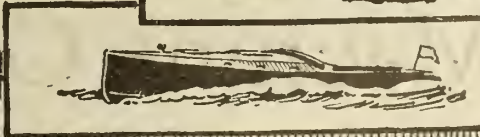












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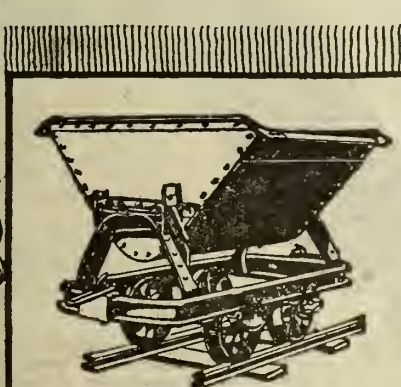
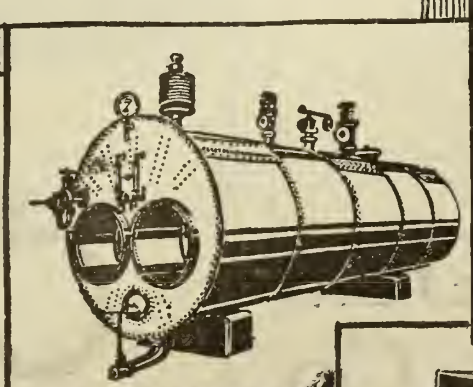
Buyers should instruct their representatives in the United Kingdom to communicate with D. B8 Canadian Export Department, Ministry of Munitions, Whitehall Place, London, S.W.

Cable Address:
"DISPEXPORT, MUNORGIZE, LONDON"





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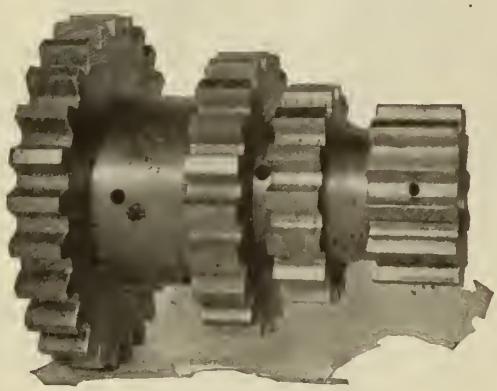
Generated Gear Teeth

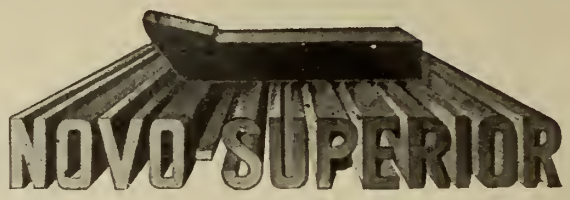


Cluster Gears, with their teeth close to a shoulder, or Internal Gears can only be cut right on a Fellows Gear Shaper.

Send us your Gear Work.

Hamilton Gear & Machine Co.

Van Horne St. TORONTO



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INTRA STEEL GIBRALTAR STEEL
Tool Steel for Every Purpose
Swedish Lancashire Iron

Twist Drills, Taps, Hack Saw Blades, Milling Cutter Files, Etc., Music Wire for Springs, Steel Balls. Cold Rolled Tool Steel in Strips and Sheets Circular Saws, Machine Knives.

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Dunbar

Springs *for* Every Use

We have been making springs of all kinds for 70 years. Let us advise you when in difficulty.

Tell us the purpose for which the spring is intended, and experts will gladly co-operate to see that you get the design best suited to the purpose.

Dunbar Springs are thoroughly tested for **accuracy** and **quality**. Send us specifications, for estimates.

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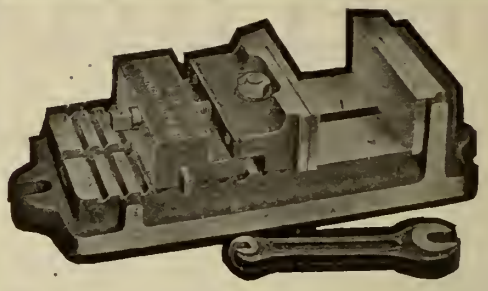

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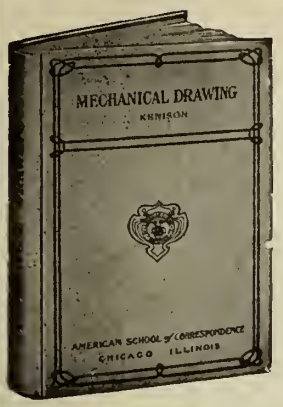

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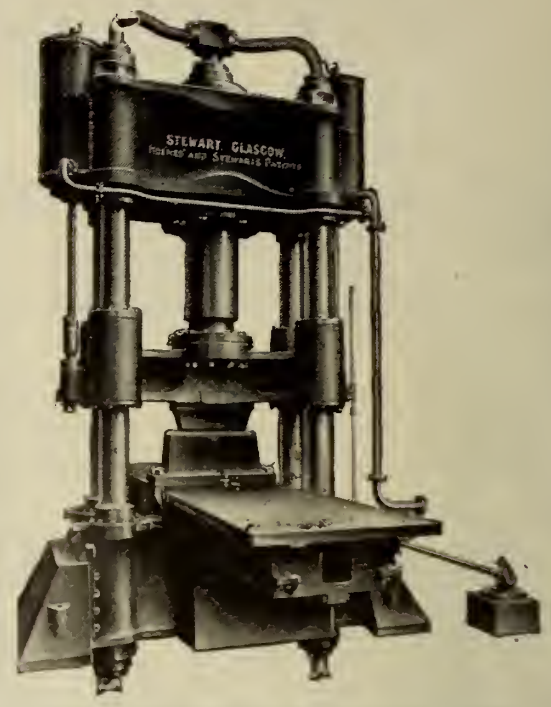

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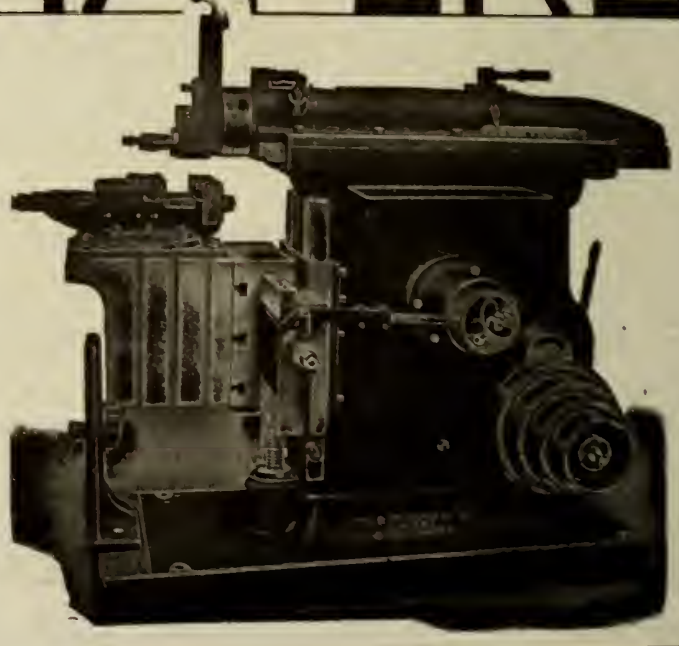

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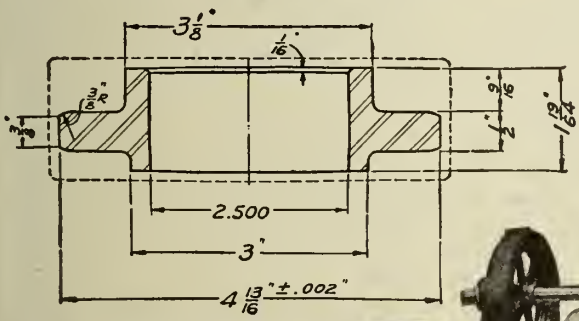

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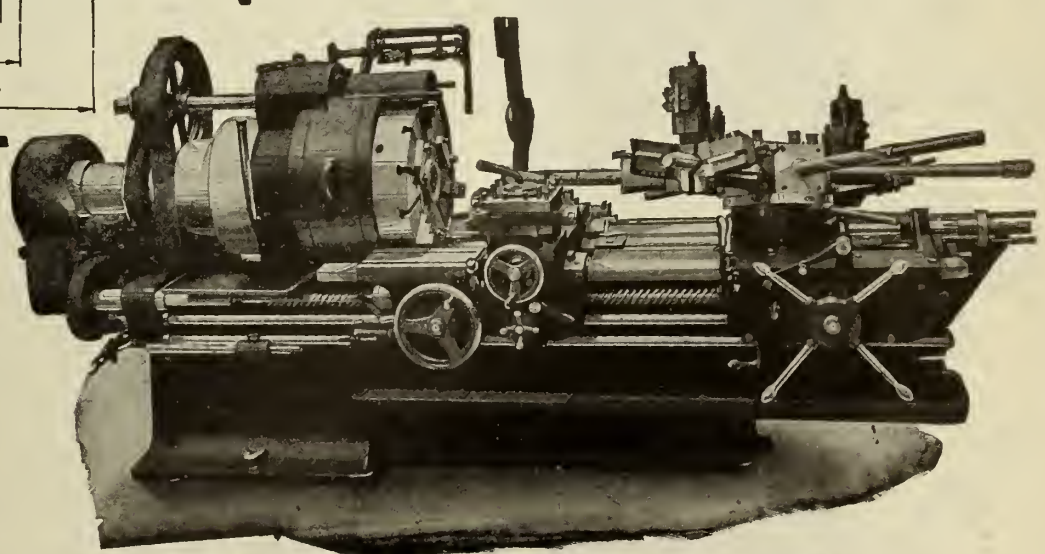

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CANADIAN MACHINERY
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MANUFACTURING NEWS

Vol. XXIV. No. 9 August 26, 1920.

Some Interesting Examples of Tool Layout

It Pays to be Thoroughly Conversant with Tool Layout Practice. This Article is a Continuation of Former Material Dealing with Different Style Machines, and the Tools Used.

By J. H. MOORE

IN preceding articles we have discussed the advisability of being thoroughly conversant with the different styles of machine tools on the market, and their method of tooling. We have already pointed out that a first-class machine tool cannot do its best work if equipped with poorly designed tools, and to aid readers in this regard we have shown various styles of machine tools, together with good examples of tool layout. In the article to follow we will illustrate tool layouts on what are known as Potter & Johnston manufacturing automatic chucking and turning machines. This series of talks is well worth preserving for future use.

For the benefit of those not familiar with this type of machine we append the following. As can be noted from Fig. 1 the machine is equipped with a turret head supported by the arm A. On this turret are four stations upon which tools can be bolted, and as is the usual practice, every new machine goes out equipped with an outfit of turning tool holders, etc., etc. What we are particularly interested in, however, is the manner in which this portion of the machine is operated.

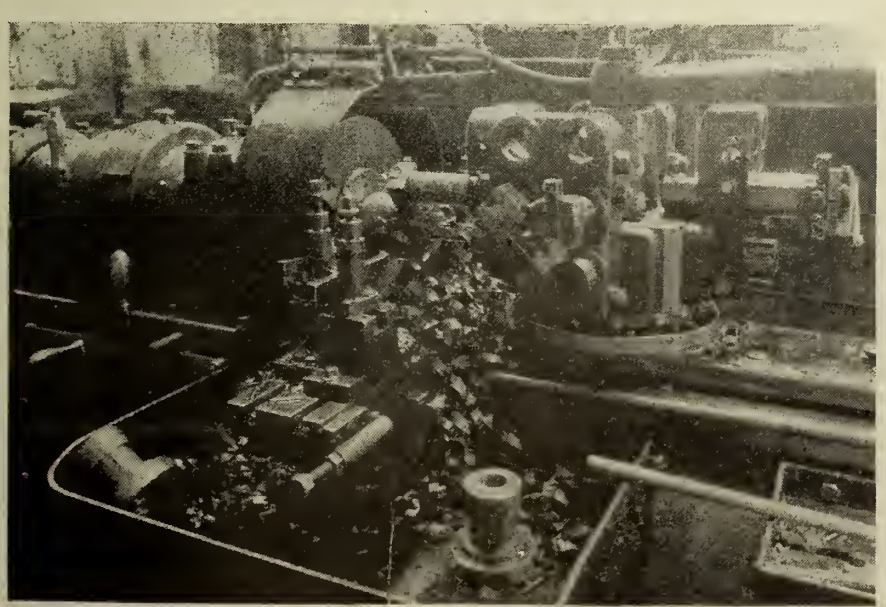


FIG. 1—ILLUSTRATING THE SECOND OPERATING ON A TURRET INDEX PINION AND CLUTCH.

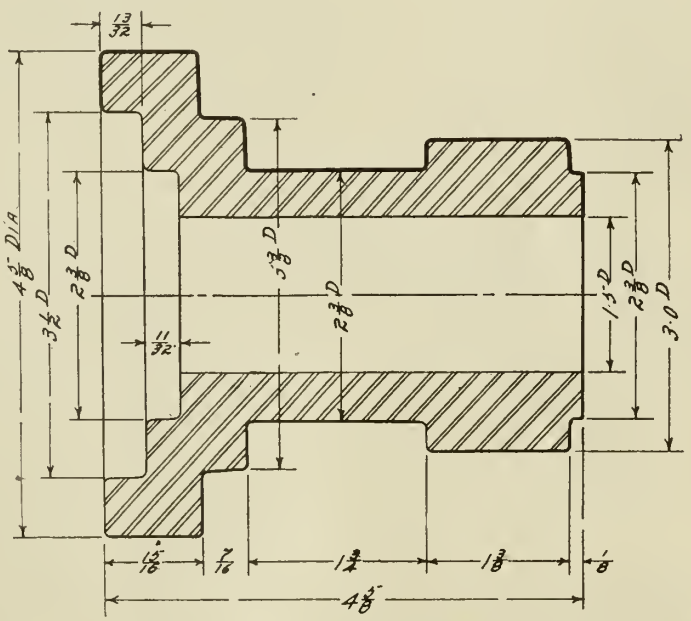


FIG. 2—A DETAIL DRAWING OF THE PART BEING MACHINED AT FIG. 1.

When in operation, the turret is advanced, revolved, and returned automatically. These movements are performed at as high a speed as practical, thus making comparatively little lost time in the operation of the cutting tools. When the turret slide has advanced to the cutting point, the feeding motion is automatically thrown in.

Of course a regular cross slide forms part of this type machine, and a portion of the slide can be noted at B, see Fig 1. On the cross slide are used the regular front and rear tools. They can be arranged and adjusted to work at the same time as the turret tools are cutting, or separately, depending upon the nature of the work. In some cases special blocks are fitted to the cross slide, these carrying blades, cutters, etc., but again this depends en-

tirely upon the class of work being manufactured.

Relative to speeds. It might be well to state that the spindles of such machines have three automatic changes of speed, and with the spindle change gears provided, one can procure the proper speeds for handling any work within its capacity.

The feed question is also very simple, the feed being transmitted from the same gear shaft that drives the spindle. This ties, so to speak, both speed and feed together. Two automatic changes of feed are provided, known as ordinary and auxiliary, each having an independent set of feed change gears. The ordinary feed is used for turning, boring, etc., while the auxiliary feed is adapted for turning and boring operations where the character of the work is such that a coarse feed will suffice. This latter feed is also suitable for ream-

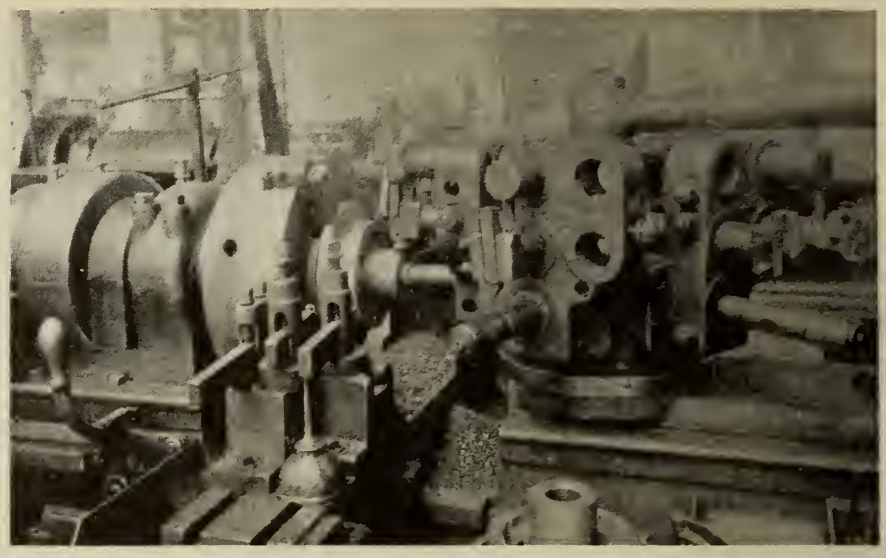


FIG. 3—SECOND OPERATION ON FRICTION HEAD.

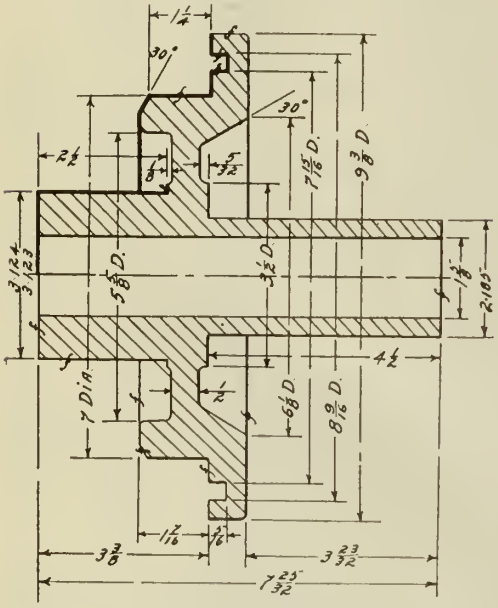


FIG. 4—DETAIL OF THE HEAD BEING MACHINED AT FIG. 3.

ing and threading. The gearing in this style machine is so arranged that quite a variety of different pitches of threads can be cut, using automatic collapsing taps, or automatic opening die heads. Either feed can be engaged at any time automatically, and they are entirely independent of the constant high speed for the idle movements as already explained.

An automatic back facing bar is generally a part of such machines. This bar, which is placed through the spindle, is provided with a taper hole to carry drills, cutters, facing tools, etc. These can be carried either singly or in combination. By using such an attachment a variety of parts such as gears, pulleys, etc., which would otherwise require two chuckings, can be finished at one setting; the back facing tools machining the inner end of the hub, while the turret and cross slide tools are turning the periphery, facing down both edges of the rim, the outer hub, and boring the hole. It is quite a common occurrence to see all three parts moving in harmony, and as many as 15 cutting tools working in simultaneous operation. This once more proves what we have already stated, namely, use your machine to its maximum cutting power at all times.

On such machines as described the chuck is supplied with a pilot bush which supports the turning and boring tools during the cutting operations. This feature of course makes for extreme rigidity. In some cases a two jawed chuck is used, while in others the three jawed type is adopted. Both styles are of the universal scroll design.

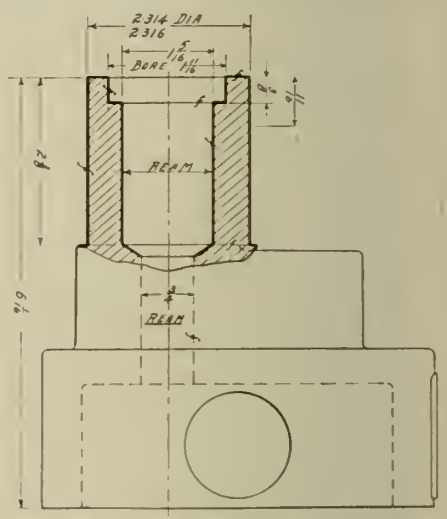


FIG. 6—DETAIL OF THE PUMP GEAR CASE.

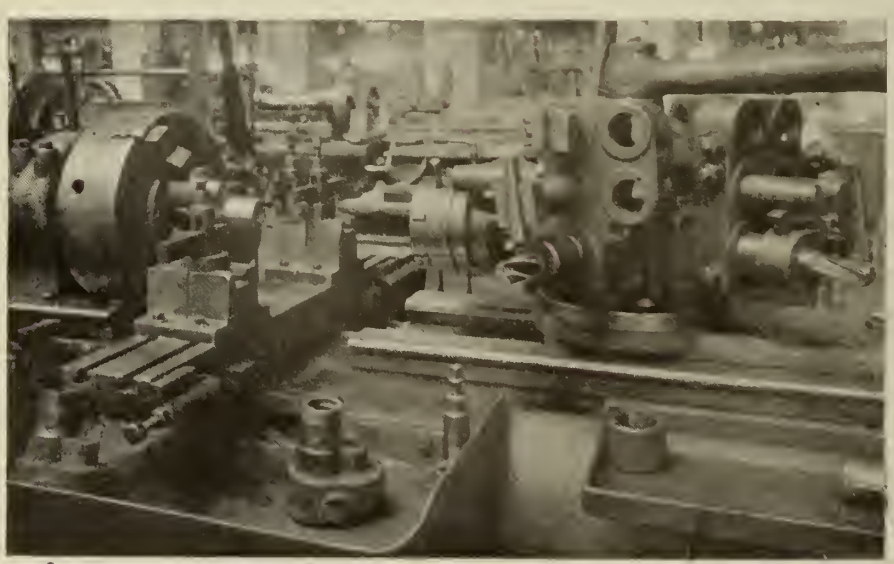


FIG. 5—MACHINING A PUMP GEAR CASE.

For small work, an automatic lever chuck is generally used. This allows the placing and removing of work with one hand. Another advantage is that it is unnecessary to stop the spindle to put the piece in the chuck or remove it when the cut is completed. Air chucks are also used when deemed advisable. In other words, depending upon the nature of the work, the machine is equipped accordingly.

The automatic action of the turret and cross slide is secured by means of cams, these covering practically every class of work coming within their range. If working on parts of very special character, special cams are installed, but for general work this is unnecessary.

From the foregoing it is evident that

all cutting operations being automatic, the operator is engaged only when placing the work in the machine, or removing the finished product. This means that an attendant does not require to confine his attention to one machine, but can handle a battery of two, to six, depending on the class of work being handled.

Having placed before readers the main points in connection with this style of machine, let us proceed to examples of work performed.

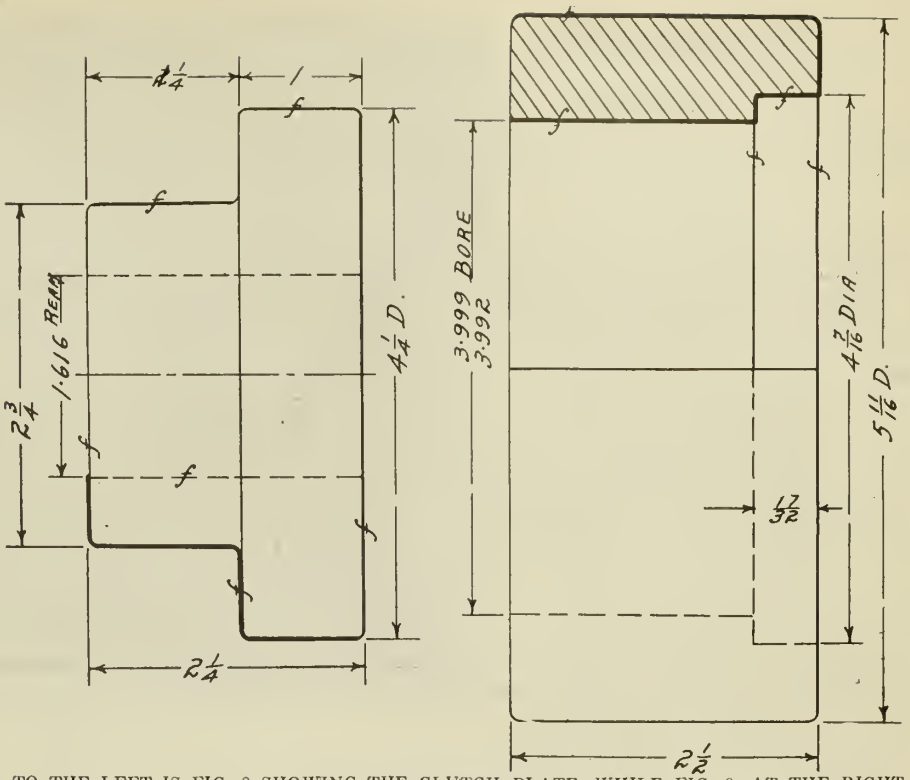
At. Fig. 1 is illustrated the second operation on what is known as a turret index pinion and clutch. The drawing of this piece is depicted at Fig. 2, and the heavy lines denote the portion machined during the operation.

The material is machine steel, and the piece is held on a roll grip arbor. As will be noted, very few special tools are employed. The piece is rough and finish turned, faced and formed, all tools being supported by pilot bars. This is the feature that we mentioned which ensured rigidity. One of the finished parts can be seen resting on the tray of machine. Do not merely glance at these set ups, study them, for they teach a lesson.

The next photograph, Fig. 3, depicts the second operation on a Friction Head. The machined surfaces are marked with heavy lines, as at Fig. 4, and in this case the material is cast iron.

The work is gripped on its large diameter on the regular chuck, and practically nothing is required in the special tool line. The piece is rough and finish turned, faced and grooved and the tools are supported by a revolving pilot in the finished hole. Note the revolving pilots, and in fact the complete tool layout. This should be easy, after a study of Fig. 4.

At Fig. 5, we see a job of rather a different nature. This view depicts the machining of a Potter and Johnston gear case, and referring to Fig. 6, we note the machined surfaces from the heavy lines. The material is cast iron, and the work is held in the chuck by means of jaws shaped to suit the case. The work is rough and finish turned, faced, counterbored, reamed, and the threads cut. The position depicted at Fig. 5 is that of the threading operation, an automatic die head being used. Finished parts can be noticed resting on the machine tray.



TO THE LEFT IS FIG. 8 SHOWING THE CLUTCH PLATE, WHILE FIG. 9, AT THE RIGHT, ILLUSTRATES GEAR SLEEVE.

Fig. 7 depicts the second operation on what is known as a quick return clutch plate. The machined surfaces are denoted at Fig. 8 by the heavy lines as usual. The material in this case is machine steel, and the piece is held on a roll grip arbor. The tools used are all standard, and the piece is rough and finish turned, and faced. All tools are supported by pilot bars. Two finished pieces can be noted towards the front of the photograph.

The remaining example is shown at Fig. 9. This depicts the first operation on a spindle gear sleeve tooth section, and the machined surfaces are marked at Fig. 10 by means of heavy lines. The material is machine steel, and the work is cut from stock. The drill used for the hole is a flat twist drill, and this drilling position is illustrated at Fig. 9. The piece is rough and finish turned, bored, faced, and counterbored, all tools being supported by pilot bars. Finished parts can be noticed in tray of machine.

From the examples shown readers can form at least a fair idea of the style of work performed by these machines, but of course it is impossible to depict even a small percentage of the variety of work manufactured on such machines.

Continued on Page 209.

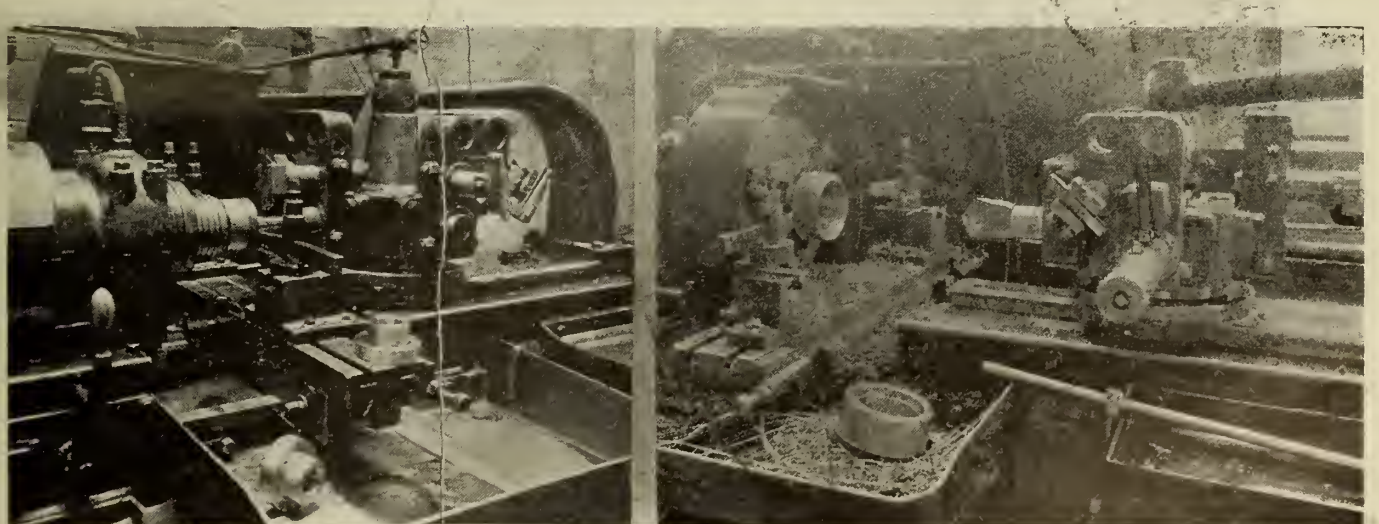


FIG. 7—SECOND OPERATION ON QUICK RETURN PLATE.

FIG. 9—FIRST OPERATION ON SPINDLE GEAR SLEEVE TOOTH SECTION

Automatic and Semi-Automatic Furnaces*

The Conclusion of Article from Last Issue, Dealing with the Subject of Automatic and Semi-Automatic Heating — Further Examples of Furnace Installations Are Given.

Compiled by J. H. M.

IN heating large dies it is desirable that they be thoroughly saturated at a temperature slightly below final temperature before the formed corners or edges on the face reach the final temperature. As the life of a die is no greater than the life of its corners or edges, it naturally follows that every possible effort should be made to prevent overheating these corners or edges or exposing them to the final temperature any longer than is absolutely necessary. The corners and edges of the die are the first to heat and the first to cool, and it is at these sections that the ruinous effects of unequal contraction are manifested. These corners and edges heat and cool more rapidly because the surface in proportion to the mass of these sections is much greater than that of the body of the die, which naturally reveals a difference in time of heating and cooling. Obviously, it is essential to consider the difference in time required to reach a given temperature in heating or cooling, due to the difference in surface and mass of the sections and embodying the outline of the piece and the body of the die itself. Improper heating or cooling, resulting from a disregard of these factors, is responsible for a great deal of the limited die service with consequent loss of production, material and labor. Such loss greatly offsets any saving in time or fuel by heating the die quickly without due regard to all the factors involved.

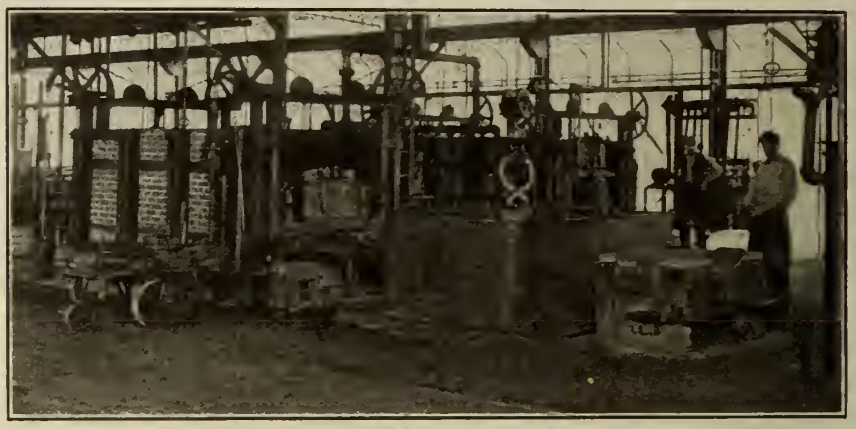


FIG. 13—Discharging end of semi-automatic furnaces for heavy dies. The quenching tank and tempering plate are shown in the foreground.

The type of furnace illustrated at Fig. 12 affords a practically continuous method of heating and cooling, with every facility for bringing the dies up to the final heat through a slow, soaking process. The dies to be heated are placed upon carriages and slowly conveyed from one end of the furnace to

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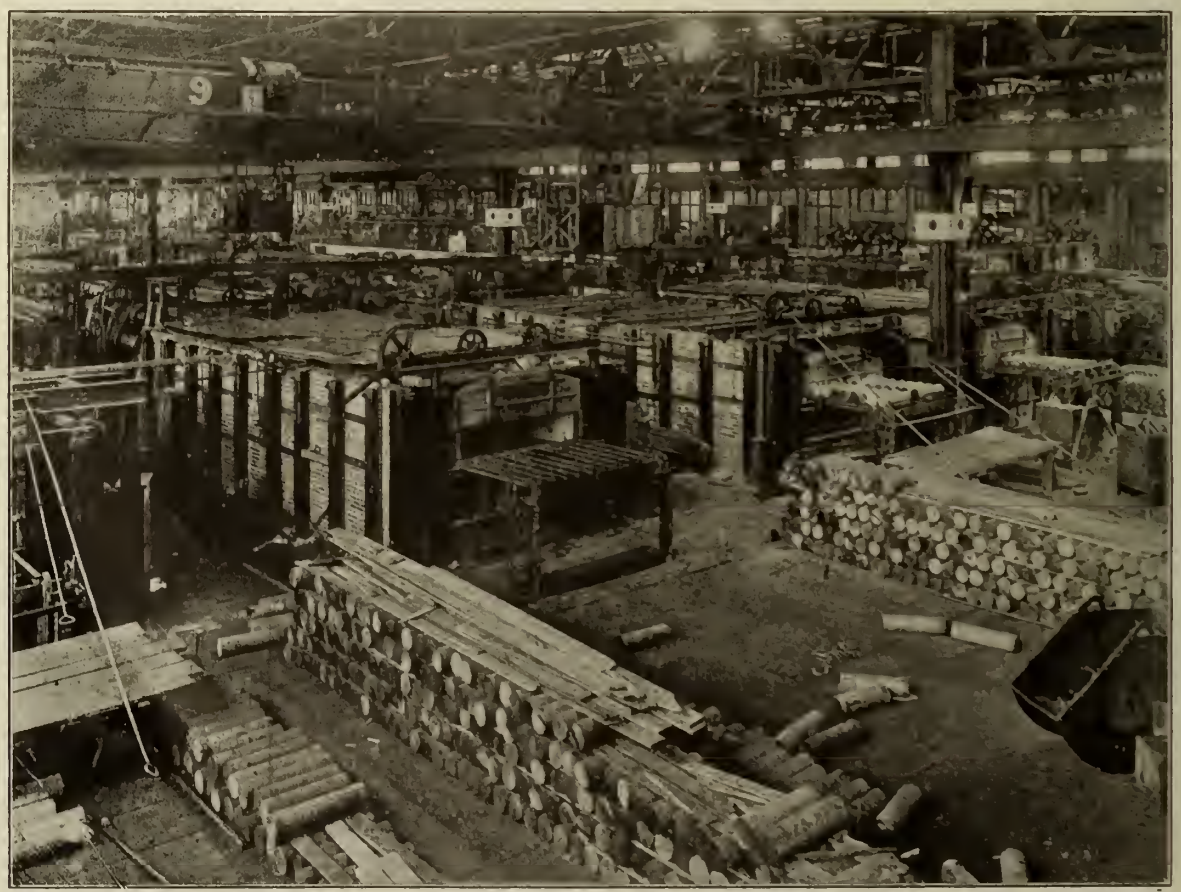


FIG. 14—View of charging ends of straight-line billet heating furnaces. The billets are charged in one end and passed straight through and out the other end.

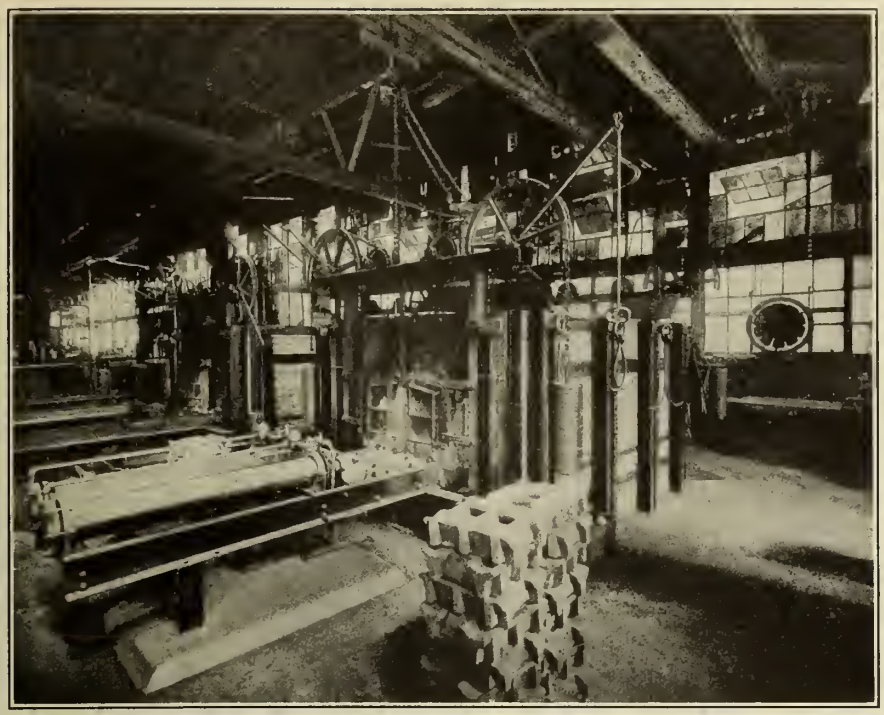


FIG. 12—Single chamber semi-automatic die-heating furnaces, each arranged for two rows of dies. Note the carriages for dies in the foreground.

the other. They are withdrawn one at a time, quenched, and tempered on the small plate furnace as shown in Fig. 13.

This semi-automatic principle may be employed in heating heavy pieces, such as bars, billets, ingots, axles, shafts, etc., for annealing, hardening or tempering, or for miscellaneous heating operations preparatory to forging, pressing, rolling or extruding. The construction of the floor, arrangement of chambers and working openings, and the method of delivering material to, through and from the furnace, vary with the nature of the operation, the size, shape and number of pieces to be handled, and the local manufacturing conditions.

As a rule the furnaces for this class of work are divided into two types: the "L" and the "straight-line." In the "L" type the pieces are charged into one end, pushed through to the opposite end and taken out of an opening located in one or both of the side walls. Furnace is often arranged with openings on both sides to serve a machine located on each side of the furnace.

This furnace may be built in single-chamber form, with openings on one or both sides or in twin-chamber form. Provision may be made to handle two rows of material in a single chamber. On account of the advantages of this type of furnace in the application of heat and decreased area of exposure in working openings, it should be given preference over the "straight-line" type whenever the manufacturing conditions will so permit.

In the "straight-line" type the material is charged in one end of the furnace and pushed or rolled straight through and out at the opposite end.

This type is to be preferred whenever the size or weight of the individual piece heated renders difficult its removal through a side door, or when it is desirable to discharge direct to a machine or quenching tank located substantially in line with the furnace chamber. It has the disadvantage of greater area of exposure incident to the wider working opening, which is apt to react somewhat on the uniformity of the material, the comfort of the operators and the furnace structure.

At Fig. 14, the pieces to be heated are placed upon an elevating platform to raise the charge to the hearth level. The material is then pushed through the chamber and delivered direct to machines located at the opposite end of the furnace.

Selection of Furnace

Determination of the type and size of furnace, number and position of working openings, and number of chambers, is governed entirely by the individual manufacturing conditions. The controlling factors are the quantity, shape and size of material to be heated; temperature; position of furnace with reference to adjacent machinery; floor space; facilities for moving material to, through and from the furnace; fuel to be used; location of stacks, vents, etc. These factors differ in each plant, make a study of each individual case necessary, in order that the type and size of furnace selected may be adapted to the manufacturing conditions.

SOME SPEED

An average speed of a little over 1,2 miles per hour was made in a recent flight from Rome to Turin by Lieut. Brack-Papa in an A. R. F. biplane constructed by the Fiat Company and equipped with a 750-horsepower twelve cylinder Fiat engine. The machine started from the Mirafiori aerodrome, in the suburbs of Turin, at 11.45 a.m. on April 5, carrying two passengers in addition to the pilot, and landed on the Centocelle ground, just outside Rome, at exactly 2 p.m. The intervening distance of 388 miles was thus covered in two hours fifteen minutes. A few days previously the same machine was officially timed over the Mirafiori aerodrome and found to give an average speed of 161.5 m.p.h. with four passengers and a pilot. In this flight the effects of wind were, of course, eliminated, and the speed attained, we understand, constitutes a world's record.

Discharging ends of semi-automatic furnaces for heavy dies. Note the hoist and quenching tank.

The Construction of Spindle Ends for Millers

Further Examples of Spindle Ends Are Shown, Each Style Being Fully Discussed in Detail—The Article in Its Complete State is Well Worth Filing for Future Reference.

By FRED HORNER

THE addition of a clutch transmission for heavy bars, Fig. 21, relieves the cotter of the driving strain. Fig. 22 gives plan and section of a special formation of nose, which serves two functions. In this drawing it is represented as driving a boring-bar, locked by cotter, and ejected when necessary by a key driven down the aperture A. For securing and driving a snout boring head the parallel outside of the nose comes into use; a longer cotter is put through the hub of the head, drawing it up so that clutch teeth on the hub mesh with teeth B on the nose and furnish a powerful drive, see Fig. 23. For the sake of safety to the operator, a brass guard collar is slipped over the clutch teeth when these are not in use, the guard being seen in Fig. 22.

For Heavy Work

That type of boring machine which revolves a large tee-slotted face-plate in addition to the central bar that slides through it often has to make use of a special bearing or socket casting, bolted to the face-plate, and receiving a milling head or facing head, the mass of which or the stress on which is too great to be taken on the end of the bar. There is manufactured in England a highly useful class of machine, in which the spindle nose carries a powerful spur driving gear, on which is bolted a circular head having a transverse slideway, through which moves a slide. This latter receives a facing tool, so that by the geared mechanism actuated from a shaft passing through the spindle facing cuts can be taken either to or from the centre. For driving the ends of bars, and the shanks of drills, reamers, milling cutters, tapping attachments, etc., a socket is bolted on to this slide, and is set central by means of a dead stop.

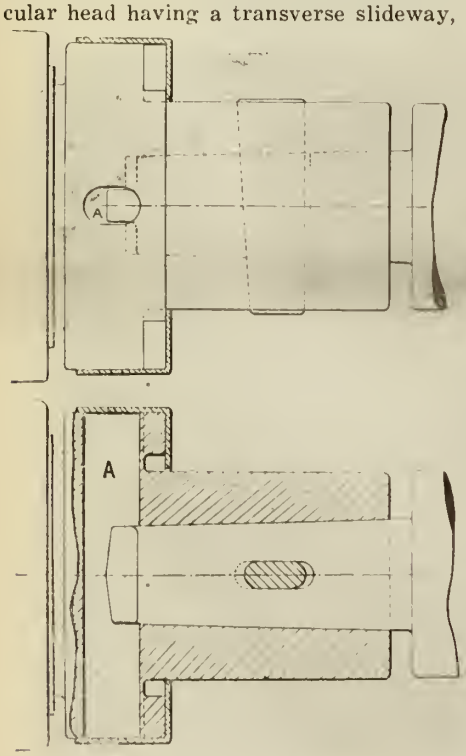


FIG. 22—SHANK AND COTTER DRIVE FOR BORING BAR.

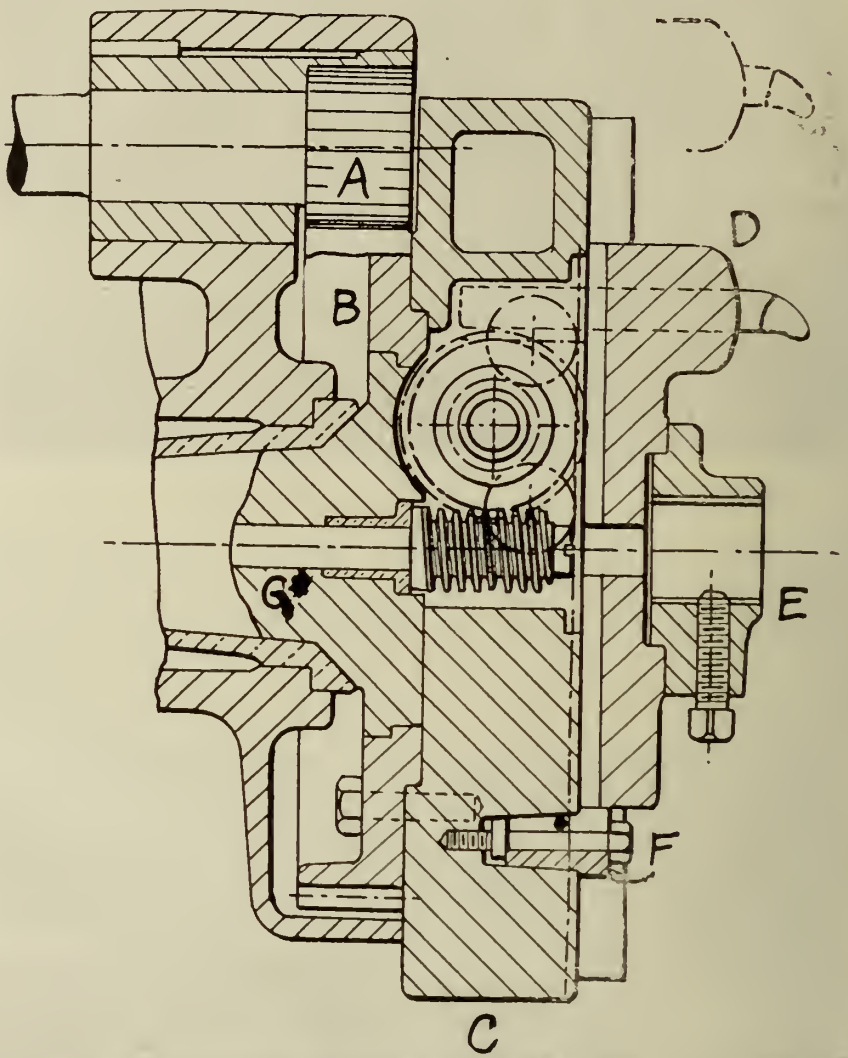


FIG. 24—TOOL-HOLDER SLIDE OF PEARN-RICHARDS MACHINE, WITH BORING-BAR SOCKET IN PLACE.

The sectional appearance of the mechanism is shown in Fig. 24 (George Richards & Co. Ltd., Manchester, England), the various parts being driving pinion A, spur gear B, head C, slide D, socket E, and stop F. The last named item is put in or removed by turning the shouldered screw which passes through the slot in its body. The traversing of the slide is brought about through the turning of the central shaft G, revolving the worm gear indicated, and thence through a spur gear, the two pinions shown dotted in mesh with the rack, on the back of the slide. The two pinions afford a very steady motion, and remain in mesh with the rack for ordinary diameters; on an extra

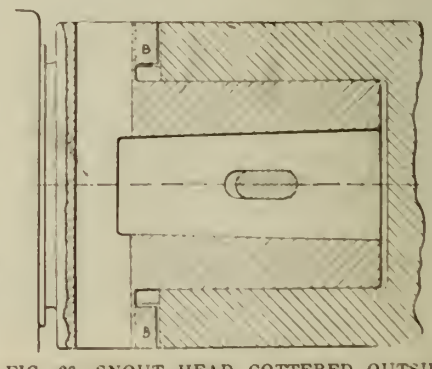


FIG. 23—SNOUT HEAD COTTERED OUTSIDE SPINDLE NOSE.

long traverse, shown by the dotted lines, the outer pinion transmits the feed. This may be had in either direction, for instance, a flange may be run across with a coarse feed on the inward motion, and a finer one on the reverse to the edge again.

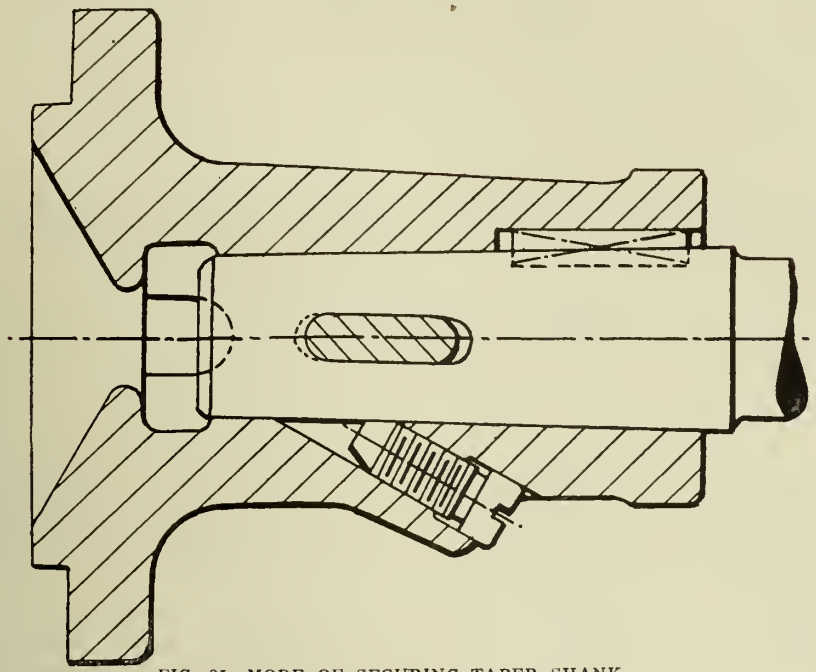


FIG. 25—MODE OF SECURING TAPER SHANK.

For driving ordinary boring bars the socket illustrated is employed, there being a key in the bar to receive the drive. For holding the shank of a tapping attachment a similar kind of socket, but longer, is bolted on. To carry the taper shanks of milling cutters, the shape of socket, Fig. 25, occupies the central position. A rectangular key provides a positive drive, and a cotter holds the tool shank back. When a collet or sleeve has to be set in the socket, the set-screw seen disposed at an angle is applied against a notch on the sleeve, in the manner visible in Fig. 26, a screw also in the sleeve holding in the cutter shank. Larger cutters, if they have shanks, are treated similarly to Fig. 25, but the heavier ones have a cast body flanged to bolt on to the facing slide direct, Fig. 27.

For operations demanding the utilization of a snout head, that is, blind holes where it is not possible to pass a bar right through, or interiors that have to be faced across on the ends, or interior flanges, the attachment Fig. 28, is bolted on. The cast steel socket portion receives a sliding tool-holder, clamped with two hollow screws, thereby arranging for the required degree of projection. An offset holder is also made, with the hole in the socket set to one side, and the holder cranked out to enable it to reach to larger diameters than practicable with the other fitting.

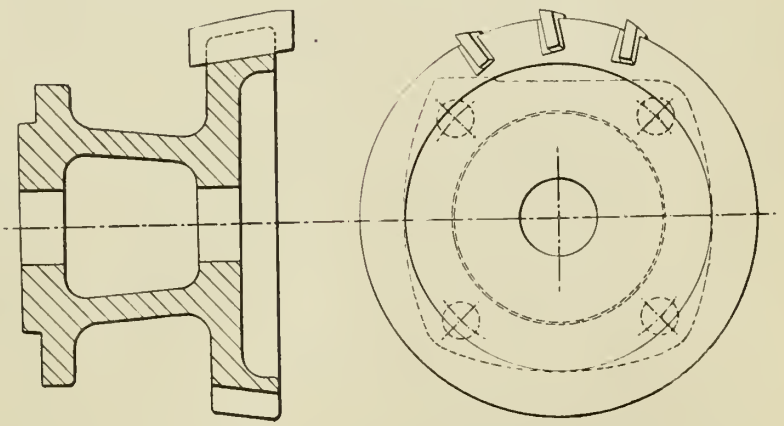


FIG. 27—FACE CUTTER WITH FLANGED BASE.

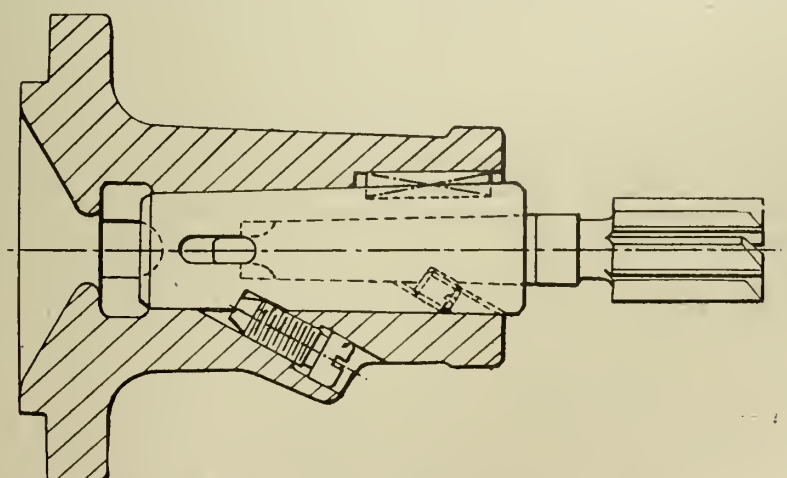


FIG. 26—SLEEVE ADAPTER FITTING FOR SMALL SHANKS.

Precautions to be Observed

All the skill in design and manufacture of these various methods of fitting and driving is set at nought unless certain precautions are observed in finishing the details, and in subsequent use. The presence of keen edges on any parts of the shanks, or arbors, or clutches, cannot be allowed, because these are so easily burred, and thereby produce small lumps and roughnesses on the corners and adjacent surfaces of the metal. This fault prevents accurate mating of the parts, and deflects the shanks, arbors, or cutters out of true running. Even when the amount of this is very slight, it may happen that the want of close fitting may lead to a little slackness, tending to vibration and chatter, which would not occur if the faces met solidly all over.

The practice of hardening, of course, reduces the chances of bruising and burring, but does not absolve the manufacturer from the necessity of adequate chamfering. In operation, much care is required in mounting and dismounting the elements. All dirt and grit should be carefully cleaned off before assembling, the hammer should be used very sparingly—preferably not at all—and in the case of boring-bars or other details where cotters are employed, and blows cannot be avoided, they should be as few as possible, and firm and well-directed. Carelessly struck blows, or those delivered needlessly hard, are apt, in course of time, to produce opening of a bar or spindle, changing its form subtly, and causing a degree of eccentricity of running, due to the warping out of longitudinal truth. Another error that is sometimes committed is that of not taking sufficient care when altering the taper of spindle noses or other fittings, as

when one desires to change from a B. & S. to Morse, or vice-versa, or to any special taper. The finishing out should be done with a carefully-rigged up internal grinding attachment, taking very slight cuts at the finish, so as to avoid inaccuracies due to the spring of the grinding spindle, or its bearings or holder.

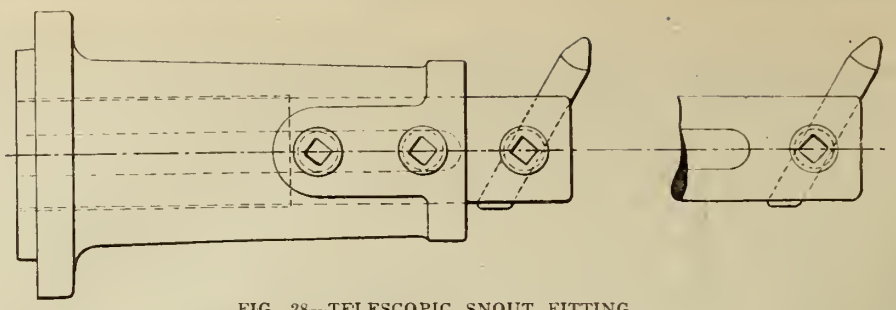


FIG. 28—TELESCOPIC SNOUT FITTING.

On What Does Production Primarily Depend?

According to the Author, Who is Secretary and Chief Engineer of the National Safety Council, Production Depends Upon Two Factors, Namely Machines and Men—Read His Views.

By SIDNEY J. WILLIAMS

PRODUCTION depends primarily on two factors—machines and men. Production also requires materials but these in turn are produced by other machines and men—using "machines" broadly to include all equipment. Production also requires capital to provide the machines and the men, and management to direct them. But machines and men are the immediate producers. They and they only can increase or decrease production. The things that cause them to do the one or the other are the things that we must study.

The basis of modern production, with respect to both machines and men, is regularity-standardization. The Swiss watchmaker a hundred years ago built his watch from the ground up, fitting each part to the parts already completed, as a carpenter builds a house. He never made two watches exactly alike. I believe the Swiss watchmaker still follows somewhat the same method But we in America make our dollar watches (which now sell for two dollars) and our two dollar alarm clocks (which now sell for four) with dies and jigs and fixtures; we stamp out the parts on power presses or machine them in automatic screw machines, so that part number 106 is always fits part number 105 exactly, although the men who make the two parts may never have seen each other and may not speak the same language. Whether in the eyes of an artist all the alarm clocks in America are worth a single beautiful Swiss watch, is a question that I will leave to philosophers. We as a nation are committed to the principle of mass production; and while we may deplore the vanishing of the old craftsman, few will seriously suggest a return to the former order.

Motion Study Expert

But we do not stop with standardizing machine operations. We standardize also the operations of men. The motion study expert tells us that practically every man wastes a large percentage of his time and effort in even the simplest operation—that a dozen skilled mechanics will do the same thing in a dozen different ways, all of them wrong. So the motion study expert determines the one best way to do a job, and in one case after another we find that by following his method we not only increase production but we decrease fatigue. While so called "efficiency engineering", like other pioneer movements, has suffered from the pretensions of quacks, there can be no serious question that modern industry demands the elimination of lost motion and the standardization, so far as is practicable, of every job in the plant.

If this is true, as it is true, I do not believe that any one will question the next proposition that I want to make—that anything which interferes with this absolute regularity of operation is inefficient and uneconomical, and that it is one of the chief functions of the engineer and the executive to bust out these disturbing influences and eliminate them.

Production Interference

The things which thus interfere with regular production are many and varied. Some of them are external to the plant itself—such as a war, or a nationwide strike, or a railroad tieup. The prevention of these is largely a function of government, and people will not long tolerate conditions that permit such national inefficiencies.

Then there are catastrophes within the plant; a strike; a disabling fire; a break-down in the power plant. Every one knows that it is the function of management to prevent such occurrences and that a management which does not in general prevent them cannot be permanently successful.

Then there is a third group of apparently minor disturbances. A laborer pushing a truck strikes an uneven place in the floor and a casting falls off the top of the load. The casting is heavy and he goes for help to put it on again. Meanwhile the lathe operator is waiting for the casting. The blockade of the passageway stops another truck coming up with material for another operator, who must also wait. The total loss of time may not be more than four minutes for each of five men—twenty minutes in all or, say, twenty-five cents worth of time.

What does the foreman do when he finds that the lathe operator is waiting for material? If he is a foreman of the old school, he goes back and bawls out the "blankety blank wop" for running his truck into a hole in the floor. The man, thus admonished, is henceforth more careful—that is, he is slower in his movements. He takes pains to avoid the holes in the floor, the posts in dark passageways, the other various sundry obstructions which sprinkle his pathway. A little later the foreman is surprised and grieved to find that he must put on another man to help the truckers because they cannot keep up. He discourses feelingly and eloquently with the Assistant Superintendent on the total depravity of laborers in general and of his laborers in particular. Am I exaggerating? Not very much. How many of us carefully walk around a hole in the floor, or a slippery place, ten times a day, because it would take a little mental and physical energy to fix it up?

The Up-to-Date Spirit

Of course, the foreman who is really on to his job, has the floor fixed at once. If he is unusually intelligent, he also looks around for other things which interfere with efficient trucking. He may find that the lighting in the passageway is poor, and recommend to the Superintendent that it be improved. He may find that the truck itself can be slightly changed so as to make it less likely that anything will fall off. The up-to-date foreman realizes that when his laborers each lose twenty-five cents worth of time a day it is up to him, not to bawl them out for it, but to find out what is wrong and correct it. And it is up to the Superintendent and higher executive officers to supply what the foreman lacks in this regard. Once labor was the

cheapest part of the cost—but the dollar-a-day man is gone.

In machine operations it is even more obvious that regularity is the essence of modern production. I dare say that every punch press foreman or superintendent in the country has as his idea of heaven a place where—if punch presses are tolerated at all—not one of them ever misses a single stroke. Unfortunately this kind of heaven, like other kinds, is seldom met with on earth. I know of large and successful companies where punch press production is from 25 to 50% less than perfect—that is, where only half or three-quarters of the strokes are productive, simply because proper means are not provided for placing the material in the press and taking it out again. The important point is that the greater part of this loss is positively preventable through the use of simple and inexpensive automatic or semi-automatic devices for placing and removing the material. With comparatively few exceptions, even in the most efficient plants, we have not had time to study these little things—the castings falling off the truck, the material sticking to the punch press, causing in each individual case a loss of time reckoned only in seconds or minutes, but causing in the aggregate a loss running undoubtedly into many millions of hours and many millions of dollars. In the past, so vast were our resources that we could overlook these "small" losses, just as the city of Chicago pumps millions of gallons of water that are distributed through leaky pipes. But now the time has come, with our diminishing man power, diminishing natural resources, and prospective sharp competition from abroad, when we must meter and stop these leaks if we are to maintain our volume of production. I have tried thus far to make the point that modern production is built absolutely on standardized regularity of operation and that anything that interferes with such regularity interferes with production. It is putting the same thought into other words to say that it is our constant effect to find the one best way of doing things and then always to do them in that way; and that anything which happens unexpectedly, whether it is a coal strike or a casting falling off the truck, is bound to interfere with our regular program and therefore to cut down our production. Therefore it is interesting to observe that the Standard Dictionary under the word "accident" gives as its first definition this: "Anything happening unexpectedly." In a second definition the dictionary recognizes, of course, the common usage of the word "accident" as meaning an occurence in which some one is hurt. But in the broader meaning it is plain that, from the standpoint of industry, a coal strike is unexpected and is therefore an accident; a breakdown of the power plant is unexpected and is therefore an accident; the sticking of material in a punch press is unexpected—not contemplated or desired by the designer of the machine—and is therefore an accident, whether any one happens to be injured or not. In short, "accident" in tht broad meaning given it by the dictionary is exactly synonomous with all the disturbing things which interfere with production—it is the exact opposite of production efficiency. It stands precisely for all those things which we as engineers and executives must fight unceasingly. Now I come at last to the point where safety enters into the proposition. Some of the "accidents" which I have mentioned—some of the things which happen unexpectedly—result in personal injury. From the standpoint of the man interested only in production, the accidents which happen to injure some one are no more and no less important than those which do not. It is true that from other standpoints the accidents causing personal injury are much more important. To the Legal Department, they mean the payment of compensation. To the Employment Department, they mean the necessity of providing another man. To any man with a spark of human feeling in his heart they mean pain and suffering to a fellow human being, perhaps poverty and distress to his dependents. But leaving these considerations out of account, considering ourselves as absolutely non-human engineers or executives, with an abundant supply of skilled labor and no compensation laws to worry about, even then we must recognize that at the very least the accident which injures some one is no less important than the accident which does not injure any one, and all these accidents—all these things happening unexpectedly—interfere with the regularity of our operation, and cut down our production. No engineer or executive living can afford to say, "I am not interested in accident prevention," unless he is willing to say, "I am not interested in efficiency"—because accidents and efficiency are absolutely incompatible; they cannot exist in the same plant; the plant where things are permitted to happen unexpectedly is an inefficient plant. Every accident is an indication that there is something wrong with men, methods, equipment, or material.

Danger Signals

And if the engineer or executive must then be interested in all accidents, whether they cause injury or not, those which do cause injury have for him a peculiar importance, because they stand out conspicuously and serve as danger signals to warn him of the inefficiency that is undermining his output. This is not theory but fact. The improvements in punch press operation, which I have already mentioned, were suggested and carried out—by whom? By the production department or by some imported efficiency engineer? No—by the safety man! He found that men were losing fingers in these punch presses because they had to reach in to the press to place or remove material. He changed the method of operation by introducing automatic or semi-automatic feeds and kickouts. He did this primarily to prevent the loss of fingers. Having done it, he found that he had increased production from 25 to 100%. The foremen were astonished. They need not have been astonished. Reflection would have shown them that the movement of the operator in reaching into the press, while it occasionally caused the loss of a finger, always caused the loss of time, and that an arrangement which would save the occasional finger would also save a fraction of a second every time the machine was operated. To quote another instance of a more general nature, the manager of one of the largest paper mills included in the membership of the National Safety Council once said to me: "Before we had a safety committee, every little while we would have to shut down our machine because of a belt breaking or something of that sort. Now our safety inspection catches these things before they happen and we have no more shut-downs. Our safety work has more than paid for itself through the increase in production, aside from cutting down our compensation costs."

You may say—"these plants were not run efficiently. If they had been, it wouldn't have taken a safety man to show them how to feed punch presses or keep belts in repair." I freely grant this. Yet the fact remains that both of the plants which I have mentioned were and are in the very front rank of their industries, they were well managed, they were making money. The management simply, like every other management that I know of, was so busy with development and with the outstanding problems which it had to face that it could not watch every single detail.

In another instance, even more noteworthy than those I have mentioned, the Chief Engineer of a large company conceived an entirely new method of accomplishing an important process in the industry—a method wholly mechanical, to replace one which required constant attention by skilled men. It happened that these men were exposed to injurious dust. When the new plan was presented, it was opposed by some of the experienced factory executives who declared on general principles their firm conviction that it would not work. The President of the company said "Even if the new method does not increase production as we hope it will, it will at least remove this danger to the health of our men. Therefore, we will try it out." It was tried out. It worked. It cut down the number of attendants required from 23 to 3 and removed all hazards to those that remained. It increased production so tremendously that it will undoubtedly revolutionize the entire industry. This

(Continued on page 205)

Plant of the Dominion Engineering Works Ltd.

By J. H. RODGERS

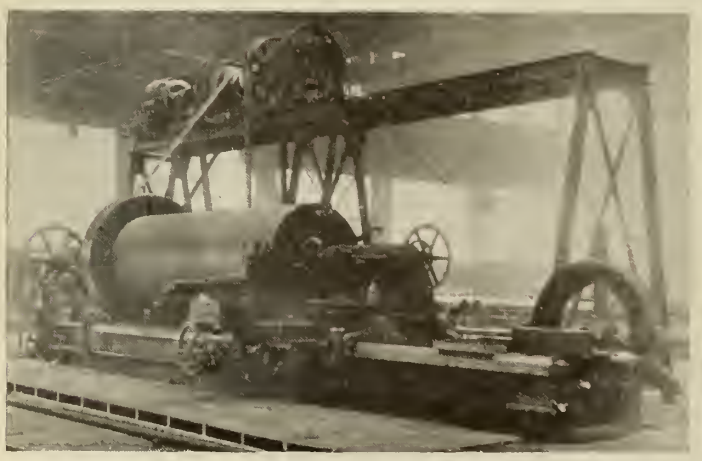
IT is surprising but interesting to note that in this comparatively short space of thirty years the export of pulp and paper from Canada has shown an approximate increase of one million per cent. In figures this might he represented as an increase in value of from $122 in 1890 to the astounding figures of $122,000,000 in 1919. This remarkable growth has been due, very largely, to the vast natural pulp wood resources and the unlimited supply of available water power, together with the initiative of the progressive business men engaged in the development of this industry.

There is, however, one feature of these activities that, until very recently, has received very little attention, and that is in the construction of the machinery essential to the problem of paper-making. In the past the bulk of this equipment has been imported, and this particularly applies to the better grade of high-speed newsprint and writing-paper making machines.

The unprecedented and rapid expansion of the pulp and paper industry in Canada, during recent years, has necessitated an abnormal demand for paper making equipment, and the opportunity for establishing plant for Canadian-made machinery was readily recognized by many of the leading business men directly associated with this great development. The result of investigation and negotiations was the incorporation of the Dominion Engineering Works, Limited, at Lachine, Quebec. This company has acquired the modern plant of the old St. Lawrence Bridge Company at Rockfield, Que., a short distance from the works of the Dominion Bridge Company, the executive of the latter being chiefly responsible for the inauguration of the new enterprise.

The plant is particularly well adapted for this new line of work, as it is provided with every modern facility for rapid and economic handling of the complexity of parts required in the construction of this type of machinery. The main building has a length of 660 feet, and is 220 feet in width. There are two erecting bays, one with a span of 85 feet and one of 75 feet, both having a length of 220 feet. There is also an additional bay 440 feet by 60 feet, that contains the boiler and power plant, tool room, smith shop, flask department, works offices, etc. The original building was provided with two 35-ton cranes and four 40-ton cranes. These cranes may be operated in pairs when desired, giving a combined capacity of 75 tons. A new 75-ton crane will shortly replace one of the smaller ones now in use. Several assembly and jib cranes are likewise provided for general erection work. The erecting department will be divided into two sections, one for paper making machinery and the other for hydraulic equipment.

An interesting feature in connection with the installation of the machine tools is the grouping of the machines on the unit principle. The overhead shafting and motors are carried on specially designed framework supported from the floor, and this arrangement relieves the roof trusses from unnecessary weight, and likewise provides free movement for the cranes overhead.



A 72" DRYER BEING TURNED ON A LARGE LATHE.

VIEW SHOWING FARRELL GRINDER GRINDING A GRANITE ROLL.

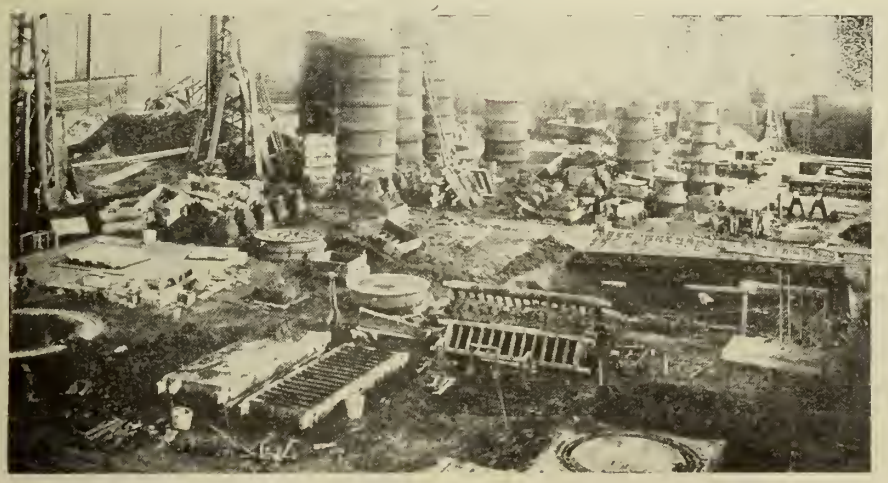
This concern at the present time are engaged in the construction of two 166-inch high-speed newsprint machines for the Laurentide Paper Company. The installation will be of the most modern design. The drier rolls will be sixteen feet in length and 72 inches outside diameter and each roll in a finished condition will weigh approximately 16 tons, and in operation will revolve at a surface speed of 1,000 feet per minute, or about 50 rev. per min. Very close accuracy is required in the machining and assembling of these units, as any slight variation in balance will be detrimental to the smooth running of the machine, and consequently the quality of the product.

The inner and outer walls of the cylinder must be perfectly concentric to assure uniform expansion and contraction by the action of the steam drying medium. These rolls, ready for assembly in the frames, are balanced to the fraction of a pound. The making of paper is comparatively a simple process, the fundamental principle being the passing of a film of wood pulp over a series of dryer drums, heated internally with steam, and thence through a number of smaller rolls covered with rubber, felt, or made of polished metal. This train of drums and reels is required to operate at high speed, and for this reason it is imperative that the mechanism and parts comprising the entire machine be fitted with extreme accuracy.

The company are likewise building a 148-inch Harper tissue-paper machine for the Interlake Tissue Mills, and prior to the present incorporation the Dominion Engineering and Machinery Company, then a subsidiary of the Dominion Bridge Co., has already constructed several paper making units, including a 48-inch Fourdrinier writing-paper machine for the Howard Smith Company, of Beauharnois, Que.,

In addition to the paper making machinery activities they are manufacturing hydraulic equipment from the original designs of the I. P. Morris Company of Philadelphia, having secured the Canadian rights for the manufacture of this firm's equipment. They are at present constructing two 20,000 h.p. waterwheels for the Laurentide Company, these being duplicates of the units now operating at the latter's plant.

The character of the work engaged in will necessitate additional capacity to the existing building now used for a foundry, which has a length of 181 feet and a width of 145 feet. This will be enlarged to 300 feet by 145 feet, and will be equipped with an 84-inch cupola in place of the two now in use, which are 37-inch and 54-inch in diameter. At present the foundry is provided with two small casting pits, but the new extension will be equipped with a casting pit 120 feet by 30 feet, and 8 feet deep. This is to facilitate the making of the castings used in the large water-turbines. The foundry will be equipped with every modern requirement for effective and economic service. A large special sand-blast room has been constructed in the main foundry for cleaning the large castings. Large and small core-ovens are installed and likewise a cinder mill for reclaiming metal and coke from the cinders. Two overhead electric cranes are provided in the foundry, one of 70-ton and the other of 15-ton capacity.



VIEW SHOWING A PORTION OF THE FOUNDRY.

PRODUCTION FACTORS

(Continued from page 203)

two-fold result was not a coincidence. It was a natural result of the fact that the old process was wasteful in both materials and time. The injurious dust that should have gone through the manufacturing process was blown out into the faces of the men. The new method saved both the dust and the men.

The man who did this remarkable piece of work was not a "safety engineer." He was an engineer who believed in safety. As a man, he believed in safety as a human necessity. As an engineer, he believed in safety as a thing inseparable bound up with engineering efficiency.

On the human value of safety, I leave each of you to judge for himself. I know how I feel and I think I know how you feel. But that is not my topic to-night. But on safety as an engineering job: I know that the engineer whom I have mentioned, and the safety man in the punch press shop, and the paper mill manager, are right—I know that safety and engineering efficiency are inseparable. You cannot have one without the other. If you are safety men and think you have to put on a guard that interferes with production, you may be sure that your remedy is only a temporary one and that it must give way eventually to an improved machine or method which will be safe without being inefficient. And the engineer or executive who thinks that accident prevention is not in his department—that he will leave that to the safety man or the insurance company or the state inspector—is missing something—something big. He will find out some day that every accident in his plant or on the machine which he designed is a danger signal for him—a symptom of time and dollars wasted as well as lives and limbs. The rough shod methods of industry a generation ago, which left a trail of human wreckage, were not only inhuman—they were inefficient. They and the man who stood for them are gone on the scrap heap and will never return.

THE INTERCRYSTALLINE BRITTLENESS OF LEAD

According to an abstract in the "Journal of the Franklin Institute" of a U.S.A. Standard Bureau Note, sheet lead sometimes assumes a very brittle granular form during service, due to corrosion. An explanation which has been offered by previous investigators for this change in properties is that it is due to an allotropic transformation, the product resulting from the change being analogous to the well-known "grey tin." Contact with an electrolyte, particularly a weak acid solution of a lead salt, has been claimed to be the agency by which the transformation is brought about. Metallographic examination of the granular "allotropic" lead shows that each grain has the characteristic properties of the ordinary form of lead. The intercrystalline cohesion of the grains for one another, however, has been so weakened that the material has a granular appearance. The rate at which the intercrystalline brittleness is brought about is proportional to the amount of impurities and to the concentration of acid in the solution in which the lead is placed. Practically all the impurities which are found in lead are lodged in between the grain. The preferential attack by the corroding agent for these impurities and perhaps also for the "amorphous intercrystalline cement," accounts for the brittleness produced.

WELDING AND CUTTING

Lessons on the A.B.C. of Good Welding

This Article Deals with Side, Overhead, and Pressure Work—Considerable Interest is Being Taken in These Practical Lessons.

By W. B. PERDUE *

LET us review carefully the position of the rod and torch shown in Fig. 3 of the April 22nd issue. Note that the angle between the torch and the weld is from 60 to 70 degrees, and that between the rod and the bevel is about 30 degrees. If we maintain these same angles with respect to our work and also the same relative positions with regard to our arms, the torch, and rod, we will experience no difficulty in executing a weld in any imaginable position.

Causes of Failure

There are three principal causes for the failure of the welds described in this chapter, viz: 1.—Lack of proper penetration and insufficient fusion of the parts welded. 2.—Unsteadiness of motion, or lack of training of the muscles of the arms in the positions in which these welds are required to be executed. This is clearly indicated by the swishing noises of the flame and the abundance of sparks which indicates oxidation of the metal within the weld. 3.—Lack of attention to minute details necessary to produce a perfect weld, resulting in a weld of rough "plastered" appearance.

Side Welds

Many of the large containers and pressure cylinders now being built by the acetylene process require the execution of welds along the sides of same. To the unversed operator of the torch these welds are almost impossible of execution. Figure 32 shows a phantom photograph of a weld of this type, looking through the plate at the operator. Note that the alternate layers of added metal extend from the outer or ripple surface to the bottom of the bevel, and slope at about 45 degrees with relation to the direction of the weld.

Working either backward or forward the position of rod and torch when at the outer or ripple surface is as shown in the posed photograph, Fig. 32. At the bottom of the bevel the torch is lifted so that the downward inclination is about equal to the upward inclination here shown. The hand holding the rod does not come below the level of the weld.

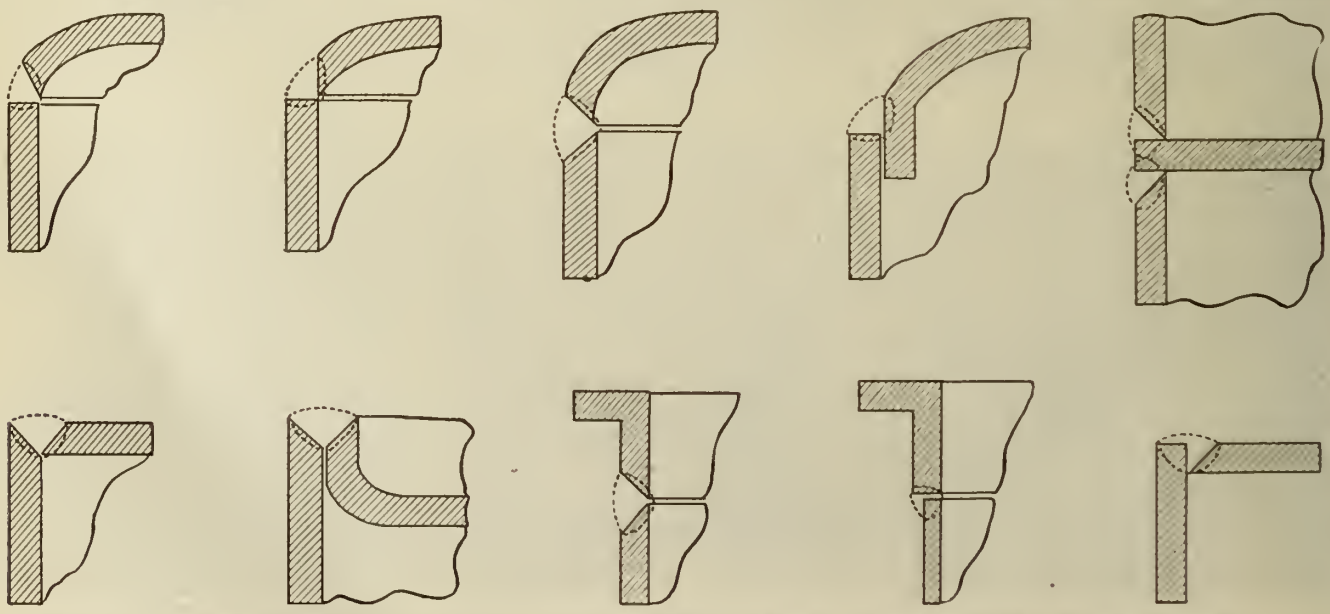
With this method of operation the tendency to form adhesions or to slop the metal from the weld is greatly minimized. The necessity for special preparation of the parts with a special bevel is also obviated, since the bevel used in ordinary work serves as well as any other.

Overhead Welds

Overhead welding is not so difficult as some may at first imagine. There is a tendency on the part of beginners to hurry the work and to add metal from the rod without first bringing the sides to proper fusion. This results in lack of proper penetration, and adhesion of metal from the rod to the unmelted sides of the parts which are not thus securely bonded together. This difficulty mastered, and proper position secured, the student will encounter no other serious difficulties and should soon become proficient in this work.

Overhead welds may be worked either forward or backward, the same movement being used as is employed in welding on a horizontal surface. Figure 32 is a photograph posed to show the

*In charge of welding instruction, Heald's Engineering School, San Francisco, Cal.



Reading from left to right and starting at top figure, we have Figs. 34 to 43. These show preparation of parts for pressure welding.

proper position of the operator in close quarters lying prone on his back. A fireproof cover stuffed with fibre asbestos will be a great comfort if used as a pillow. Long gauntlets should be worn to prevent sparks from entering the sleeves of the operator, and the use of a face shield instead of goggles is recommended.

Although it is almost impossible to dislodge any of the metal from an overhead weld, there might at times be some danger from solder or spelter which might be in or above the parts being welded. At any rate nothing is gained by placing one's face, arms or body directly beneath a large body of metal in fusion.

An imaginary line of welding has been indicated on the posed photograph shown in Figure 32. This position gives freedom of motion and prevents such sparks as may be dislodged from the vicinity of the weld from alighting on the person or clothing of the operator. The work may be carried on from a point a few inches to the left of the point directly over the top of the operator's head to a point almost two feet distant, when it will be found necessary to change positions.

When working inside a boiler or other confined space, the best of protective clothing should be worn and the operator divested of all other garments save his underwear. Otherwise the combination of a spark on the clothing and a leak of oxygen might produce disastrous if not fatal results to the operator. The helper should be cautioned never to leave the operator while working in any confined space.

Regulators should be in good repair, so that there will be no leak from them when the pressure regulating key is removed. To remove this key by turning it to the left, first from the oxygen and then from the acetylene regulator should be the first duty of the helper in case of any accident such as the bursting of a hose. The operator who fails to thoroughly instruct his helper in these very necessary precautions is taking an unnecessary chance. Be careful. Take no chances.

Containers and Pressure Cylinders

In the construction of containers it is not always possible or even advisable to separate the edges or otherwise make allowance for contraction in those welds which extend around the circumference of the parts to be joined. In such work two welders often work together. The welds are commenced at opposite sides and worked as side welds, thus producing less strain than where the weld is worked all the way round by one operator.

The welding of bottoms, either dished or flat, to cylinders caused the cylindrical part or shell to expand and become larger than the bottom or head in which the effects of expansion are not so great. This produces a deformation due to the bulging of the shell where the weld is commenced and worked all the way round without interruption. Therefore, in order to prevent distortion and the consequent internal strain of the parts being joined it is necessary even while tacking to work alternately on opposite sides, by this means the effect of expansion on one side is counterbalanced by that produced immediately afterward on the other.

In the construction of containers when either a bottom or heads in both ends are required, the method of putting in and their preparation for welding must be governed by the purpose for which the container is intended.

Pressure Containers

Containers which are to withstand considerable pressure should have the heads dished and flanged in accordance with boiler-maker's standard specifications. Furthermore, they should be so prepared that the line of welding is one of tension

(Continued on page 209)

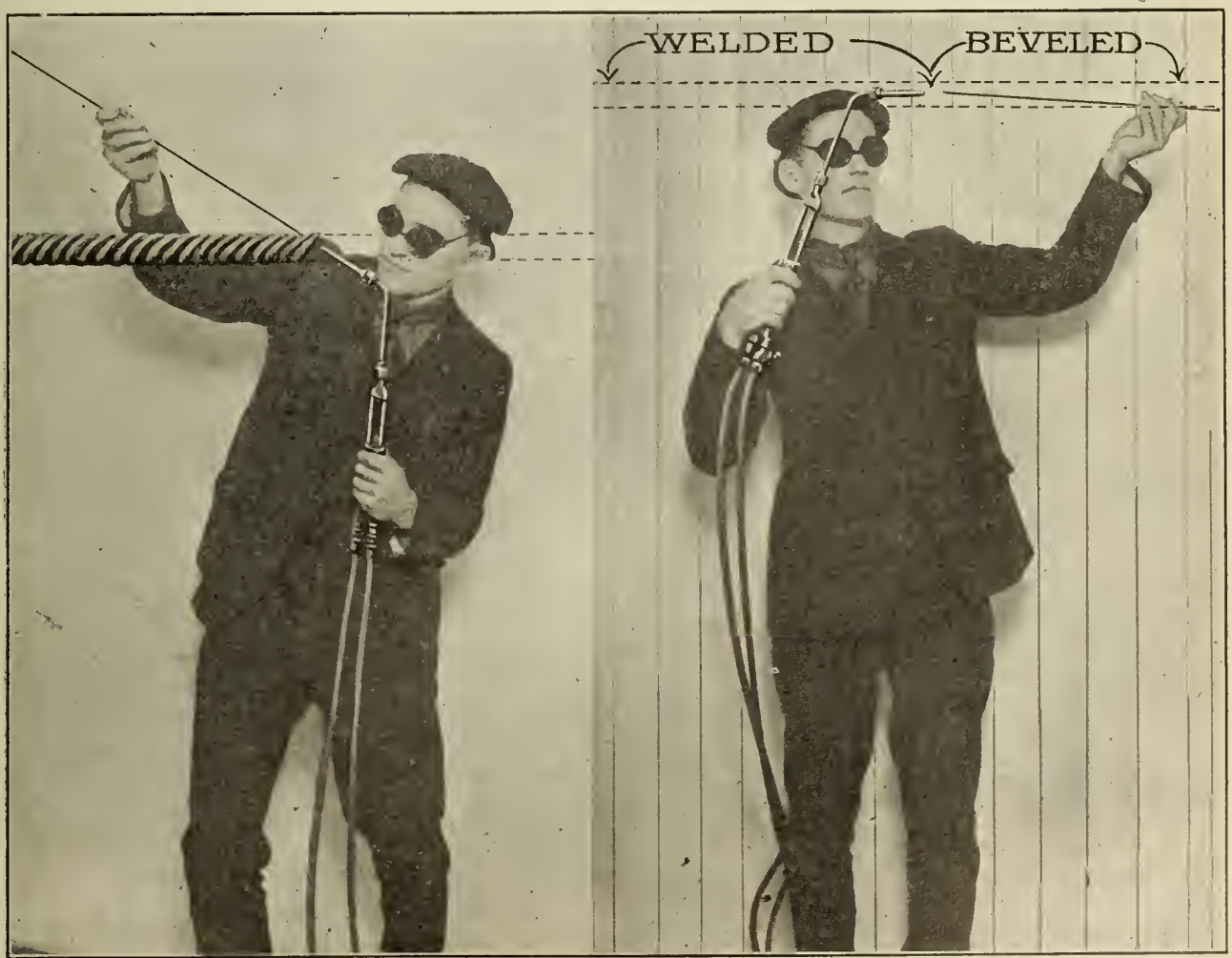


FIG. 32—Posed position, facing operator, showing rod and torch at the finish of ripple in Side Welding, working backward. In Forward Welding the same position is assumed at the commencement of the fill.

FIG. 33—View from directly above operator, lying prone on the floor, showing position for execution of overhead weld. Note that the line of welding is even with the top of operator's head and some distance to the left.

Learning the Machinist Trade is not all Sunshine

So Says John Conley, Whose Former Efforts We Have Previously Recorded—Breaking Drills, Chasing Centre Punches, and Figuring If His Square is Square, Are John's Latest Troubles.

By J. DAVIES

HITHERTO John has simply been making holes that did not need to be located very exactly, but now he is given a job that requires that the holes must be in a certain place. It has been marked off at the marking-off table as is nearly always the case, and the centre is a very small one. The drill is not running very true and he tries in vain to strike the centre. Not being successful, he decides to make the drill run true and hits it with a hammer, but this procedure breaks the drill. Off he goes to the foreman to get an order for another drill. "What's the matter with the one you had?" asked the foreman, and John meekly replied, "I broke it." "How did you break it?" "Trying to straighten it," says John. "Haven't you learned yet that you can't straighten a hardened twist drill with a hammer?" "Yes, I learnt that about five minutes ago," sighed the would-be mechanic.

"All right," commented the foreman kindly, but firmly, "but listen here. Don't forget your experience. Everyone makes mistakes. It is those who do not make the same mistake twice that succeed; come and I'll show you how to do the job."

The foreman cleans out some little bits of chips that have got inside of the chuck, moves the adjusting screws a little and makes the drill run true, then enlarges the centre punch holes with a centre punch to give the drill a chance to strike the centre. Turning, he said, "You will notice that when you start to drill a hole, the drill will not always cut true to the circle marked off, but will cut to one side. In such a case cut a light groove with a round-nosed chisel, on the side toward which the drill is to be drawn, in other words on the wide side. Don't wait until your drill is cutting nearly the full size before you draw it over or you may not be able to draw it over. Draw it over as soon as you detect the error, then cut out your chisel marks with the drill and repeat the operation until you drill is cutting true to the lines."

"Do you think you will be able to manage that job now?" he asked suddenly.

"Yes, I think so," remarked John.

"All right, let me know when you have them done," and away the foreman went.

About five minutes later John could be seen crawling on his hands and knees under the bench after the centre punch that flew out of his hands. After several minutes' fruitless search Chas. Bailey lifted his foot off it and kicked it towards him, at the same time advising him to glue it to his hand so that he could hold it. In spite of this advice John finished the job in a fairly creditable manner and lost no time in informing the foreman of the fact.

"I'll next give you a somewhat difficult job," said the foreman, "but if you will listen to the instructions carefully you should be able to manage it.

"This is a little repair job. I want to drill a hole through the collar as shown on this sketch to suit a hole in the round shaft. You will notice that owing to someone's bad workmanship the hole in the shaft does not go through the centre.

"Place the round bar in the vee block, then put the drill through the hole, bolting the vee block securely and fastening the table in such a position that the drill is free to move up and down in the hole. After this is done replace the bar with the collar to be drilled, leaving the vee block in the same place. Providing you take the proper care the holes in the collar will coincide with the holes in the bar. If the hole is to be drilled in the bar, set your drill from the collar in the same way. You can use this method for many other jobs which would be very difficult to mark off. Last but not least insert the round bar in the collar and drill through both collar and bar.

"Just by way of variance suppose we were merely attempting to drill through the centre of a round bar. In this case all you would have to do would be to simply bolt a vee block down to the table and set your drill to the centre of the vee, secure your work to the block and drill it through."

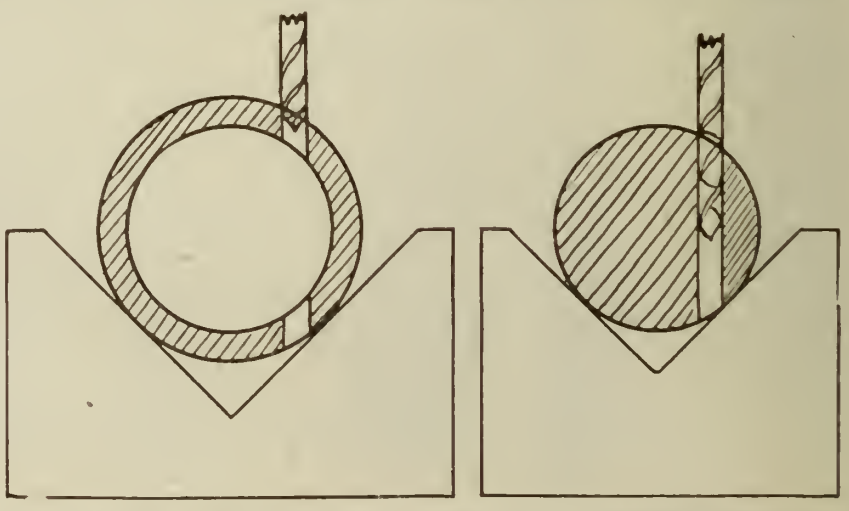
John was so impressed with the usefulness of the vee block that he told his father of his experiences in the few minutes' chat that they usually had before bedtime. He also informed him that he intended to add a pair to his own personal tools.

"Oh, that reminds me," said his father. "I intended to ask you if you hnew if your square was square, and if your level was level.

"Yes, I know for a positive fact, I took them over to Mr. Glenn, who has charge of the tool room and asked him to show me how to test them. Here is what he did. First he took the combination square, put in the 12 in. blade, taking care that there was no dirt or grit in the slot where the blade goes in. He then placed the base of the stock against the planed edge of a surface plate or marking-off table, then made a fine line close up against the blade, and reversed the square. He next drew another line parallel with the first one, leaving just as small a space between the lines as the eye could detect. He told me you could draw one line exactly on the top of the other if you desire. If the two lines thus drawn run exactly parallel, your square is correct, but if the lines do not run exactly parallel then the error in your square is equal to half the error shown by the lines. Now take out the blade and turn it upside down to test the other edge, or you may try it with micrometers to see if it is parallel, which amounts to the same thing.

"To test your center finder, you practically repeat the same operations, except that instead of the surface plate, or marking-off table, you must get something that is perfectly round.

"The end of a short shaft turned and faced in the lathe, or the end of a plug gauge will serve very well, the diameter being such as will allow the sides of the



THIS SKETCH FOLLOWED JOHN'S INSTRUCTIONS, AS TO THE METHOD OF DRILLING.

centre finder to bear somewhere about the middle."

He also told me how to test other tools, here is what he said:

"To test a spirit level place it upon a surface plate and pack up the plate, not the level, until the level shows perfectly level, then draw a pencil mark around the edge of the base of the level, reverse the level, placing the base inside the pencil mark, and if the level still shows true, it is true. If you are testing an adjustable level, adjust it until it fulfills the conditions as stated. If your level is not adjustable then you will have to scrape, file, or machine the base of the level to correct any error there may be in it.

To Test Your Protractor

"Since there are 360 degrees in every circle, if two lines forming a square or right angle are placed inside a circle, they will divide that circle into exactly four equal parts, and as 360 divided by four is equal to 90, the angle of the square will be 90 degrees. Therefore set your blade at 90 deg. and test exactly as you did for your square; if the base of the stock does not form a perfect square with the edge of the blade, it follows that every other angle will be out an equal amount.

"He said he couldn't test my straight edge except by reference to the shop straight edge. To test a straight edge properly, he mentioned we would have to have three, and if any one of these fit the other two they would be perfect.

"I don't see how he makes that out. If his straight edge and my straight edge fit each other, I don't see why they wouldn't both be right, do you?"

"Why yes, let me explain. Suppose one straight edge was hollow or concave, and the other was round or convex, it would be possible for them to fit each other perfectly and yet neither of them would be straight by any means. Now suppose we had a third one which was straight. When the first two were tried out on the straight one it would show the hollow on one straight edge and the round on the other. You can see that it would be impossible to make three pieces fit each other perfectly unless each piece was perfectly flat. Here are some other facts worth knowing.

"A pair of angle plates are among the most useful tools for fastening work to the drill. If they are both alike and properly designed, they form quite a number of very useful combinations. Bolted face to face, they can be made to form any angle; standing on end they form vees for drilling round stock endways; side by side they form parallels for drilling pipes, etc.

"An overhanging arm is often useful for drilling wheels and pulleys that are too large to go on the table.

"In drilling, tapping, and clearance holes, as in bearings and caps for same, drill the clearance holes in the cap first, then use the cap as a guide or jig for the tapping hole, putting the clearance drill into the tapping hole until it begins to cut full size, which will prevent the tap raising a burr; then change the drill to tapping size and drill the tapping holes.

"In some cases where two holes are to be drilled in line with each other at opposite sides of a casting, it is impossible to drill right through at one setting. In such a case a centre is fixed either in a casting bolted to the base of the machine, or else fitted to the hole in the centre of the table. The centre punch mark for one hole is placed in the fixed centre, and the other is brought directly under the drill. Great care must be taken to have the fixed centre directly in line under the centre of the drill spindle. Drill one end, then turn the job over and repeat the operation. When turning the job end for end, if the hole drilled is too large to sit on the conical part of the centre, it must be temporarily bushed with a concentric bush—that is, one that is turned and bored true. Fasten the job securely before you start to drill, the method of doing this depending entirely upon the nature of the job and the tools available. Now off to bed, son. I've told you enough for one night. I feel you may develop into an honest-to-goodness mechanic yet. One thing I like is you are a good listener, and good listeners are bound to learn."

A, B, C OF WELDING

(Continued from page 207)

and not of bending. This precaution is taken chiefly because of the fact that few operators secure complete and proper penetration of the parts welded, with the result that the bottom of the weld contains a line of weakness that under continual bending strains will extend deeper until it eventually produces a fracture.

The forms illustrated in Figures 34 and 35 are, therefore, subject to this criticism. Where pressures are not too great, and the welder is sure of his ability to secure complete penetration and has a torch which stirs the gases into such complete and perfect mixture as to produce no change in the metal, these welds may be used, provided proper manipulation is given thereto to eliminate impurities and produce proper refinement of the grain of the weld.

The form illustrated in Figure 36 is ideal, but costs a great deal more to prepare than the others. That given in Fig. 37 is permissible only for riveting. It should not be used where welding is to be employed.

Figure 38 illustrates the common method of preparation for welding a partition in a cylindrical container. Where this method of welding is used two welders should be employed, one working immediately behind the other. This prevents the strain which would ensue from a second heating of the metal in the immediate vicinity of the first weld and also utilizes the heat of the forward weld to speed up that of the one following. The faster of the two workmen should carry the front weld.

Storage Tanks

Where the container is to be used for storage purposes only and is not to be subjected to high pressures the head may be cut the inside diameter of the shell and tacked in position as shown in Figure 39, where both shell and head are beveled. Figure 43 shows the same arrangement with the head beveled and the shell left square. This beveling may be done more rapidly and cheaply with the cutting torch than with the circular shear, even where such circular or bevel shear forms part of the shop equipment. This form of welding is preferable where the workmen are competent and can be depended upon to secure proper penetration without adhesions or burning the metal in the bottom of the fill.

Figure 40 shows the head for a storage tank chamfered, flanged, and backed into the shell until the edges are even. It is then tacked on opposite sides in several places and welded in position. Welders can work in pairs, on opposite sides, to great advantage on this work.

Angle Iron Rings or Tops

In welding angle iron tops to cylinders either as a reinforcement for the top to keep the container in proper shape or to secure thereto a bolted head, it is necessary that both the angle iron and the shell shall be flanged where the thickness of the metal exceeds ⅛ inch. The proper preparation is shown in Figure 41. The same method of preparation is used where two cylindrical shells are to be welded end to end as is often necessary in the manufacture of long containers which can not be rolled from a single sheet of metal.

The method for welding a heavy ring to a light shell is shown in Figure 42. It is important that the greater force of the flame shall play upon the thicker section and that complete penetration shall be effected as shown by the dotted outline of the weld.

SOME INTERESTING EXAMPLES

(Continued from page 197.)

There is hardly a line of industry where they are not used, but our main idea is to familiarize readers with the different classes of tools and their uses.

All the operations depicted were performed on what are known as the 6A type of automatic, and for a later article we will present still another style of machine tool and its work.

Large Mill in B. C.—The construction of the B. C. Spruce Mills, Ltd., Wattsbury, B. C., 18 miles west of Cranbrook, B.C., is well under way. It is the first all steel and concrete mill to be built in B. C. The flume is ten miles in length and it will be the largest mill in the interior and have an output of 250,000 ft. every 16 hours. It is estimated there is enough timber for 12 years' cutting. B. F. Wilson, Warsau, Wis., is the manager.

DEVELOPMENTS IN SHOP EQUIPMENT

PORTABLE SLOTTING MACHINE

The accompanying illustrations depict the latest type of portable slotting machine recently placed upon the market by the Newton Machine Tool Works, Inc. of Philadelphia. U. S. A. This machine has a maximum stroke of 76" —cross feed to the tool slide of 40" and in-and-out feed to the tool slide of 6". There is a vertical adjustment of the tool slide of 24" and a cross feed of the upright on the sub-base by motor of 84". Saddle is counterbalanced with counterweights inside of the upright running in guides. The feed to upright is by separate motor through spiral and bevel gears and stationary screw. These feeds are automatically intermittent through friction cloth.

The upright has power rapid traverse in either direction through friction clutch controlled by hand lever,. The saddle is operated by screw with one piece bronze nut, and is supplied with taper shoes to compensate for wear. The saddle traverse is controlled by means of a coarse pitch large diameter screw which is fitted with roller thrust bearings both top and bottom to insure operation in tension. The drive to the screw is by reversible motor through spur and bevel gears, and the driving screw is carried in tension bearing with thrust collars running in oil and is supplied with a safety clutch which is disengaged by the saddle at top or bottom to prevent jamming.

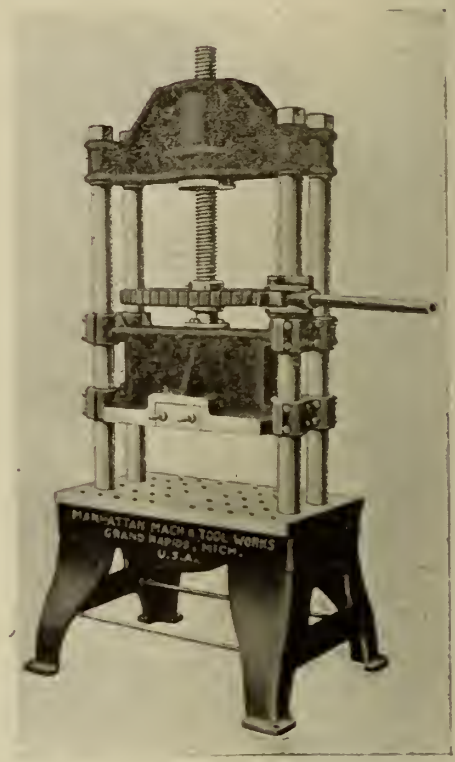
Operating dogs for the reverse are mounted on the side of machine with a latch so that they can be easily changed while the machine is in operation. These operating dogs have no connection with the feed.

The tool apron has swivel for relief and is arranged to swivel through a full circle for the making of angular cuts. The tool slide intead of having bolted straps on the side for the square gibs is integral with the slide itself and bronze taper shoes are used for taking up the play.

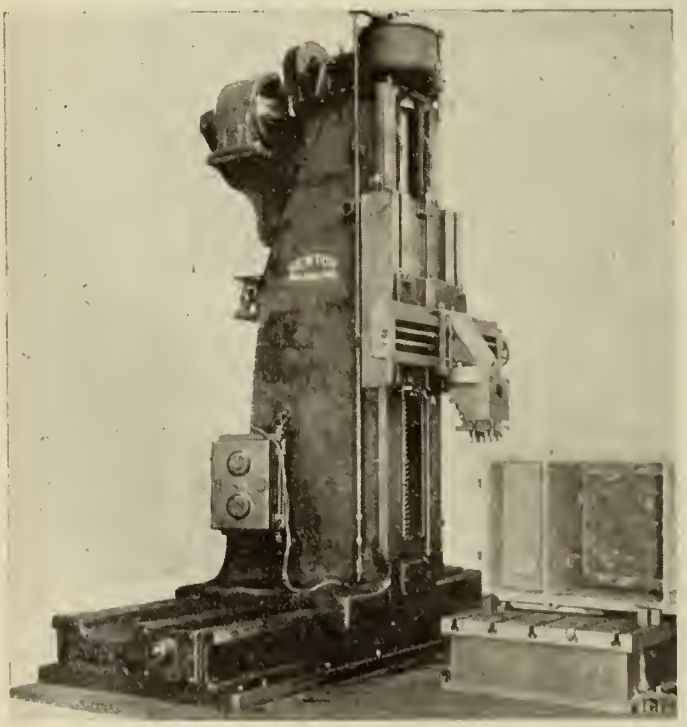
All gears on this machine are fully enclosed. A reversing planer type motor of 15 h.p. is recommended to drive the machine. A 7½ h.p. motor is recommended for the feed to the upright.

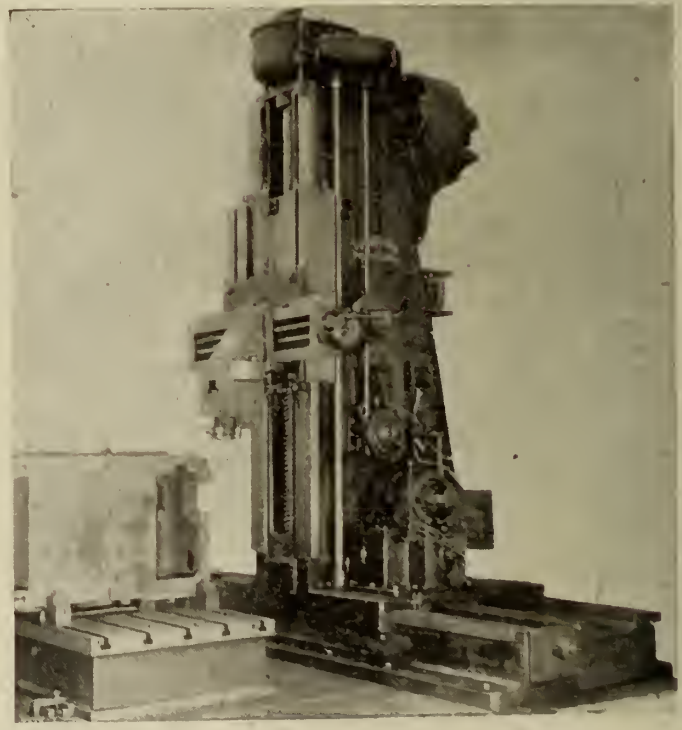
FOUR-POST SCREW PRESS

The Manhattan Machine & Tool Works, Grand Rapids, Michigan, U.S.A., has placed on the market a four-post screw press which is illustrated herewith. This press is of very massive



GENERAL VIEW OF THE SCREW PRESS.





THESE VIEWS SHOW BOTH SIDES OF THE SLOTTER.

construction, and possesses both rigidity and strength.

It will be noted that a ratchet action is secured by means of a ratchet disc, and a lever, which is of sufficient length for all purposes within the capacity of the machine. This ratchet can be reversed if desired. It can also be disengaged so as to leave the hand wheel free for rapid adjustment of the ram.

The two post presses manufactured by this concern are for the regular run of tool room work, etc., but this four post construction is especially suited to the heavier class of work.

Every convenience for facilitating quick work and simplicity of operation have been embodied in the design, and all parts are balanced as to proper strength, so that there is no danger of breaking or failing just when you want it most. Following are the principal specifications:

Capacity, 80 tons; size of bed, 20 x 36 inches; space between standards, 26 in.; floor space, 31 x 41 in.; height over all, 77 in.; height to top of bed, 24 in.; diameter of standards, 3 in.; maximum height from bed to ram, 22 in.; thickness of ram, 14 in.; thickness of bed, 3¾ in.; diameter of screw, 3 in.; diameter of hand screw, 23 in.; diameter of punch shank, 1½ to 3 in.; net weight, 2,270 lbs.; shipping weight, 2,425 lbs.; boxed for export, 2,600 lbs.; boxed for export, 58 cu. ft.

NEW THINGS IN MACHINE TOOLS

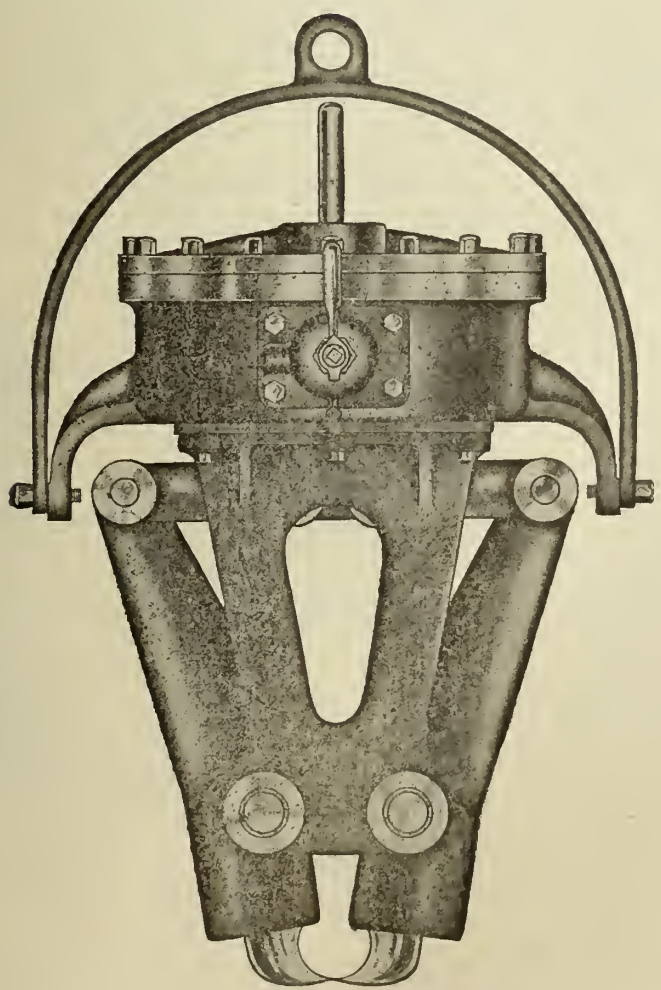
STAYBOLT CUTTER

The Baird Pneumatic Tool Co., Kansas City, have placed on the market the staybolt cutter as shown in the illustration. It is said that this cutter will clip off staybolts up to 1⅛ in. diameter at the rate of 1,200 per hour.

The machine is composed of a 15 in. air cylinder, the piston head of which connects directly through toggle movement with a pair of lever arms, into which are fastened, but removable, a pair of cutter knives of sufficient strength to clip the stay bolts.

The machine is operated at a working pressure of 100 lbs. air pressure. It delivers 88 tons pressure on the knives and the blades are so designed that when placed against the crown sheet the stay bolt is cut off just the proper distance to allow for heading over.

The machine can be operated on modern rail stay, or marine boilers, and is capable of being held at the gravity point at any angle, being perfectly balanced. This feature allows it to be easily handled on either straight side or radial stay work. Different sized blades are used depending upon the nature and length of bolt to be cut.



GENERAL VIEW OF THE STAYBOLT CUTTER.

The machine is so designed that it can be operated by one man, and all control valves are placed convenient to the operator. Apart from use in staybolt cutting, these machines can be used for the reclamation of scrap. Following are its principal specifications: Diameter of cylinder, 15 in.; travel toggle, 3 in.; maximum capacity between cutter knives, 1⅛ in.; air pressure required, 100 pounds; maximum tonnage on cutters, 88 tons; net weight complete, 430 pounds.

AIR OR STEAM ENGINE

A small engine that may be operated either by steam or air for driving portable mechanism, such as boring bars and drilling machines, has been developed by the H. B. Underwood Corporation, of Philadelphia, Pa. The working parts are inclosed in an oil-tight case which forms part of the engine base. The engine operates at a speed of 250 r.p.m. on a pressure of from 70 to 125 lbs. per square inch. These engines are made in two sizes, 3 and 5 H.P. Weight about 270 lbs.

MULTIPLE MICROMETER

The A. T. Brush Tool Company of Erie, Pa., are now making a micrometer that can be used for measuring from 0 to 2 inches, without any attachments. The spindle has a screw of 220 threads per inch while a separate screw with 40 threads per inch is used for traversing the thimble. It is stated that the readings are quite easy and accurate. Provision is made for taking up the wear of the anvil and the spindle.

CYLINDER REAMERS

The Wetmore Reamer Company of Milwaukee, Wis., is placing on the market a special set of reamer tools, designed for the production of round, straight and thoroughly smooth holes in small cylinders. A set consists of three reamers, one for roughing, one for semi-finishing and the third for finishing. Suitable arbors are provided for all makes of machines. The finishing reamer is of the floating type. All cutter blades are made of high-speed steel and accurate adjustment is provided to 0.001 inch.

IMPROVED HELVE HAMMER

An improved design of helve hammer has been brought out by Long and Allstatter, of Hamilton, Ohio. It is of the rubber-cushioned type. The treadle is arranged to prevent lost motion between it and the belt-tightener and is very sensitive in its action. Increased area of brake surface assures quick and accurate stoppage of the helve hammer when in an "up" position.

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THE WEEK IN PASSING

CANADIAN manufacturers do well to keep going as they have done, considering the trouble they have met in securing supplies. Tube mills find it difficult to operate to capacity, or anything like it, because they cannot secure skelp; our steel mills are doing their best on a very indifferent supply of coal, but they are away behind in what they should be shipping; makers of boilers and kindred lines are hampered, because they cannot get a plentiful supply of standard sizes of tubes; stove makers and electrical workers want more steel sheets, and many construction concerns are hard put to keep up their supply of rods for reinforcing. The industrial community of the Dominion is making a remarkable showing considering the handicaps and hurdles that are being placed in front of them.

THERE are now over six hundred American factories with branches in Canada, and indications are that the number will increase. The tariff is the first consideration that has to be met if U. S. firms are to do business in Canada. The war added a 7½ per cent. tax to that, and the exchange rate since then, at times as high as 17½ per cent., has made the question one of such seriousness as to compel action. U. S. firms coming to Canada do so to handle the Canadian market at close range, and also to gather the advantage of trade relationships that may exist between the various parts of the British Empire. It might mean in the long run that Canada would purchase less direct from United States by the opening of so many U. S. branches in this country, and in this way improve the exchange situation, but it will take some time for this to come to pass.

WORD comes from the Advisory Committee of Railway Executives of New York that the following are the aims in view: (1) an average daily minimum movement of freight cars of not less than 30 miles per day; (2) an average loading of 30 tons per car; reduction of bad orders cars to a maximum of four per cent.; reduction of the number of locomotives now unfit for service, and more effective efforts to bring about the return of cars to the owner roads. Now that is all very well, but the great bulk of it rests with the roads themselves. Many of the cars that come into the yards in this and other cities, especially from the other side of the line, would sag in the middle were they to get thirty tons piled into them. When Canadian business men have to pay charges from U. S. points in New York funds, and pay the increase of some forty per cent. in rates, they will have an item that will make even the strongest sit up and blink.

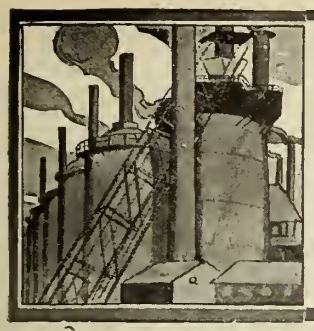
EVERY week or so some very well meaning financial critic rises and assassinates the premium mills in the steel and allied industries. And after this has been done the premium mills keep right on operating just the same. There seems to be no reconciling some of the prices that prevail in the steel market now. For instance, why should No. 10 gauge steel sheets sell at 9.50, and No. 12 at 11.25? Simply because the mills that have them for sale ask that difference. There is some improvement in the railroad situation. It may be a little hard to get some interests to admit that such is the case, but yards report cars coming from Pittsburgh in a week and less, a thing that was out of the question a few weeks ago. With the continuance of this movement—and the increased freight rates will make cars valuable—Canadian manufacturers should look for improved service in the matter of getting their much-wanted supplies from U. S. mills, and with a betterment of service the premium mills will dwindle, or at least their high prices will.

A SPLENDID summer home is pointed out in Northern Ontario, and the remark generally goes with it: "He made his money out of the war." Before the war he was just an ordinary business man, making a decent sort of a living. The war came and, to use the phrase that best fits the case, he cashed in on the thing. Cashed in while others gave their lives, and their limbs, while others sacrificed sons, husbands and brothers, homes and everything that seems worth while. And apparently there was nothing wrong in what this worthy citizen did. He wound up his business and paid all his debts, and pocketed the hold-over. And all this while others were winding up their little estates and leaving to return no more. It's a mighty poor compliment to pay to a man to hang on him the fact that he made his money out of the war. And it's a mighty poor compliment to pay to the Government of any country to say that it allows one section of its manhood to fight and die, while another lives and waxes fat and wealthy on their agony.

ENVOYS EXTRAORDINARY

—From London "Punch"

Prime Minister (To Bolshevist Delegates:) "Happy to see you, gentlemen. But would you mind going round by the tradesmen's entrance, just for the look of the thing?"



MARKET DEVELOPMENTS

Establishing Pig Iron at $50 Per Ton

Quite a Number of Sales Made at that Figure—Large Concern Recently Opening in Canada is Out Asking for Cancellations of Reductions in Price.

CHARGES are being added to business in this country. The hope that the prepayment of freight in New York funds was to be done away with seems to be doomed to failure, according to the interpretation that many houses have of the ruling, and now there is the added charge of through freights from U. S. points. These things tend to take up any sag that may be developing in favor of the consumer.

There is some improvement in the matter of railroad delivery, as yards are reporting that they receive cars from Pittsburgh in from five days to a week now. But there is still a severe shortage in some lines, such as sheets and boiler tubes. Canadian manufacturers are embarrassed more or less in several lines, because they cannot get the sizes they require, and industrial concerns all over are after tubes for repair to plants. Canadian mills are giving little relief to the steel market just now for the reason that they are operating on very indifferent and insufficient coal supplies.

One of the largest automobile concerns that has started work in Canada is asking that there shall be cancellations of a large number of its orders, or failing this, that reductions in price be made. The automobile and allied industries are having a quiet season, and the dealers in machine tools are looking for some other industry to take their place in the purchasing of equipment. The railroads have failed to buy up to expectations, in fact some of their more recent requisitions have been cancelled.

Premium prices are still quoted on a large number of lines in the steel warehouses.

The scrap metal market is uninteresting for either buyers or sellers. There is very little material being offered, and the yards are not going out of their way to take on any more tonnage. The one thing that would help would be the operating of the big mills, such as steel plants, to full capacity, and this cannot be done until the supply of coal improves.

PIG IRON IN PITTSBURGH IS GETTING FIXED AT $50 TON

Special to CANADIAN MACHINERY

PITTSBURGH, August 26.—Pig iron and coke still occupy the centre of the stage. Pig iron was going to advance because coke was so high. Now coke has declined slightly, with prospects of further declines, while pig iron has advanced sharply, with no proof that it will not advance indefinitely beyond the present level.

Car placements in the Connellsville coke region have continued good, this being due of course to the cars moving less slowly and thus making round trips more frequently. The total number of cars in the coke service rarely varies much. The increase in production, due entirely to better car supplies, is shown by the Connellsville Courier's reports of coke production in the Connellsville and Lower Connellsville region, which for three successive weeks have been as follows: 172,870 tons, 194,140 tons and 219,440 tons. Thus the last week reported upon shows an increase of 25,300 tons over the preceding week and an increase of 46,570 tons over the week before that, an increase of 27 per cent. in two weeks. The immediate influence upon the market has been small because the increase has been chiefly in the production by the furnace ovens, rather than in production by the merchant ovens, but it is going to come to the same thing in the long run, as if the steel interests make more coke in their own ovens they will seek less in the open market. In the past week spot furnace coke has been rather soft at $17.50 per net ton, f.o.b. ovens, while formerly and for many weeks it was $18.00 and $18.50, with a strong leaning towards the higher figure. "Off" coke has sold down to $16 or less.

Advancing Pig Iron

A curious caper was cut by valley foundry iron, for after being quotable at $46, valley, for several weeks, suddenly there were sales at $50. The sales were not heavy in point of tonnage, only a few thousand tons altogether, but they were in numerous lots, and in a few cases the deliveries ran to the end of the year, so that there is no question about the market being established at $50. The jump was a quick one, but from a long range view foundry pig iron has not had a particularly rapid advance, since three months ago it was $45, and six months ago it was $40. Bessemer and basic grades are probably going to be established at $50, but thus far not enough sales are on record to establish the fact. The last well established quotations were $47, valley, for Bessemer, and $46.50 for basic. There was a large sale of basic reported at $48.50, but the reported buyer has always required a limit of .03 per cent. on sulphur, and that is not standard iron. A furnaceman would be throwing money away if he could not get an extra for such sulphur in these times, hence the sale did not make a general market for basic.

An interesting commentary on the pig iron market situation is that when foundry iron was $4 some of the furnaces were discussing whether the advance in freight rates on the raw materials, coke, ore and limestone, ought not to be passed on to the pig iron buyer. For valley furnaces the advances were computed to amount to between $1.50 and $1.75 per ton of pig iron. Now the furnaces have passed $4.00 to the consumer, and the consumer must pay the advanced freight on the pig iron as well. Even to a Pittsburgh consumer the advance on pig iron freight is about 60 cents, as all rates have gone up this week 40 per cent. and the old valley-Pittsburgh rate was $1.40. On New England buyers the 40 per cent. advance

will fall much more heavily. Thus the pig iron buyer has to pay his increased freight on pig iron, the furnaceman's increased freight on the raw materials assembled, and an advance in the price besides.

The pig iron advance is made the more remarkable because pig iron was already high relative to steel, yet steel shows a slight declining tendency and pig iron advances. In last report sales of sheet bars were recorded at $70, Pittsburgh, a decline in the market of $5. It has since developed that some of the sales were equal to $1 or $2 below $70, and there is now a possibility that the next sales will be at $65, as some of the mills are anxious to sell sheet bars and the demand has slackened off. Several sales of billets are reported from the east on the basis of $60, Pittsburgh, a price that was very difficult to do two or three weeks ago.

Market Anomalies

The general market, of course, is upside down. If coke really cost all the furnaces $17.50 ovens, $50 would be altogether too low for pig iron, for at 2,200 pounds coke consumption the cost of coke delivered to valley furnaces, with the new freight, would be about $22 per ton of pig iron made. With $50 pig iron billets at $60 would be altogether too low. With $60 billets bars and shapes would be too low, for they can be bought from large independent mills at little if any above $60 per net ton. If one started from the coke he could argue that prices ought to advance all along the line, but when one came to bars and shapes at $60 or thereabouts, by the independents, he would encounter the fact that the Steel Corporation, which produces between 40 and 45 per cent. of all the steel, has prices of $47 per net ton on bars and $49 on shapes. The corporation has had those prices since the Industrial Board adjustment of March 31, 1919. It is nearly a year since the independents began to expect that the corporation would advance its prices, but the corporation has not done so.

Transportation Improved

The steel interests as a whole complain almost as much as formerly about transportation conditions, but the fact is that almost every week there is a decided improvement. The complaint is due in most cases to the improvement not being as rapid as was expected. Several weeks ago the turning point occurred in the matter of accumulating steel at mill, the rate of accumulating decreasing, and in the past week or two the condition has been of the mills shipping as much steel as they were making. Some have shipped less and have added to their accumulation, while others have shipped more, thus moving some of the steel they had previously accumulated.

Ever since steel started to accumulate at mills the question has been discussed what effect there would be upon the market by the steel eventually being shipped, in addition to current production. There is a little weakening in prices, but it is hardly discernible. One reason for the market's remaining rather strong probably is that the shipments are far from uniform to different customers, since on account of embargoes and other influences the mills can ship much more freely to some customers than to others, and thus there are left many steel consumers who are still very short of steel.

BUYERS AND SELLERS OF STEEL

It is a moot point whether the raising of freight rates will not be balanced by the slowing down of some lines of industry.

The coke market is getting easier, but not to any marked extent. The increase in production and the better car supply are having their effect.

Germany hsa recently purchased 14,000 tons of ship plate and sections in the . and it is probable that an additional 30,000 tons will be placed.

Pig iron prices continue to advance, foundry and bessemer grades being now firmly settled at $50 for this year's delivery, valley furnace. There is much caution on the part of buyers for next year iron.

There is a better market for plates, enquiry being about 5 per cent. greater than during last week. The price for sheared tank plates remains at 3.25 to 3.50, U. S. and it is probable that an additional 30,000 tons will be placed.

United States railroad car builders are expected to come into the market shortly with large plate orders.

Demand for warehouse material is active, and in some grades of black and galvanized sheets an advance has been noted.

Some automobile firms have asked sheet makers to hold up shipments for a short period, but generally there is a continued demand for delivery of sheets on order, and a good enquiry for new orders.

With the improvement in the car situation, the old material market has also taken a turn for the better, and advances on various grades run from $1 to $4 a ton.

Germany is reported to be offering barbed wire for export to South America at a price about 1½ cents lower than can be done by U. S. makers.

Mill accumulations of steel are being moved now, and the car situation looks very much better.

Germany has cut prices of pig iron, and prices of all iron and steel products, the prices to remain in effect till October 31st subject to withdrawal. No. 1 foundry is quoted at a price equivalent to about $37.65.

France has removed all import restrictions, and the only metal products now excluded are portable firearms, empty cartridges, and projectiles of all kinds.

QUIET PERIOD IN MACHINE TOOLS

DEMAND IS NOT BRISK — SOME CONCERNS ASK FOR CANCELLATION OR REDUCTION

TORONTO. — There are numerous cases of cars of material reaching Toronto from the Pittsburgh district in from six days to a week. This is one indication, and a fairly reliable one, that in spite of all other evidence otherwise, there is an improvement in the shipment situation. It may take some time for this to be generally felt, and of course there are always those who are quick to hint that the U. S. railroads are likely to find a large number of cars now that the rates have been advanced.

Information which was printed some days ago to the effect that the prepayment of freight charges from United States points in New York funds had been discontinued seems to be true in a very limited degree. Advices reaching the Canadian offices of some of the larger U.S. concerns state they have found this is not the case, excepting on a few southern lines. The roads are still insisting that freight be prepaid in American funds, and the business world still feels that an injustice is being done. One of these advices contains the following mention to the rates: ". . . the suspension only applies to tariffs which were filed by certain south-western lines, but does not affect the territories in which our mills are located (which is mostly in Pittsburgh) and there will therefore be no change from the present practice of prepaying such shipments."

It seems that the Canadian lines are not entirely agreed on the question, and it has been suggested that they must come to some understanding before anything will be done.

The increased freight charges which are due on U.S. roads in a few days now, will no doubt help to keep the price of material up. The trouble with many of these rates is that by the time they get passed on to the consumer they have grown out of all proportion and relation to the original increase.

The Machinery Market

The automobile business can be said to be out of the place it has occupied in the machinery market for some time past as the chief buyer of tools and equipment. For some time past it has been common knowledge that the market has been looking for a new buyer to come in on a large scale and take up the slack left when the automotive shops fell off in their purchases. It was expected that the railroads both in Canada and United States would come into the market in a large way, but in Canada the buying of the roads has not been very extensive, in fact some of the requisitions have been cancelled in the last few weeks.

Some of the industrial concerns are

not inclined to view with alarm the halt that has taken place in the making of automobiles. They claim that the auto industry has spoiled the labor market in every centre in which it has located, on account of the high wages paid to operators of automatic and semi-automatic machines.

One of the largest automobile concerns to come into Canada during recent months has sent out a large number of letters respecting various orders it has placed with Canadian houses, the drift of them all being that they be allowed to cancel the orders or that a substantial reduction be made in the purchase price. The chances are that if anything takes place it will be the allowance of cancellation, as it is almost out of the question for a dealer to make a reduction, as it would simply mean that more money would have to be made elsewhere to maintain the balance of profit, a thing which is most necessary in these times.

Several firms are waiting now until after Toronto fair to see the turn affairs may take there, relying on information secured at that gathering to judge their course by.

An Erratic Market

The state of the steel market is shown by the fact that No. 10 gauge is selling at 9.50, while for No. 12 the figure is 11.25. There is no apparent sense or reason between the two figures, and in the ordinary course of events they cannot be reconciled at all. The heavy sheet mills roll the 10 gauge, but beyond that the buyer had to get out and do business with the premium mills. These latter are taking full advantage of the present peculiar market. They have some material, and they are turning out more, and their books are not overburdened with orders. Hence they are selling to a trade that is willing to pay the price if it can get quick action in the matter of delivery. Canadian dealers are paying from eight to nine cent base for sheets from a number of these mills. There is considerable scheming going on too in order to get this material into this country on time. Some of the dealers are able now and then to get Canadian railway cars to send to United States mills, on the understanding that they must get them back promptly. In this way some very good tonnages have been brought across the line. The delivery of bars has been very unsatisfactory of late, and Canadian mills, owing to the trouble in securing shipment of coal, have not been able to do very much to help out in relieving the situation.

Some shipments of tubes have been secured by Toronto yards, but the amount coming in is very small compared to the orders booked up against the arrival of the supplies. Prices in United States warehouses have been increased about ten per cent. during the past week, but this has not been added here yet. The tubes that are coming in are fairly well assorted from two to four inch. Industrial concerns in many points want tubes for repairing purposes, and the shortage in supplies is hurting operations in several of the large plants in Canada where they specialize in building boilers. The big call is for 4 inch 18, and for 3½ inch. 16. A salesman going around announcing that he had a good supply of these would be a welcome caller at any port just now. The demand for plate appears to have fallen off as the business in this line is quite normal.

The scrap metal market is a lifeless affair now, and there seems to be little chance of it recovering until some of the larger mills are busy again to the point where they are eating up the material. There is a limited amount of trading going on now, but the "at a price" element is always in evidence. As one of the dealers stated to-day, "You can always sell at a price, but you can't always buy at a price." Yards are not keen to load up with much material, as they seem uncertain in regard to their views of the future trend of events.

NEW YORK THINKS THAT PRICE IS DECIDING FACTOR IN MARKET

Special to CANADIAN MACHINERY

NEW YORK, Aug. 26. — There is a sharp division of opinion in the machinery trade as to the extent to which the present business readjustment will go. Some seem to feel that the readjustment must go much further before there is any marked improvement in demand for machine tools and allied equipment, while others believe that business is suffering only a temporary reaction, and that inquiries and orders will begin to flow in more freely in the early fall, or at latest after the results of the coming Presidential election are known.

It is admitted in some quarters that the peak of prices has about been reached in all products made from iron and steel; it is contended that a readjustment of values must come about before there is any marked improvement in buying. At present there is no suggestion of lower prices on machine tools. As long as manufacturers have a few months' business on their books they are not likely to jeopardize such business by reducing prices, but such price reductions may come when builders of tools are actually "hungry" for orders. Some will undoubtedly be in this position before the first of the year if the present inactivity is prolonged. Some sellers say that if there are to be lower prices on machine tools there must also be a readjustment downward of wages paid to labor. Raw materials are high, but this cost comes secondary to that of labor costs.

The dullness which has prevailed in machine tool markets for some weeks continues. In Chicago there has been a little activity among the railroads, and there are prospects that nearly all of the carriers will come into the market for shop equipment as soon as the full effect of the new freight and passenger rates has been felt. At present the purchasing departments of the roads do not know just how much of such equipment will be bought because no funds have been appropriated by boards of directors. Should railroad buying develop in fairly large volume this fall it would be a great boon to the machine-tool industry. There are some who predict that there will not be much railroad buying before spring.

The Federal Signal Co., Albany, N.Y., which manufactures railway signal systems, is in the market for about a dozen tools, but otherwise inquiry in this market is at a minimum. Some dealers and factory representatives report conditions as dull as they have ever known them to be.

TIRE MAKERS ARE LAYING MEN OFF

Production on Hand Enough to Warrant Curtailing at Toronto Factory

The night shift of the Goodyear Tire and Rubber Company's plant at New Toronto, consisting of about 600 men, is being laid off. President C. H. Carlisle confirmed this report and stated that, while the plant had always worked to capacity, it had been deemed advisable to cut down the production. The "lay-off" will apply only to the New Toronto factory.

President Carlisle ascribed the necessity of the slowing down to overproduction. "We have not had trouble with the men over wages," he said, and paid tribute to the loyalty and co-operation of the employees.

The first of the New Year was set by Mr. Carlisle as the possible date when the men would be taken on again. "We do not anticipate laying off any more men," he said. This will leave between 2,400 and 2,500 men still on the pay-roll of the firm.

There was the possibility of keeping all the men on the pay-roll, but they would be working only four days a week, and it was decided it would be better to let them out in order that they could get continuous work in other places.

Speaking of over-production, Mr. Carlisle said that the wet months of June and August had retarded the demand for automobiles and the mileage was greatly reduced. The lack of steel, caused by the steel strike, the coal miners' strike and the switchmen's strike had all had their bearing on the automobile industry.

Open Canadian Branch.—Clemson Bros., makers of Star back saw blades have opened a branch warehouse and office in Canada, the location being Room 304 Imperial Building, Hughson & Main Sts., Hamilton. F. J. Macdonell is the Canadian manager.

Decide To Arbitrate and Stay at Work

British Steel Masters and Employees Reach Agreement—Joint Committee Will Consider All Matters that May Come in Dispute—Three Main Points in the New Understanding.

LONDON.—The details of an agreement recently arrived at between the iron and steel employers and their skilled craftsmen and helpers engaged in the repair and maintenance of blast furnace plants, coke ovens and steel rolling mills, which have recently been made known, must gladden the hearts of all who take a friendly interest in the relations between capital and labor. The agreement is signed by, and on behalf of, the Steel Ingot Makers' Association, the North of England Iron and Steel Manufacturers' Association, the Cleveland Iron Masters' Association on the one hand, and the Amalgamated Society of Engineers, the Electrical Trades Union, and the United Machine Workers' Association on the other—whose representatives are to be congratulated upon accomplishing an exceedingly useful piece of work, that must remove anxiety and assure peaceful and uninterrupted running of machinery for many months to come.

The working arrangements of the men concerned, engineers, electricians, plumbers, blacksmiths, roll turners and a number of other trades, have always been a source of anxiety to the management, as they invariably are in all industries forced to keep their plant running day and night, inasmuch as owing to the rates for overtime, it is uneconomical to have more mechanics on the night shift than is absolutely necessary to effect minor adjustments. But there is always the possibility of a breakdown, necessitating the employment of more men than are available, thereby causing delay in the restarting of the productive machinery, not to mention annoyance on the part of the steelworkers themselves, who are paid by results.

The Main Points

The three main points that distinguish the agreement concern, in the order of importance: (1) Arbitration and a joint committee to consider matters in dispute; (2) recognition that day workmen are interested in tonnage output; (3) payment for abnormal hours (overtime) in plainly stated terms. Again the principal and outstanding feature of (1) is that there is to be no cessation of work pending a settlement of the matters in dispute, either by the joint committee or by arbitration. And the agreement cannot be terminated unless three calendar months' notice in writing has been given.

In other respects the procedure of the joint committee follows pretty closely that of the "Whitley scheme," particulars and details of which are familiar. The committee is to consist of not more than eight employers' representatives and eight workmen's representatives, who will adjudicate upon any question submitted to them from any works owned or controlled by the association mentioned. As each establishment will have its own joint committee and shops committees, the above will provide an additional court for the hearing of a grievance, strengthened by the circumstance that the majority of its members will not be directly concerned.

Arbitration Proposals

Even in the event of this committee being unable to agree, however, the matter in dispute is to be submitted to arbitration. If, after all this procedure has been tried, the results are unavailing in averting a strike, it cannot be said that the "walk-out" savored of the lightning variety, so beloved of the syndicalist. As regards (2), the details of the tonnage bonus scheme have not been worked out, but it is significant that employers are beginning to realize that a mechanic—an engineer's fitter, for instance—is, and ought to be interested in output.

It will be remembered that the committee advised Winston Churchill to advance the wages of engineers, who, by virtue of their occupation, particularly tool and gauge makers, could not be employed on piece work or other system of payment by results. The necessity for some such increase was manifest by the fact that these men were taken from the productive shops into the tool room—from mass production payment by results and high earnings—on to a day-rate system and comparatively low earnings wholely and solely because of their skill.

In other words the more highly skilled suffered very considerably because they were better craftsmen than their colleagues. How the special increase of 12½ per cent. first granted to the tool makers eventually covered the whole round of industrial activity and was paid to every man for whom it was originally intended relatively in the same position, is a byword, and a subject of laughter even to-day.

Three-Shift System

Regarding the third point in the agreement, an arrangement for establishing a three-shift system appears to have been worked out in an eminently simple way without the complications commonly associated with maintenance men, such as bare time for so many hours, time and a quarter for so many, and time and a half afterwards, and so forth. A man engaged on the first shift, namely 6 a.m. to 2 p.m., will be paid 8 hours; the second shift, from 2 p.m. to 10 p.m., will be paid 10 hours, and from 10 p.m. to 6 a.m., 12 hours. On Saturday the first shift will be from 6 a.m. to 1 p.m. for which 8 hours will be paid. An interval of 30 minutes for each shift will break the monotony and give opportunity for a meal. None will remain permanently on the same shift; every man will take his turn in doing the three-shift, alternate weeks.

The advantage of this arrangement lies in the opportunity that is given to the management to apportion the requisite number of maintenance men in each shift, and the desire engendered in each group of men to keep their plant running as long and as free from delay as their colleagues, whom they relieve. Coupled with the fact that the worker has now distinct interest in increased output, indifference is changed to zeal and a desire to get things going, and to preparations and intelligent anticipation of things needed in cases of emergency.

STEEL EARNINGS VERY GOOD SO FAR

First Four Months of the Year Are in Advance of the Same Period Last Year

MONTREAL.—Among the constructive events of the day is the information that the Dominion Steel Corporation's earnings for the first four months of the year are running well ahead of those for the same period last year, in fact, running very much ahead.

At a meeting of the directors the financial report for the four months mentioned was discussed, and pleasure expressed at the improvement. As a result of the meeting, plans for improving the status of the corporation and the opening of two new coal mines were authorized.

In reference to the opening of the mines, it is stated that the demand for coal is so urgent that every effort of the company to increase the output will be extended to take advantage of this demand. That is the immediate reason for rushing the opening of the two new mines.

The financial expenditures necessary to this and to carry out other improvements will be paid for out of the improved current earnings, and will not necessitate any raising of money.

"Our current earnings are good enough," said the president, "to pay for all improvements, etc., as we go along."

Coal Arriving.—Railway officials claim that a record was established at the Niagara frontier on Sunday when nine hundred cars of coal were cleared for destinations in Ontario. Five hundred of these cars passed through Hamilton and the remainder went via Burlington Junction to Toronto and points

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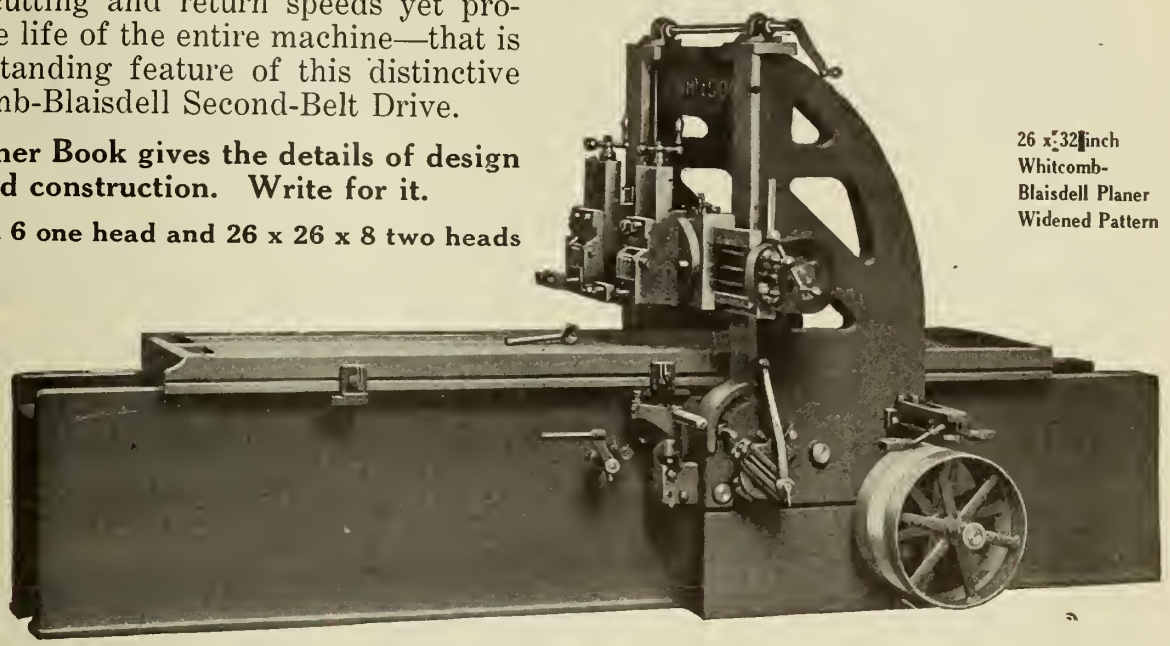

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64 Front St. TORONTO

Gray Iron and Semi Steel Castings of all Descriptions

From 5 lbs. up to 4 tons

Foundry capacity, 15 tons per day.

Difficult castings our specialty.

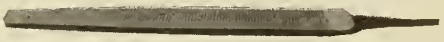
Mixtures regulated by chemical analysis and all castings sandblasted.

Estimates from blue prints submitted promptly.

If desired, we can make patterns to your drawings.

G. W. MacFarlane Engineering, Limited

Paris, Ontario



Don't blame the Mechanic.

Use

P.H. or Imperial

Files.

P H IMPERIAL

"They cut faster and wear longer."

Be File-wise.

Ingersoll File Company, Limited.

John Morrow Screw and Nut Co., Ltd., Sole Distributors,

Ingersoll, Ontario.

INGERSOLL

If interested tear out this page and place with letters to be answered.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$42 40
Lake Superior, charcoal, Chicago	57 00
Standard low phos., Philadelphia	50 00
Bessemer, Pittsburgh	43 00
Basic, Valley furnace	42 90
Toronto price:—	
Silicon, 2.25% to 2.75%	52 00
No. 2 Foundry, 1.75 to 2.25%	50 00

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	$ 5 50
Steel bars, base, Toronto	5 50
Iron bars, base, Montreal	5 50
Steel bars, base, Montreal	5 50
Reinforcing bars, base	5 00
Steel hoops	7 00
Norway iron	11 00
Tire steel	5 75
Spring steel	10 00
Band steel, No. 10 gauge and 3-16 in. base	6 00
Chequered floor plate, 3-16 in.	8 40
Chequered floor plate, ¼ in.	8 00
Bessemer rails, heavy, at mill	....
Steel bars, Pittsburgh	3 00-4 00
Tank plates, Pittsburgh	4 00
Structural shapes, Pittsburgh	3 00
Steel hoops, Pittsburgh	3 50-3 75
F.O.B., Toronto Warehouse	
Small shapes	4 25
F.O.B. Chicago Warehouse	
Steel bars	3 62
Structural shapes	3 72
Plates	3 67 to 5 50
Small shapes under 3"	3 62
	C.L. L.C.L.

FREIGHT RATES

Per 100 Pounds.

Pittsburgh to Following Points		
Montreal	33	45
St. John, N.B.	41½	55
Halifax	49	64½
Toronto	27	39
Guelph	27	39
London	27	39
Windsor	27	39
Winnipeg	89½	135

METALS

	Gross. Montreal	Toronto
Lake copper	$25 00	$24 00
Electro copper	24 50	24 00
Castings, copper	24 00	24 00
Tin	62 00	65 00
Spelter	11 50	12 00
Lead	10 75	11 00
Antimony	13 00	14 00
Aluminum	34 00	36 00

Prices per 100 lbs.

PLATES

Plates, 3-16 in.	$ 7 25	$ 7 25
Plates, ¼ up	6 50	6 50

PIPE—WROUGHT

Price List No. 44—April, 1926.

STANDARD BUTTWELD S/C

	Steel Black	Steel Galv.	Gen. Wrot. Iron Black	Gen. Wrot. Iron Galv.
⅛ in.	$6 50	$ 8 50	....	....
¼ in.	5 13	7 26	$ 5 43	$ 7 56
⅜ in.	5 13	7 26	5 43	7 56
½ in.	6 84	8 42	7 27	8 84
¾ in.	8 45	10 58	9 03	11 16
1 in.	12 50	15 64	13-35	16 49
1¼ in.	16 91	21 16	18 06	22 31
1½ in.	20 21	25 30	21 59	26 68
2 in.	27 20	34 04	29 05	35 89
2½ in.	43 00	53 82	....	....
3 in.	56 23	70 38	....	....
3½ in.	71 30	88 32	....	....
4 in.	84 48	104 64	....	....

STANDARD LAPWELD S/C

	Steel Black	Steel G'v.	Gen. Wrot. Iron Black	Gen. Wrot. Iron Galv.
2 in.	$30 90	$37 74	$34 60	$41 44
2½ in.	45 34	56 16	51 19	62 01
3 in.	59 29	73 44	66 94	81 09
3½ in.	73 14	90 16	82 34	99 36
4 in.	86 66	106 82	97 56	117 72
4½ in.	0 98	1 23	1 24	1 49
5 in.	1 15	1 44	1 44	1 73
6½ in.	1 49	1 86	1 87	2 25
7 in.	1 94	2 43	2 42	2 90
8-L in.	2 04	2 55	2 54	3 05
8 in.	2 35	2 94	2 92	3 51
9 in.	2 81	3 52	3 50	4 21
10-L in.	2 61	3 26	3 25	3 90
10 in.	3 36	4 20	4 18	5 03

Prices—Ontario, Quebec and Maritime Provinces

WROUGHT NIPPLES

4" and under, 60%.

4½" and larger, 50%.

4" and under, running thread, 30%.

Standard couplings, 4-in. and under, 30%.

Do., 4½-in. and larger, 10%.

OLD MATERIAL

Dealers' Average Buying Prices.

	Per 100 Pounds. Montreal	Toronto
Copper, light	$15 00	$14 00
Copper, crucible	18 00	18 00
Copper, heavy	18 00	18 00
Copper wire	18 00	18 00
No. 1 machine composition	17 00	17 00
New brass cuttings	11 00	11 75
Red brass turnings	14 50	15 75
Yellow brass turninbs	9 00	9 50
Light brass	7 00	7 00
Medium brass	8 00	7 75
Scrap zinc	6 50	6 00
Heavy lead	7 50	7 75
Tea lead	4 50	5 00
Aluminum	19 00	20 00
	Per Ton	Gross
Heavy melting steel	18 00	18 00
Boiler plate	15 50	15 00
Axles (wrought iron)	25 00	20 00
Rails (scrap	23 00	18 00
Malleable scrap	26 00	25 00
No. 1 machine east iron	32 00	33 00
Pipe, wrought	12 00	12 00
Car wheel	33 00	33 00
Steel axles	25 00	20 00
Mach. shop turnings	11 00	11 00
Stove plate	26 50	25 00
Cast boring	14 00	14 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, 7-16 and up	+10
Carriage bolts, ⅜-in. and less	Net
Coach and lag screws	—15
Stove bolts	55
Wrought washers	—25
Elevator bolts	+10
Machine bolts, 7-16 and over	+10
Machine bolts, ⅜-in. and less	+10
Blank bolts	Net
Bolt ends	Net
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	+25
Machine screws, fl. and rd. hd., brass	net
Machine screws, o. and fil. hd., brass	net
Nuts, square, blank	+25 add $2 00
Nuts, square, tapped	add 2 25
Nuts, hex., blank	add 2 50
Nuts, hex., tapped	add 3 00
Copper rivets and burrs, list less	15
Burrs only, list plus	25
Iron rivets and burrs	40 and 5
Boiler rivets, base ¾" and larger	$8 50
Structural rivets, as above	8 40
Wood screws, O. & R., bright	75
Wood screws, flat, bright	77½
Wood screws, flat, brass	55
Wood screws, O. & R., brass	55½
Wood screws, flat, bronze	50
Wood screws, O. & R., bronze	47½

MILLED PRODUCTS

(Prices on unbroken packages)

	Per Cent
Set screws —20% 25 and	5
Sq. and hex. hd. cap screws	12½
Rd. and fil. hd. cap screws	plus 25
Flat but. hd. cap screws	plus 50
Fin. and semi-fin. nuts up to 1-in.	12½
Fin. and Semi-fin. nuts, over 1 in., up to 1½-in.	—5
Fin. and Semi-fin. nuts over 1½ in., up to 2-in.	+12½
Studs	+5
Taper pins	—12½
Coupling bolts	+40
Planer head bolts, without fillet, list	+45
Planer head bolts, with fillet, list plus 10 and	+55
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	+60
Collar screws	list plus 20, 30
Thumb screws	40
Thumb nuts	75
Patch bolts	add +85
Cold pressed nuts to 1½ in.	add $1 00
Cold pressed nuts over 1½ in.	add 2 00

BILLETS

	Per gross ton
Bessemer billets	$60 00
Open-hearth billets	60 00
O.H. sheet bars	76 00
Forging billets	56 00-75 00
Wire rods	52 00-70 00

Government prices.

F.O.B. Pittsburgh.

NAILS AND SPIKES

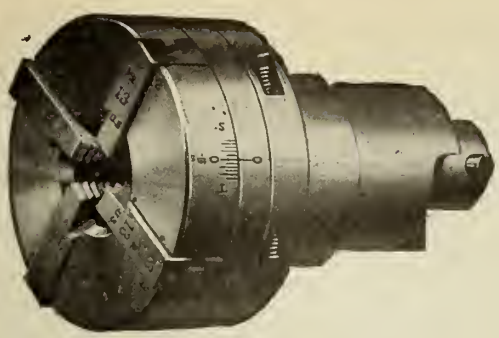
Wire nails, base	$6 10
Cut nails, base	7 00
Miscellaneous wire nails	50%

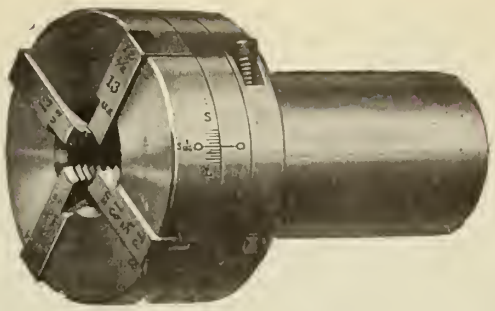
ROPE AND PACKINGS

Plumbers' oakum, per lb.	0 10¼
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 35½
British Manila rope	0 28
New Zealand hemp	0 28

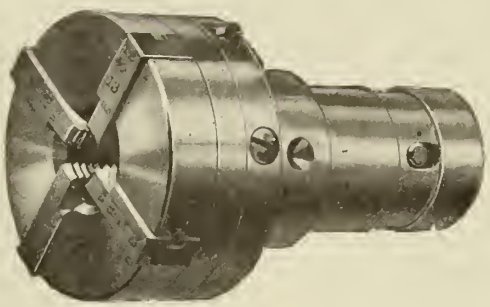
POLISHED DRILL ROD

Discount off list, Montreal and Toronto	net





Geometric Solid Adjustable Die Heads



When one uses the word "ONLY," he needs to be sure of what he is talking about. With confidence we use the word in saying that a Geometric Solid Adjustable Die Head, fitted with a set of milled dies, is the only solid die head that will back off without stripping the thread.

Geometric Solid Adjustable Die Heads may be fitted with either a releasing shank, plain shank, or with special shank for the Gridley Automatics. The releasing shank permits the head to disengage from the shank upon completion of the thread. The plain shank fits the head for use on the turret of a lathe or on a live spindle, such as a drill press.

Apart from the fact that it is not equipped with the self-opening feature or the roughing and finishing attachment, the Geometric Solid Adjustable Die Head is the same in principle and construction and will do equally as accurate work as the other styles of Geometric Die Heads.

Whatever the requirements, there is a type of Geometric Die Head best adapted to the work.

THE GEOMETRIC TOOL COMPANY
NEW HAVEN CONNECTICUT

Canadian Agents:

Canadian Fairbanks-Morse Co., Ltd., Manitoba, Saskatchewan, Alberta.

Williams & Wilson, Ltd., Montreal. The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg; St. John, N.B.; Halifax, N.S.

If interested tear out this page and place with letters to be answered.

MISCELLANEOUS

Solder, strictly	$ 0 35
Solder, guaranteed	0 39
Soldering coppers, lb.	0 62½
White lead, pure, cwt.	20 35
Red dry lead, 100-lb. kegs, per cwt.	16 00
Gasoline, per gal., bulk	0 38
Pure turp., single bbls., gal.	3 15
Linseed oil, raw, single bbls.	2 37
Linseed oil, boiled, single bbls.	2 40
Wood alcohol, per gal.	4 00
Whiting, plain, per 100 lbs.	3 00

CARBON DRILLS AND REAMERS

S.S. drills, wire sizes	32½
Can. carbon cutters, plus	20
Standard drills, all sizes	32½
3-fluted drills, plus	10
Jobbers' and letter sizes	32½
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	50
Sleeves	50
Taper pin reamers	25 off
Drills and countersinks	net
Bridge reamers	50
Centre reamers	10
Chucking reamers	net
Hand reamers	10
High speed drills, list plus	10 to 30
Can. high speed cutters, net to plus	10
American	plus 40

COLD ROLLED STEEL

[At warehouse]

Rounds and squares	$7 base
Hexagons and flats	$7.75 base

IRON PIPE FITTINGS

	Black	Galv.
Class A	60	75
Class B	27	37
Class C	18	27

Cast iron fittings, 5%; malleable bushings, 22½%; cast bushings, 22½%; unions, 37½%; plugs, 20% off list.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$8 50	$10 50
Sheets, Blue ann., No. 10	8 50	9 50
Canada plates, dull, 52 sheets	8 50	10 00
Can. plates, all bright	8 60	9 00
Apollo brand, 10¾ oz. galvanized	....	....
Queen's Head, 28 B.W.G.	11 00	....
Fleur-de-Lis, 28 B.W.G.	10 50	....
Gorbal's Best, No. 28	....	....
Colborne Crown, No. 28.	....	....
Premier, No. 28, U.S.	11 50	11 60
Premier, 10¾-oz.	11 50	12 00
Zinc sheets	16 50	20 00

PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13.00; 5-16, $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅞ in., $9.20; ¾ in., $9.30; ⅝ in., $9.50; 1 in., $9.10; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $13.00; 5-16 in., $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.50; ¾ in., $9.30.

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

BOILER TUBES.

Size.	Seamless	Lapwelded
1 in.	$27 00	$.....
1¼ in.	29 50	.....
1½ in.	31 50	29 50
1¾ in.	31 50	30 00
2 in.	35 00	30 00
2¼ in.	35 00	29 00
2½ in.	42 00	37 00
3 in.	50 00	48 00
3¼ in.	.. ..	48 50
3½ in.	63 00	51 50
4 in.	85 00	65 50

Prices per 100 ft., Montreal and Toronto

OILS AND COMPOUNDS.

Castor oil, per lb.	
Royalite, per gal., bulk	27½
Palacine	30½
Machine oil, per gal.	54½
Black oil, per gal.	28
Cylinder oil, Capital	82½
Petroleum fuel oil, bbls., net	18

BELTING—No 1 OAK TANNED

Extra heavy, single and double	6½
Standard	6½
Cut leather lacing, No. 1	2 00
Leather in side	2 40 3 00

TAPES

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	$4 60
Polishing wheels, bull-neck	2 00
Emery in kegs, Turkish	09
Pumice, ground	06
Emery glue	30
Tripoli composition	09
Crocus composition	12
Emery composition	11
Rouge, silver	60
Rouge, powder, nickel	45

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	.08½
Grits, 80 and finer	.6

BRASS—Warehouse Price

Brass rods, base ½ in. to 1 in. rod	0 34
Brass sheets, 24 gauge and heavier, base	$0 42
Brass tubing, seamless	0 46
Copper tubing, seamless	0 48

WASTE

XXX Extra	.24
Peerless	.22½
Grand	.22½
Superior	.22½
X L C R	.21
Atlas	.20
X Empire	.19½
Ideal	.19
X Press	.17½

Colored

Lion	.17
Standard	.15
No. 1	.15
Popular	.13
Keen	.11

Wool Packing

Arrow	.35
Axle	.28
Anvil	.22
Anchor	.17

Washed Wipers

Select White	.20
Mixed colored	.10
Dark colored	.09

This list subject to trade discount for quantity.

RUBBER BELTING

Standard ... 10% Best grades... 15%

ANODES

Nickel	.55 to .60
Copper	.38 to .40
Tin	.70 to .70
Zinc	.16 to .17

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	$42 50	$43 00
Copper wire, list plus 10		
Plain sheets, 14 oz., 14x60 in.	46 00	44 00
Copper sheet, tinned, 14x60, 14 oz.	48 00	48 00
Copper sheet, planished, 16 oz. base	46 00	45 00
Braziers', in sheets, 6 x 4 base	45 00	44 00

LEAD SHEETS

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$10 75	$14 50
Sheets, 3½ lbs. sq. ft.	10 50	14 00
Sheets, 4 to 6 lbs. sq. ft.	10 25	13 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS

Acid, boracic	$ .23
Acid, hydrochloric	.04
Acid, nitric	.11
Acid, sulphuric	.04
Ammonia, aqua	.15
Ammonium, carbonate	.23
Ammonium, chloride	.22
Ammonium hydrosulphuret	.75
Ammonium sulphate	.30
Arsenic, white	.14
Copper, carbonate, annhy	.41
Copper, sulphate	.15
Cobalt, sulphate	.20
Iron perchloride	.62
Lead acetate	.30
Nickel ammonium sulphate	.20
Nickel carbonate	.32
Nickel sulphate	.22
Potassium sulphide (substitute)	.42
Silver chloride (per oz.)	1.30
Silver nitrate (per oz.)	1.25
Sodium bisulphate	.14
Sodium carbonate crystals	.06
Sodium cyanide, 127-130%	.38
Sodium hyposulphite per 100 lbs	8.00
Sodium phosphate	.15
Tin chloride	.80
Zinc chloride, C.P.	.30
Zinc sulphate	.10

Prices per lb. unless otherwise stated

Quality

CONFIDENCE

THE GREATNESS OF BRITAIN IS FOUNDED ON HER INTEGRITY.

HER STRENGTH SHE DERIVES FROM WORLD COMMERCE—HER ENDURANCE FROM CONFIDENCE.

THE WAR TEMPORARILY RETARDED HER CONSTRUCTIVE EFFORTS, BUT THE POWER OF THE CONFIDENCE OF THE PEOPLES OF THE WORLD WILL RESTORE TO HER IN MORE BRILLIANT FORM THE LEADERSHIP SHE HAS JUSTLY EARNED AND PROUDLY HELD.

CONFIDENCE IS THE FOUNDATION OF OUR POSITION IN THE WORLD OF IRON AND STEEL—OUR PROGRESS DEPENDS ON IT.

WE HAVE BEEN SUCCESSFUL IN THE PAST—THE FUTURE IS BEFORE US. TO ADVANCE, WE MUST CONTINUE TO MERIT THE CONFIDENCE OF THE BUYERS OF STEEL AND IRON PRODUCTS OF EVERY DESCRIPTION IN CANADA, AND WE ARE DETERMINED TO ADVANCE.

THE
STEEL COMPANY
OF
CANADA
LIMITED
HAMILTON MONTREAL

Service

The Rational Use of the Cutting Blow Pipe

By Marcel*

THE technique of welding is better known than the use of the cutting blow pipe, and if this last named is often found in welding stations with the welding blow pipe, it is surely more often put to a worse use.

It can be asserted that the bad results obtained in the cutting of iron and steel come because the cutting blow pipe is an instrument the exact regulating control of which is delicate.

If it is true that in the use of the welding blow pipe it is always possible to know at first sight the regulating of the flame and the aspect of the fusion bath, it is also true that very good practitioners of welding do not know sufficiently the practice of cutting.

A well-regulated cutting blow pipe for a certain kind of work is that in which the oxygen pressure, the exhaust aperture of the cutting jet and the heating flame are in proportion to the thickness of the piece to be cut.

We could cite many examples in which cutting with a blow pipe shows an enormous waste of oxygen, and very poor work. One of the most striking and the very latest one which we have been able to witness is the following: In a shop near Paris, a firm was demolishing a large quantity of car frames which the Germans had set on fire in a northern station, during their retreat. The frames were delivered in pieces easily transportable to be used for some other purpose. The work consisted, in fact, of cutting with the cutting blow pipe some U-shaped beams and flat iron pieces, the thickness of which ranged from 20 to 25 mm, as the larger pieces were left intact with the frames.

The blow pipes employed for this work were of the oxy-acetylenic type with central jet, fed with acetylene by movable generators of the contact type. We are not exaggerating when we state that eight times less oxygen could have been used for this work if the operators had had in their possession the necessary elements allowing them to apreciate a good execution of their work. The cutting operation was done in the following manner: The blow pipe after being lit, the oxygen used for cutting escaped without the flame having been regulated, which during the whole operation showed an excess of acetylene, then the operator, forming the fusion of a part of the iron to be cut, was afterwards swinging the blow pipe from left to right of the sectioning line, obtaining thus a fusion of the metal, increased by the oxygen. This operation, being from this fact, very slow, gave a cut from edge to edge large enough to allow the thickness of the hand to pass through!

If we add to that that the aperture of the cutting nozzle had been chosen without discernment, too strong, and that a six-kilos pressure was in current use, without mentioning the many leaks at the fittings and joints of the manometers and blow pipes, one can imagine the great saving which could have been realized in such a shop if it had been equipped with four or five cutting stations during several weeks.

It seems to us that it is necessary to recall the principal conditions and the rational and economical use of the cutting blow pipe.

The first thing most commonly found is the too frequent and almost general use of a too high oxygen pressure. One finds too often also inexperienced workmen who compare cutting to a physical phenomenon and attach much importance to the "force of the jet." One on the contrary must be impressed with the fact that the cutting of iron and steel is only a destruction of the metal through a chemical phenomenon, the oxygen pressure helping only to bring the gaseous stream over the whole thickness to be cut.

An operator who is not well experienced in oxygen pressure to be used is naturally tempted to employ high pressure, for the manufacturers of valves deliver to their customers, especially for cutting purposes, apparatus equipped with manometers graduated up to 25 and 30 kilos.

In comparison with the graduations which are made for the valves for welding purposes, the operator is tempted to use, through simple deduction, pressures from 5 to 6 kilos for cuts not any thicker than from 10 to 20 mm, and from 10 to 15 kilos for work for which a pressure half as high would be sufficient.

Is the result better and the cutting done quicker?

It is certain that a slight increase of oxygen pressure may give a quicker cutting, but the expense in gas is also increased. There is thus no real economy by using a higher pressure.

By way of compensation, experience shows that the use of oxygen at exaggerated pressure rather slackens the speed in cutting through the cooling off caused by the expansion of unused gas and of the air forming around the jet. Thus, one must be very careful to use just the pressure necessary for a normal outlet of the cutting jet. These pressures can be settled very approximately as follows, when sheet iron and ordinary iron for construction purposes and under normal conditions are concerned:

Thickness in Mm.—	Pressures in Kilos
Up to 12 mm.	1 to 1.500
From 12 to 30 mm.	1.500 to 2
From 30 to 50 mm.	1.700 to 2.500
From 50 to 100 mm.	2.250 to 3.500

It is to be observed that the oxygen pressures for cutting leave a certain margin for their use on different thicknesses. Thus these pressures in certain proportions are the function of the aperture of the cutting nozzle.

Cuts of the same value may be obtained, for example, by using a pressure of 1 kilo 500 with a cutting nozzle of 10/10th and a pressure of 1 kilo with 12/10th; the table below shows the diameter of nozzles which can be practically used.

For cutting blow pipes with separate jets one can easily go as low as 10 mm, especially if the separate feeding of heating oxygen and cutting oxygen is realized. In the most current case in which the blow pipe is only fed by one stream of oxygen and especially in central jet type more subject to back flame through obstruction of the nozzzle, the pressure of 1 kilo 500 is practically necessary to obtain a good heating flame.

Another important cause to figure out the cost of the work is the section allowed for the flowing of the cutting oxygen. One must remember that the sections of circular apertures are in themselves like the quadrate of their diameters and that theoretically a cutting nozzle of 20 10th, must give way to four times more oxygen than a nozzle of 10 10th under the same pressure conditions, supposing that the waste of gas is equal in both cases, which is not absolutely exact. It is easily seen thus that the mere mistake of choosing a cutting nozzle of 2 mm instead of 1 mm will immediately give a quadruple expense of oxygen. It would be already doubled in the case of using a nozzle having an aperture of 15/10th instead of 10/10th.

In the work shops, the thicknesses to be cut are generally from 8 to 30 or 40 mm, when sheet-iron, in large plates is concerned, and up to 80 to 100 mm, for bar sections, profiles or round pieces.

This table gives the diameters of the nozzles:

Thickness in Mm.—	Apertures of Nozzles
Eight and below	7/10th
From 8 to 20	10 to 12/10th
From 20 to 40	12 to 15/10th
From 40 to 75	15 to 17/10th
From 75 to 125	15 to 20/10th

For cuts on thicknesses below 15 mm, there exists smaller types of cutting blow pipe with central jet, having series of nozzles the apertures of which

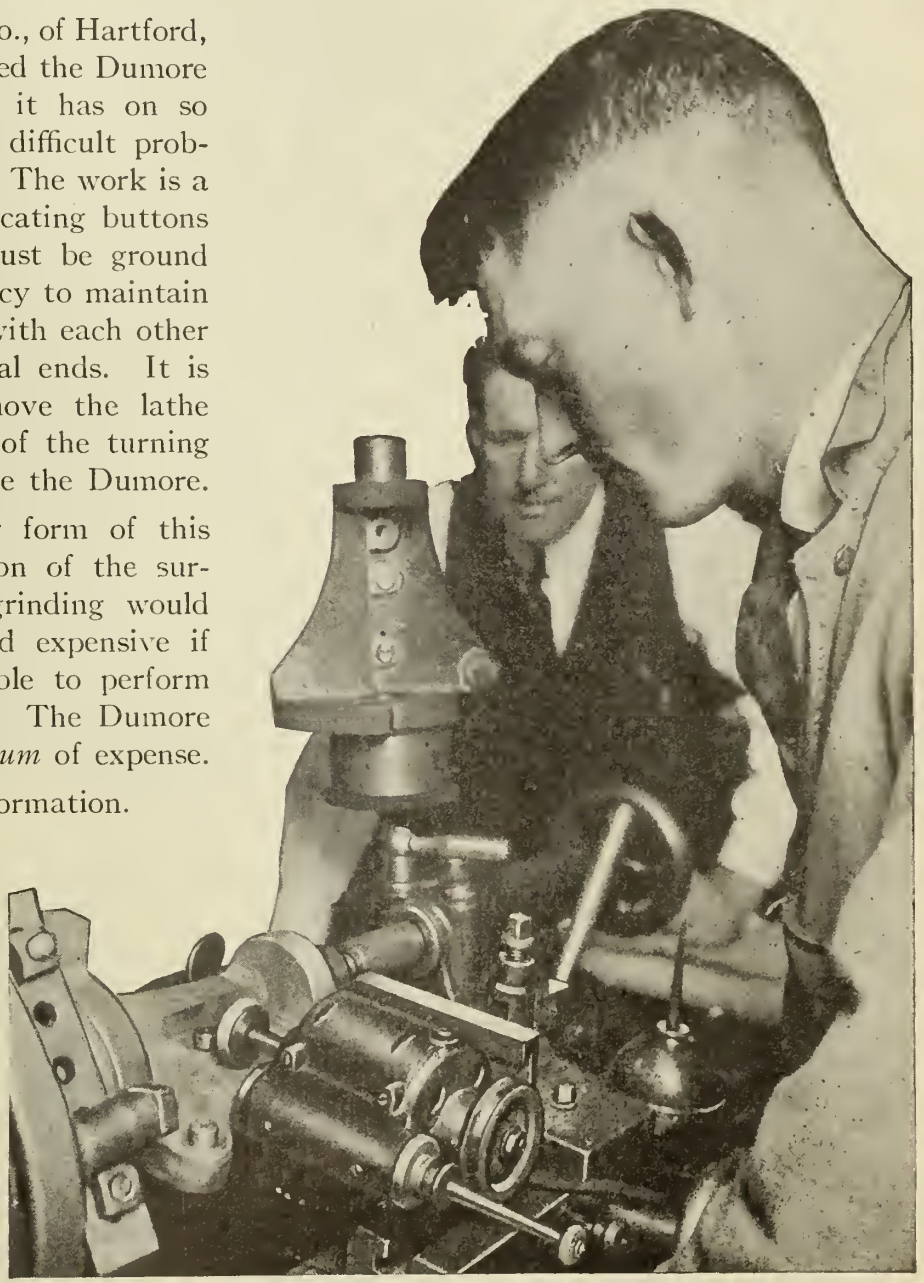
*From the March (1920) issue of Revue de la Soudure Autogène (Paris).

Planning and Producing with the Dumore

THE Reid Motor Co., of Hartford, Conn., has selected the Dumore Grinder because it has on so many occasions solved difficult problems for this Company. The work is a fixture with certain locating buttons and surfaces, which must be ground with the utmost accuracy to maintain their correct relations with each other and with the cylindrical ends. It is necessary only to remove the lathe tool at the conclusion of the turning operation and substitute the Dumore.

Owing to the peculiar form of this casting and the location of the surfaces to be ground, grinding would have been difficult and expensive if not altogether impossible to perform on any other machine. The Dumore did it—*and at a minimum* of expense.

Write for complete information.



WISCONSIN ELECTRIC COMPANY

2926 Sixteenth Street
RACINE, WISCONSIN

DUMORE HIGH SPEED GRINDERS

If interested tear out this page and place with letters to be answered.

are very small and begin from 6/10th for sheet iron to 5 mm.

We also call the attention of the reader to the importance of the purity of the oxygen to the cutting mechanism. There are also in this case chances of saving in the shops, if the purity of the gas is controlled and if nothing but the purest of gas is used in the cutting stations.

The effect of impure oxygen is the slackening of speed in the cutting and this is so clearly noticeable that it must attract the attention of the practitioners.

As per the experiments of the Laboratory of the Old Union of Welding, (Union de la Soudure Autogene), the speed in cutting, under equal conditions, is reduced to 30 per cent. or a quantity of azote of 6 per cent. for a speed obtained with oxygen at 99 per cent. At 91.5 per cent. this speed is reduced to 50 per cent!

The influence of the purity of oxygen is well known by heavy thickness specialists who know that below 95 or 96 per cent. of the purity of oxygen they cannot make a cut.

Besides, the use of impure oxygen is one of the causes which often oblige the practitioner to use a higher cutting pressure, leading to an enormous waste of gas without appreciable improvement.

The power of the heating flame must itself be in proportion to the thickness to be cut. If it is too weak, it slackens the speed in cutting and favors the loss of the oxidation point; if too strong, it provokes the fusion of the superior parts.

A thing which is not observed enough in the cutting done in shops is the space which must exist between the sheet and the nozzle. This space must be the smallest possible, so that the oxygen jet coming from the nozzle produces a narrow cut. Any exaggerated space between the nozzle and the sheet tends to increase the width of the cut on account of the divergence of the gaseous stream which is produced when coming out of the apparatus. This divergence is attenuated by an inside profile in the cutting nozzle especially studied for that purpose.

The oxy-acetylenic and oxhydric blow pipes which separate jet permit of getting closer to the sheet iron than the central jet blow pipes, the heating flame of which, though very short, leads to a certain separation of the nozzle from the surface to be cut. The construction of this kind of blow pipe forces one to place on a same level the extremities of the heating nozzle and of the cutting nozzle.

An improvement on the results of the cutting blow pipes is obtained by previously heating the cutting oxygen. Many work shops where extensive cutting is done would reduce their expenses if they would adapt to their blow pipes or on one of the cutting oxygen pipes a device of some kind, properly studied, allowing of increasing the temperature of the combustible gas.

This suggestion is the result of trials made at the laboratory of the Old Welding Union, a few years before the war, and that we intend to resume for the finding of devices suitable for the industry.

It seems thus that an improvement on cutting blow pipes could be obtained, and this simply by the strict application of the most elementary principles of technic and practice on this subject. Great saving could be made in shops where cutting is done without care, precisely in those places where cutting with the blow pipe is considered as too expensive.

The cutting blow pipe is really a marvelous instrument which can be used with advantage and economy, not only for tearing down or ordinary cutting of steel parts, but also in new undertakings and many very interesting cases in metallic construction.

On this subject the Americans have gone ahead of us and they have created special implements and tools which allow them, with an excellent technic and practical use, to perform all sorts of cuts and on all thicknesses just as fine as if they were made with mechanical tools, much quicker and much more economically.

BRITISH REVERSING GEAR FOR MOTOR BOATS

An ingenious magnetic reversing gear for motor boats has been introduced by a leading British firm of engineers. The shaft carries a magnet which, when excited, attracts a flat steel disc behind it and causes it to revolve, giving a direct drive to the propellor. The reverse magnet is of a similar type and, when excited, draws the disc to the right and holds it stationary. The engine drive is then transmitted through planet wheels so as to drive the propellor in the reverse direction. These magnetic clutches and the engine throttle valves are operated by the one lever. When the lever is in the central position the throttle is closed and neither of the magnets is excited; therefore the engine runs idly at a low speed. Movement of the lever in one direction or the other excites the ahead magnet or the astern magnet as the case may be, opening the throttle and speeding up the engine at the same time.

NEW BOOKLET

The Hammond Steel Co., Inc., Syracuse, N.Y., have issued an interesting booklet dealing with their line of status, known as the oil hardening, non-shrinkable tool steel. The booklet touches on the uses of their line, and hints as to hardening and drawing temper of the same. Illustrations are given showing examples of status steel used with surprising results, and one punching die depicted has 390 holes in it. There are other items of interest which make this booklet well worth having.

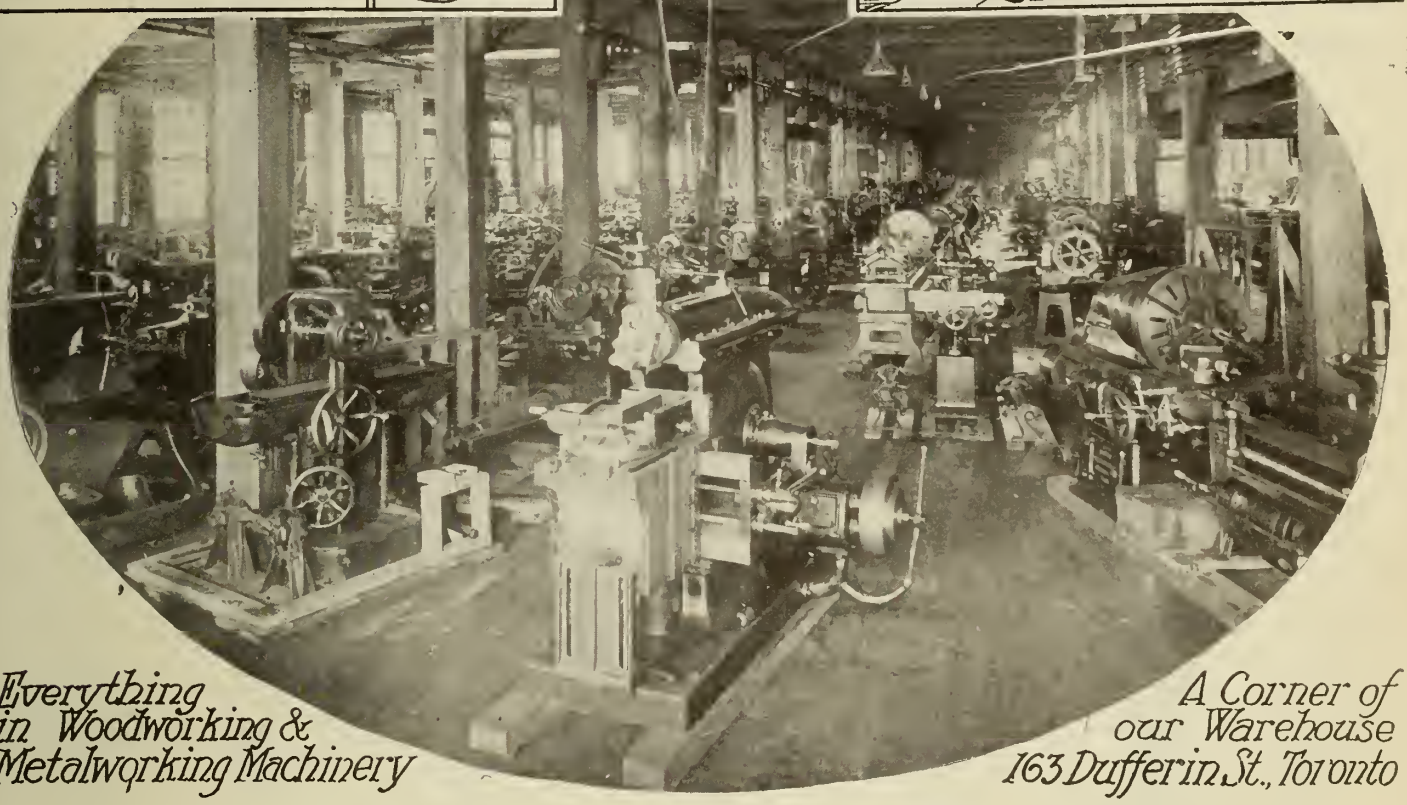
SECOND-HAND MACHINES DISAPPEARING

In speaking of the business now done in used equipment one dealer here stated that the Canadian market is gradually being depleted of standard equipment. There is still a large quantity of shell machinery stored in different places but little general use can be made of what is left of such equipment. What would seem a peculiar feature is the large volume of second-hand machinery, especially lathes, that is at present stored in American warehouses. A recent picture taken in a Chicago warehouse, and now in the hands of a dealer here, shows many hundreds of lathes and shapers, piled up from eight to ten deep, just leaving room enough for the overhead crane to pass. On some of this used equipment it is possible to get delivery in Canada at figures considerably lower than similar tools made in Canadian plants. However, one difficulty is in delivery, and this is a factor that is entirely out of the hands of the dealer or the buyers, as they must await the receipt of cars and the convenience of the railways regarding shipments.

Change Announced.—The company of G. & J. Weir (Canada), Ltd., has been incorporated to take over the business of the Clyde Engineering Co., and will manufacture their complete line of marine auxiliary machinery and power plant auxiliaries for land installations. For this purpose land has been secured and work has been commenced for foundry and machine shop in Montreal. This extension has been found necessary as a result of the increasing demand for G. & J. goods.

Locating in Peterboro.—The "Laundryette," a copper domestic washing machine which dries the clothes by centrifugal force as well as washing them and is almost a complete laundry, will be manufactured in Canada beginning November 1 by the Laundryette Manufacturing Company at Peterboro, Ontario. This company was organized in Cleveland, Ohio, five years ago and has so far been successful. It will incorporate in Canada. It has leased the warehouse of Rishers', Limited, wholesale grocers, in Peterboro, with the option to purchase. At the start it expects to employ 25 hands with the probability of increasing this number to 50 within a short time.

Material Wanted.—This paper has an inquiry from an American concern asking where the following material may be secured in Canada in less than car lots: Steel channels, angles and plate cut to size, cast iron doors weighing about 1,100 to 1,200 pounds each, steel rods, bolts, nuts, etc., 1-inch diameter steel rods, turn-buckles for 1-inch screws. The address of the firm can be had by addressing the editor of Canadian Machinery.



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AND WOODWORKING MACHINERY OF ALL KINDS

GARLOCK-WALKER MACHINERY LIMITED will have an attractive display of metal-working and woodworking machinery at the Canadian National Exhibition, commencing August 28th, and cordially invite all users of machinery to visit and inspect their exhibit in Machinery Hall. It will be well worth while.

Among the Firms whose machinery will be exhibited are :

Gooley & Edlund, Cortland, N.Y., Briggs Milling Machines; American Woodworking Machinery Co., Rochester, N.Y., Woodworking Machinery; John Steptoe Co., Cincinnati, Steptoe Shapers; Rich Tool Co., Chicago, High Speed Drills and Reamers; Grant Manufacturing & Machine Co., Bridgeport, Conn., Riveting Machines; Hardinge Bros., Inc., Chicago, Cataract Lathes and Equipment; Fitchburg Grinding Machine Co., Fitchburg, Mass., Grinding Machines; Jos. T. Ryerson Co., Chicago, Lathes, Punches and Shears; and other equipment of interest to machinery users.

Our Warehouse at 163 DUFFERIN ST. is situated just outside the Dufferin St. Entrance to the Exhibition Grounds. Call and See Us.

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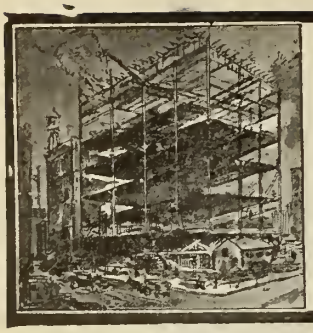

INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS PERSONAL AND TRADE NOTES

PERSONAL

Mr. A. W. Wheatley, who was recently elected president of the Armstrong, Whitworth Co., of Canada, Limited, assumes his new duties well qualified for the position. After serving his apprenticeship with the S. E. Railway in England, Mr. Wheatley went to the United States, where after some fifteen years spent in the mechanical departments of several American railways he was appointed in 1907 to be general inspector of all plants for the American Locomotive Works, with headquarters at Schenectady, N.Y. He was here for only a short time when he came to Canada as manager of the Montreal Locomotive Works, where he remained until 1911 when he became manager of the Dunkirk plant of the American Locomotive Works. In 1912 he returned to Canada as vice-president and general manager of the Canadian Locomotive Company at Kingston, Ont., and continued in this position until 1916 when he was elected to the presidency of the Lima Locomotive Works, Lima, Ohio.

Trade Gossip

The Department of Public Works, Ottawa, is calling for tenders for repairs to the superstructure of the western breakwater, including headblock at Port Colborne. Tenders are asked by the same department for the reconstruction of 466 feet of the superstructure of the east pier of the eastern channel to Toronto Harbor. In both cases plans and forms of contract can be had at the department and at the office of the district engineer, Equity Building, Toronto.

Freight Rates Increased.—In an order handed out at Ottawa the Dominion Board of Railway Commissioners grants the application of the American Railway Association for an increase in through rates, insofar as Canada is concerned, to correspond with increases recently granted by the Interstate Commerce Commission across the line. The increases, however, it is specifically stated, will not apply to freight rates on coal and coke. If there is to be an advance in the rate on these commodities, it is delayed until the decision of the board in the general freight rate case is made. The increase provided for is effective on or after August 26th, upon not less than five days' notice.

GETTING TIRED OF HIGH PRICES

Evidence That Several Houses Are Much More Anxious to Take on Business

A Toronto manufacturer, says the Globe, who visited Pittsburgh a few days ago in search of steel, reports a remarkable change in the willingness of manufacturers there to receive orders. Whereas a few months ago delivery was uncertain, or at least would be delayed indefinitely, he now finds manufacturers competing for orders. Assuming that transportation conditions will improve, this change should make for a better position in Canadian industry, in which such raw material is needed. The same visitor reports a certain amount of pessimism accompanying this change in American industry, but too much heed should not be given to such a display of feeling, because American business men are known to be mercurial, and their emotions go in waves from time to time.

Alongside this comment on the steel industry might be placed other straws of evidence on commodity prices generally. A probable wheat supply in the United States of 904,000,000 bushels, including the carry-over of 109,000,000, and the new crop of nearly 300,000,000 in Canada, continues to make for easier prices in grain, which are bound to influence commodities generally. Rollin P. Grant, Vice-Chairman of the Irving National Bank, New York, who has just returned from a two months' trip in the American northwest and Pacific coast, said:

"My impression gained from the trip is that from one end of the country to the other people are thinking, and thinking seriously, of a very definite change in conditions. Bankers are watching and restricting credits as never before. The merchants have had their ears to the ground for some time and are buying more carefully. They have been taking advantage of what are known as summer sales to force a large reduction in their inventories. They have sensed a widespread feeling that the public is becoming tired of paying high prices, and are governing themselves accordingly."

Open Hearth Furnaces—The Canadian Baldwins announce their intention to instal two 50-ton open hearth furnaces at their plant, and that two 35-ton furnaces purchased by them at Collingwood will be enlarged.

Sault Ste. Marie Plants.—At a meeting of the board of directors of the Lake Superior Corporation, annual operating reports of subsidiary companies were submitted and approved. The directors declared the payment of 5 per cent. interest on the outstanding bonds of the company. President Cunningham in commenting on the past year's operations, said that full detailed reports would shortly be published and forwarded to the stockholders showing a most satisfactory operation of the steel plants under the very trying conditions that existed throughout the year. The steel company's earnings after all interest charges but before reserve for general depreciation were $2,591,183, the net balance carried forward amounting to $1,570,314, making the total surplus at close of year $2,793,444, subject to taxes. The future held out encouraging outlook for steel operations during the present year. Coal and ore receipts to carry over winter months' operations were substantially assured by heavy arrivals in the past and present months.

Kingston After Them.—On the tenth of September, the qualified ratepayers of Kingston are to vote on two industrial bylaws, the passage of which will mean that the city will secure the location there of a large machinery manufacturing concern. For some time the civic industries committee has been working to get this industry to locate here, and a few days ago secured an agreement with the leading factor, Thomas Watson, Woodstock. In order to talk business, the committee first secured options on 28 acres of land close to the railways. This land will be sufficient for half a dozen industries. An agreement is to be entered into with Thomas Watson and the company incorporated whereby the city will give the company a site for factory buildings, exemption from taxation and railway siding, the company agreeing to amalgamate their businesses at Woodstock and Mitchell, Ont., and transfer them to Kingston and erect a factory here for the purpose of manufacturing machinery.

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PURO SANITARY DRINKING FOUNTAIN

(MADE IN CANADA)

DRINKING CUPS ARE UNSANITARY but the "Puro" delivers clean, fresh water at a reduction of 15 per cent. to 35 per cent. in water bill.
"PURO" WILL SAFEGUARD THE HEALTH OF YOUR EMPLOYEES and protect your staff against disorganization by sickness.
Easily attached. Simply unscrew the ordinary faucet and put on the "Puro."
Write us to-day for full information regarding the cost of installation of the "PURO" Sanitary Drinking Fountain Service.

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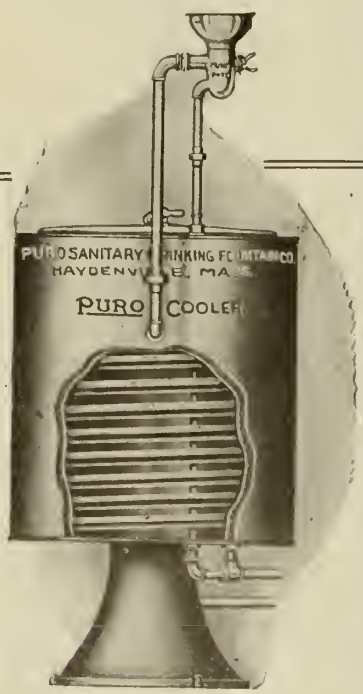

PATENTS TRADE-MARKS AND DESIGNS

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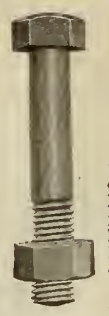
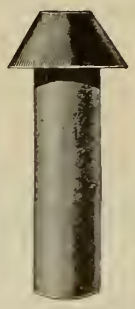


BOLTS AND RIVETS



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Oil Tempered Steel Springs

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Special styles of all kind to order.

THE CLEVELAND WIRE SPRING COMPANY
Cleveland, Ohio
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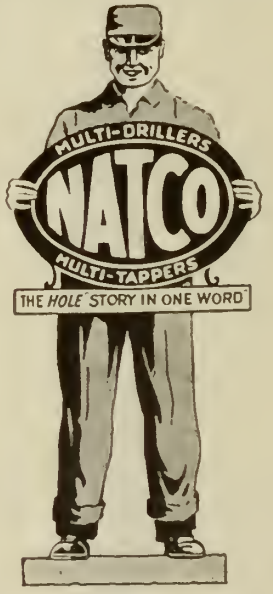


THE
NATIONAL AUTOMATIC TOOL CO.
Richmond, Indiana, U.S.A.

The capital stock of the Canadian Brakeshoe Co. has been decreased from $200,000 to $50,400, by the cancellation of 1,490 outstanding shares of $100 each.

St. Thomas Gets Thrills.—The citizens at St. Thomas were evidently out for thrills during the recent convention of fire chiefs in that city. Two barrels partly filled with water, with six gallons of gasoline on top was the first thrill, a floor 12 by 14 feet, saturated with gasoline and kerosene was the second test, while the third thrill consisted of four boxes each 4 feet high and 3 feet wide, with a strip of gasoline three feet wide and 10 feet long leading to the boxes.

Last, but not least, as the circus barker would put it, came the spectacular feat. A structure of a frame of boards, 10 inches wide and 14 feet long, was erected in the shape of a triangle, the structure being open at all ends and the loose boards permitting draft from all sides. The floor was covered with excelsior and hay and a wagon load of hickory sticks, and an additional load of old lumber and boards was placed inside.

A barrel of gasoline was poured on the centre of this varied mass and the entire structure was saturated with the same material. A strip of gasoline, 15 feet, was led directly to the gasoline barrel which had been placed in the centre of the structure. All the above were duly ignited.

These tests were for a purpose, however, and not merely for display. The fire department used sand, soda and acid to extinguish the fires, but in all cases did not put them out. It was after such devices had tried to put an end to the blazes that the Canadian Foamite Firefoam, Ltd., who were conducting the tests, used their foamite firefoam with splendid success. In the last test a 40 gallon engine was used, this generating 320 gallons of foamite. In less than three minutes the fire was completely extinguished. The tests were conducted both for the benefit of the fire chiefs and manufacturers in general.

INCORPORATIONS

Incorporation has been granted to the Hamilton Engineering service, to design, manufacture, erect and sell engineering material, machinery, tools, accessories, etc. Capital stock is placed at $50,000, and the head office is to be at Hamilton, Ont.

Some changes have been made in the organization of the Canadian Fairbanks-Morse Co. by sub-dividing the sixteen thousand shares of the capital stock of the company, now of the par value of one hundred dollars each, into eighty thousand common shares of no nominal or par value, and also increasing the capital stock of the company by the addition of forty-five thousand common shares of no nominal or par value, making the capital stock of the company one hundred and twenty-five thousand shares of no nominal or par value, provided, however, that the company shall carry on its business with a capital stock of two millions, one hundred and twenty-five thousand dollars, ($2,125,000.)

Incorporation has been granted to the Richmond Wire & Iron Co., to make or deal in wire and iron goods, etc. The capital is limited to $1,000,000, and the place of business is to be at Richmond, Que.

Incorporation is granted to Exide Batteries of Canada, Ltd., to make, assemble, repair, etc., storage batteries of all descriptions. The capital stock is placed at 15,000 shares without nominal or par value. The head office is in Toronto.

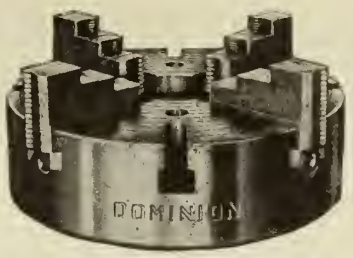
Incorporation is granted to the Canadian Detroit Twist Drill Co., with a capital stock of $20,000. The purpose is to trade, deal in and make, many lines, but particularly twist drills, reamers, machinery, machine products, and any other articles composed of steel and iron. The chief place of business is to be at Walkerville, Ont.

Incorporation was granted to Darling Bros., Ltd., through George, Edward, and Kenneth Darling, J. W. Blair and Francis J. Laverty, for the following purposes: To carry on the business of manufacturers, merchants, and dealers in all kinds of articles made of iron, steel or other metal. The head office is to be at Montreal, and the capital stock is placed at $1,250,000.

Incorporation has been granted to the London Concrete Machinery Co., Ltd., with a capital of $500,000, to take over the business at present carried on by the London Concrete Machinery Co., under an Ontario charter. The incorporators are Henry Pocock, J. C. Doidge, L. M. Pocock, E. A. Doidge and C. W. Eastwood. The head office, as at present, remains in London.

NEW DATA BOOK

The Blanchard Machine Company, Cambridge, Mass., U.S.A., have issued a very interesting data book dealing with different jobs machined on their line of grinders. The book is of pocket size and contains 63 pages of real production data in concise form. It is intended principally for managers, superintendents, tool engineers, and foremen, and a copy can be procured upon mentioning the notice in Canadian Machinery.



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SCREWS are made of the best grade steel. Both ends are broached and are heat treated after machining. They are reversible, so that either end may be used, are large enough in diameter to stand the torsional strains applied by operator when setting up his work. They are made to give the best service—and may be depended upon to stand up under the hardest usage.

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Planers, Engine and Axle Lathes, Slotters, Boring and Turning Mills, Horizontal Boring and Drilling Machines.
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Send us your blueprints and specifications. Entrust your requirements to experienced workmen and up-to-date equipment. Have your dies made in Canada. First-class workmanship guaranteed.
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Classified Opportunities

HELP WANTED

WANTED—IN THE PROVINCE OF QUEBEC, tool shop superintendent, one accustomed to the manufacture of twist drills, reamers and a complete line of milling cutters, also the designing of special tools. Give full information as to experience, also stating age and salary expected. Correspondence will be treated strictly confidential. Box 702, Canadian Machinery. (c9m)

CANADIAN AGENTS WANTED

CANADIAN AGENT WANTED — AMERICAN firm whose line (high grade factory specialty) is being manufactured in Canada, wishes to get in touch with live man who will act as Provincial or Dominion representative. Box 679, Canadian Machinery.

FOR HIGH-GRADE AMERICAN-MADE LATHE —14 to 26. In replying state territory you can cover and cover thoroughly. Box 682, Canadian Machinery. (c22m)

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1—18" x 8' Mueller Lathe.
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MECHANICAL ENGINEER—AMERICAN—EXperienced in light and medium interchangeable manufacture; broad knowledge in designing and making dies, tools, patterns and special machinery. Open for executive position. Box 701, Canadian Machinery. (c9m)

MASTER MECHANIC DESIRES CHANGE—thoroughly conversant with steam, water and electric power plants and manufacturing machinery. An expert mechanic with a technical education and twenty years' experience as an executive. Best of references. Apply Box 703, Canadian Machinery. (c10m)

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WANTED TO PURCHASE BY U.S. FIRM, small shop equipped with automatic screw machines. Box 699, Canadian Machinery.

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CLEARANCE LINE—GENUINE "SLOCOMBE" Drills are offered at a sacrifice, sizes "C," "E," "F," and "G." Wholesalers and dealers will find it of interest to communicate their requirements to Box No. 692, Canadian Machinery. (ctfm)

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QUALIFIED ELECTRICAL AND MECHANIcal sales engineer. Technical graduate having travelled and made connections in South America, France, Belgium, India, China, would like to represent Canadian manufacturing and export house. Box 594, Canadian Machinery.

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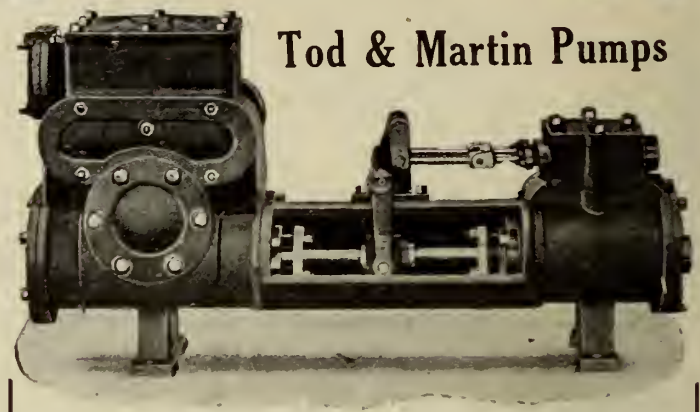

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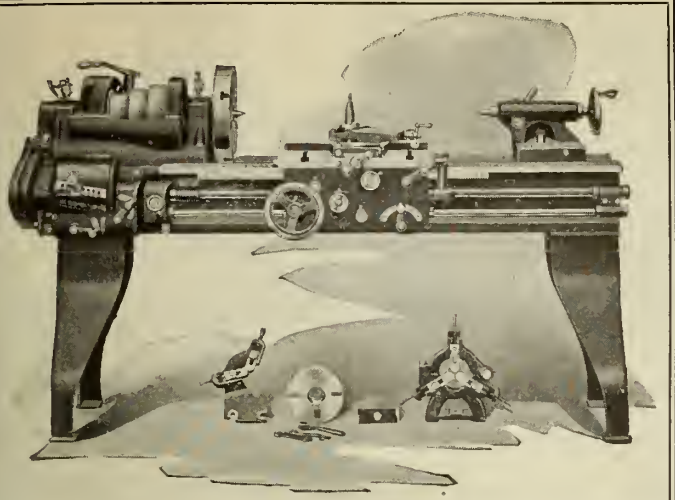

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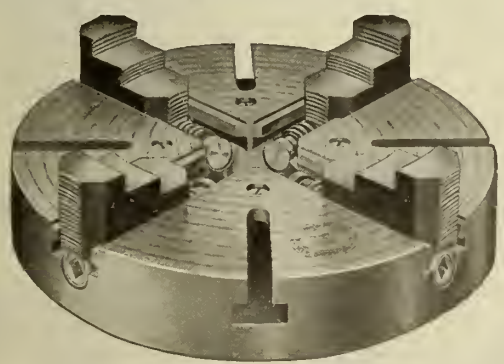

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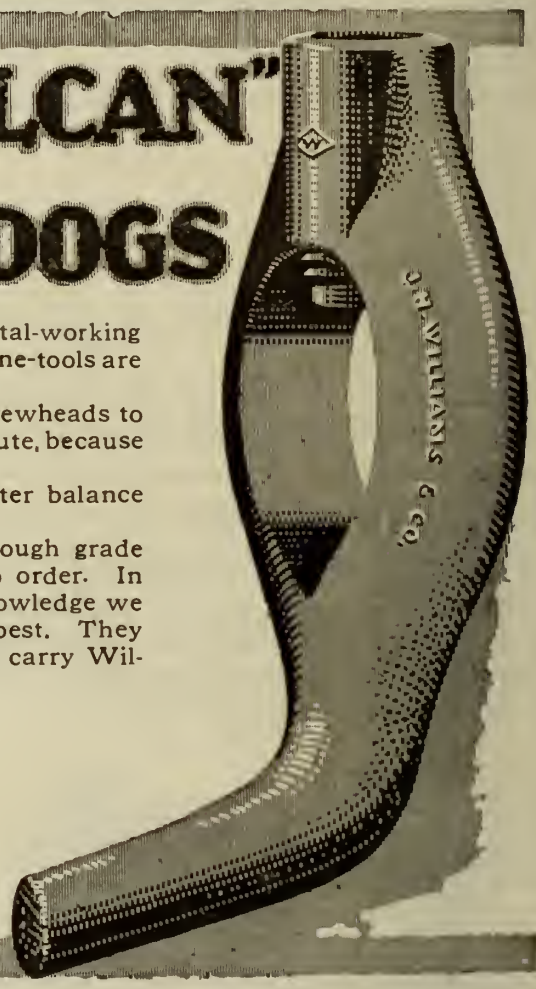

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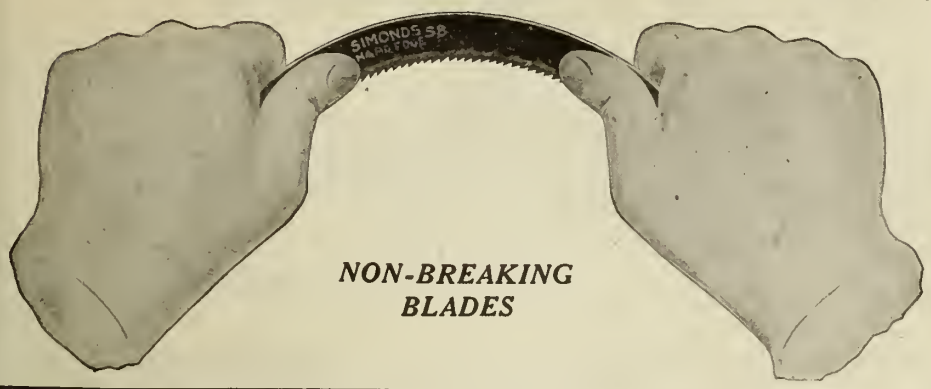

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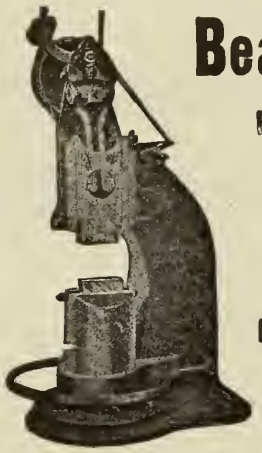

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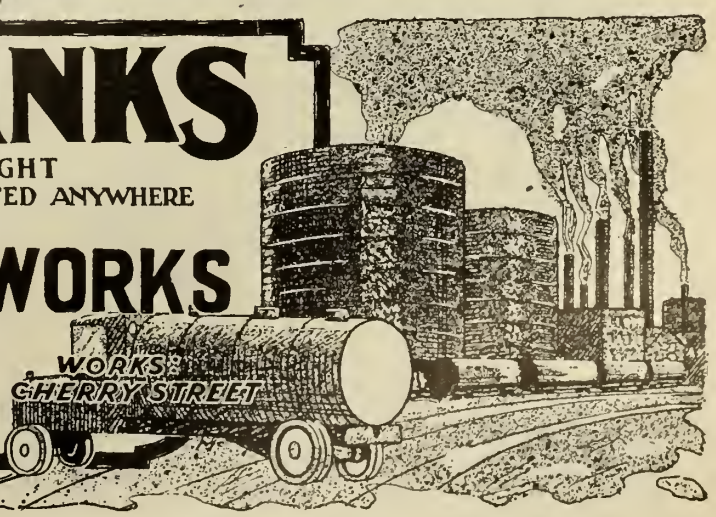

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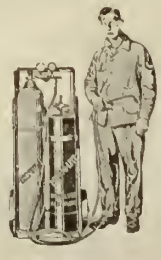

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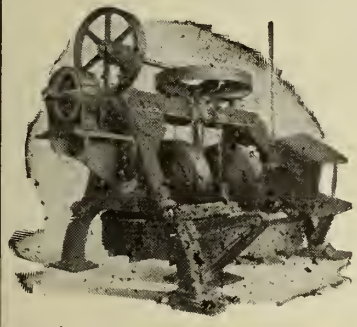

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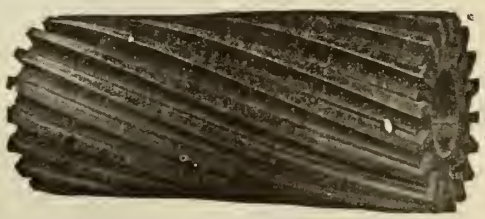

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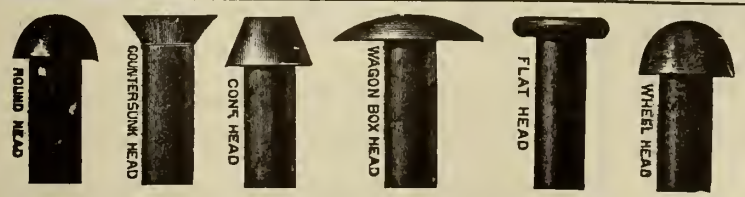

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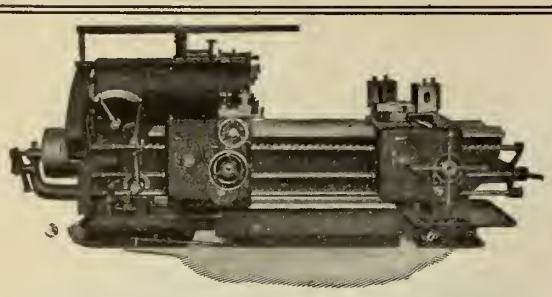

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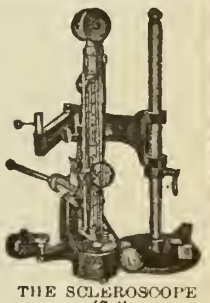

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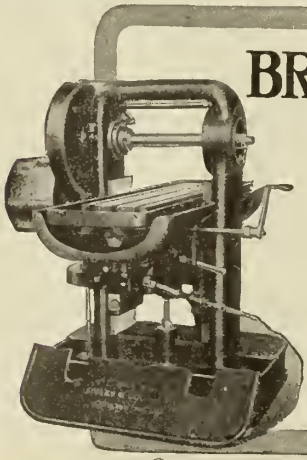

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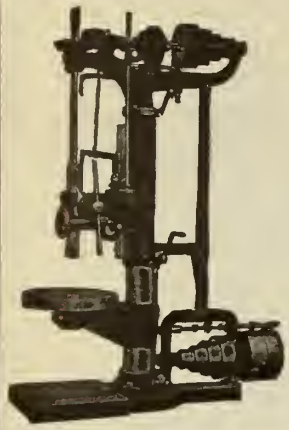

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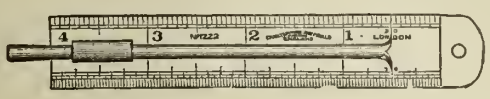

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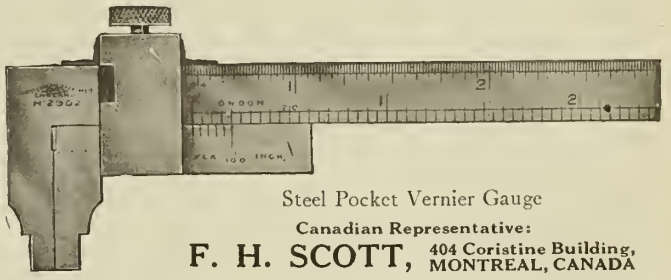

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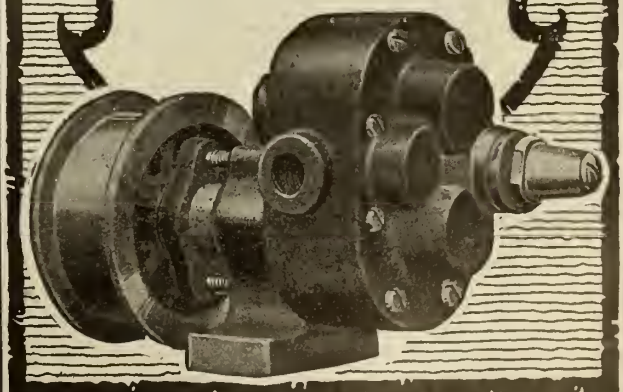

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Swan & Finch, Inc., New York.

CUTTING OIL, RECLAIMING SYSTEM

Bowser Co., Ltd., S. F., Toronto, Ont.

CUTTING AND WELDING PLANTS

Davis-Bournonville Co., Jersey City, N.J.
Prest-O-Lite Co., Inc., Toronto, Ont.
Welding & Supplies Co., Montreal, Que.

CYANIDE AND LEAD BATH POTS

Swedish Crucible Steel Co., Windsor.

CYLINDERS, AIR

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Ford-Smith Machine Co., Hamilton, Ont.
Smalley General Co., Inc., Bay City, Mich

CYLINDERS, AUTOMATIC REBORING JIGS AND REAMERS

Kelley Reamer Co., Cleveland, O.

DEHUMIDIFYING

B. F. Sturtevant Co, Galt, Ont.

DERRICKS

Aikenhead Hardware Co., Toronto, Ont.
Dominion Bridge Co., Montreal.
Hepburn Co., Ltd., J. T., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

DERRICK HOISTS

Canadian Mead-Morrison Co., Limited, Montreal, Que.

DIAMOND (BORTZ)

Furniss, Clarke & Co., Montreal, Que.

DIAMOND TOOLS

Can. Desmond-Stephan Mfg. Co., Hamilton
Ford-Smith Machine Co., Hamilton, Ont.
Furniss, Clarke & Co., Montreal, Que.
Joyce-Koebel Co., Inc., New York City.
Wheel Trueing Tool Co., Detroit.
Petrie, Ltd., H. W., Toronto.

DIAMONDS, CARBON AND BORTZ

Joyce Koebel Co., Inc., New York, N.Y.
Wheel Trueing Tool Co., Detroit.

DIAMONDS, BLACK AND ROUGH

Joyce, Koebel & Co., Inc., New York.
Wheel Trueing Tool Co., Windsor, Ont.

DIE CASTINGS

Fisher Motor Co., Ltd., Orillia, Ont.
Tallman Brass & Metals Ltd., Hamilton, Ont.

DIE HEADS, AUTOMATIC

Greenfield Tap & Die Corp., Greenfield Mass.
Wells Bros. of Can., Galt, Ont.
Petrie, Ltd., H. W., Toronto.

DIES, BRASS PRINTING, EMBOSSING AND LETTERING

Matthews, Jas. H., & Co., Pittsburgh, Pa

DIES FOR BIT BRACE USE

Butterfield & Co., Rock Island, Que.
Crescent Mchc. Co., Ltd., Montreal, P.Q.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Wells Brothers Co., of Canada, Galt.

DIES AND DIE STOCKS

Ackworthie Ltd., J., Birmingham, Eng.
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Rock Island, Que.
Brown, Boggs Co., Hamilton, Ont.
Crescent Mchc. Co., Ltd., Montreal, P.Q.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardiner, Robt. & Son, Montreal.
Herbert Ltd., Alfred, Toronto, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Jones & Lamson, Springfield, Vt.
Landis Machine Co., Waynesboro, Pa.
Marshall, Son & Bunney, Toronto.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Acme Co., Cleveland, Ohio.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Riekert-Shafer Co., Erie, Pa.
Stoll Co., Inc., D. E., Buffalo, N.Y.
Strelinger, Chas. A. Co., Windsor, Ont.
Wells Brothers of Canada, Galt, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

DIES, HAMMERED

Kimber & Hillier Mfg., Co., St. Catharines, Ont.

DIES, DROP FORGE.

Kimber & Hillier Mfg., Co., St. Catharines, Ont.

DIES, METAL STAMPING

Ackworthie Ltd., J., Birmingham, Eng.
Crescent Mchc. Co., Ltd., Montreal, P.Q.
Elliott & Whitehall, Galt, Ont.

DIES, PIPE THREADING

Ackworthie Ltd., J., Birmingham, Eng.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Crescent Mchc. Co., Ltd., Montreal, P.Q.
Landis Machine Co., Waynesboro, Pa.

DIES, THREADING

Ackworthie Ltd., J., Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Crescent Machine Co., Ltd., Montreal.
Greenfield Tap & Die Corp., Greenfield Mass.
Wells Bros. of Can., Galt, Ont.

DIE SINKERS

Ackworthie L..., J., Birmingham, Eng.
Becker Milling Machine Co., Boston
Garvin Machine Co., New York.
Kimber & Hillier Mfg., Co., St. Catharines, Ont.
Pratt & Whitney Co., Dundas, Ont.
Walcott Lathe Co., Jackson, Mich

DIES FOR MACHINES

Ackworthie Ltd., J., Birmingham, Eng.
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Rock Island, Que.
Firth & Sons, Thos., Montreal, Que.
Landis Machine Co., Waynesboro, Pa.
Wells Brothers Co. of Canada, Galt.

DIE HEADS

Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Canada, Galt, Ont.

DIES, SELF-OPENING

Geometric Tool Co., New Haven.
Landis Machine Co., Waynesboro, Pa.
Medera Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Wells Brothers Co. of Can., Galt, Ont.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.

DIE FILING MACHINES

Oliver Mach. Co., Grand Rapids, Mich.

DIE STEEL, HOT AND COLD WORK

Armstrong-Whitworth of Can., Montreal.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall, Son & Bunney, Toronto.
Firth & Sons, Thos., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.

DIES FOR SCREW PLATES

Ackworthie Ltd., J., Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Wells Bros. Co. of Can., Galt, Ont.

DIES, SHEET METAL WORKING

Ackworthie Ltd., J., Birmingham, Eng.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada
Globe Engineering Co., Hamilton, Ont.
Stoll Co., D. E., Buffalo, N.Y.

DIES, SCREW AND THREAD

Ackworthie Ltd., J., Birmingham, Eng.
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
National-Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros., Co., of Can., Galt, Ont

DISCS, LEATHER, STEEL

Graton & Knight Mfg. Co., Worcester, Mass.
Swedish Steel & Importing Co., Montreal.

DIRECT CONNECTED UNITS

MacGovern & Co., Montreal, Que.

DRAFT, MECHANICAL

Butterfield & Co., Rock Island, Que.
Can. Blower & Forge Co., Kitchener.
A. B. Jardine & Co., Hespeler, Ont.
Pratt & Whitney Co., Dundas, Ont.
Sturtevant Co., B. F., Galt, Ont.

DRAINAGE FITTINGS

Crane, Ltd., Montreal, Que.

DRAWING INSTRUMENTS

Hughes, Owens Co., Ltd., Montreal, Que.

DRAWING OFFICE SUPPLIES

Hughes, Owens Co., Ltd., Montreal, Que.

DRESSERS, GRINDING AND EMERY WHEEL

Atkins & Co., E. C., Hamilton, Ont.
Can. Desmond-Stephan Mfg. Co., Hamilton
Dominion Abrasive Co., Ltd., Mimico, Ont.
Petrie, Ltd., H. W., Toronto.
Wheel Trueing Tool Co., Windsor, Ont.

DRILL PRESSES

Aurora Tool Works, Aurora, Ind.
Barber Mchy. Co., Ltd., Toronto, Ont.
W. F. & John Barnes Co., Rockford.
Can. Blower & Forge Co., Kitchener.
Canada Machinery Corp., Galt, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machinery Co., Toronto
Garvin Machine Co., New York.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
U. S. Mach. Tool Co., Cincinnati, Ohio.
A. R. Williams Machinery Co., Toronto

DRILL RODS

Atkins & Co., Ltd., Wm., Sheffield, Eng.
Kayser-Ellison & Co., Ltd., Montreal.
Lincoln Electric Co. of Canada, Ltd., Toronto, Ont.
Marshall, Son & Bunney, Toronto.
Swedish Steel & Importing Co., Ltd., Montreal.

DRILLING MACHINES, GANG

Barnes, W. F. & John, Co., Rockford, Ill.
Barber Mchy. Co., Ltd., Toronto, Ont.
Bilton Mach. Tool Co., Bridgeport, Conn.
Canada Machinery Corp., Galt, Ont.
Petrie, Ltd., H. W., Toronto.
Oliver mfg. Co., Salem, Ohio.
Strelinger, Chas. A. Co., Windsor, Ont.

DRILLING MACHINES, LOCOMOTIVE AND MULTIPLE SPINDLE

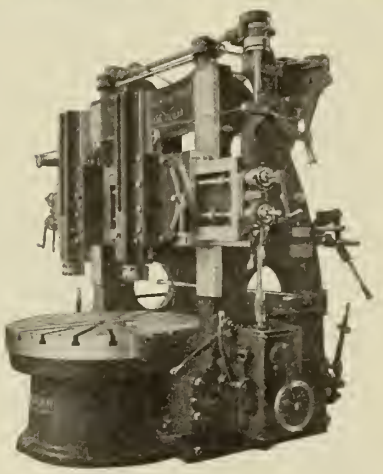
Barber Mchy. Co., Ltd., Toronto, Ont.
John Bertram & Sons Co., Dundas.
Bilton Mach. Tool Co., Bridgeport, Conn.
Can. Blower & Forge Co., Kitchener, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Mach. Co., Toronto.
Garvin Machine Co., New York.
Hoefer Mfg., Co., Freeport, Ill.
Henry & Wright Mfg. Co., Hartford, Conn
A. B. Jardine & Co., Hespeler, Ont.
Landis Tool Co., Waynesboro, Pa.
Nat. Automatic Tool Co., Richmond, Ind.
Niles-Bement-Pond Co., New York.
Rockford Drilling Mach Co., Rockford, Ill
Strelinger, Chas. A. Co., Windsor, Ont.

DRILLING MACHINES, RADIAL AND TURRET

Barber Mchy. Co., Ltd., Toronto, Ont.
John Bertram & Sons Co., Dundas.
Canadian Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto
Henry & Wright Mfg. Co., Hartford.
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

VERTICAL BORING MILLS AND HEAVY DUTY DRILLS

Colburn Boring and Turning Mills for Service



Service from a Colburn Boring and Turning Mill means more than just continuous performance over long periods of time. It means a daily output of accurate, smooth, finished work, an adaptability for a wide range of boring and turning jobs and an ease and convenience of control which enables the operator to get **maximum** production.

Colburn Heavy Duty Drill Presses are Producers

Trepanning 120 washers per hour is a good output of work. This is what a Colburn Drill Press accomplished in the plant of the Bearing Company of America, according to a recent record. The hole was 2 inches in diameter and 7-16 in. deep, the rate of feed .007 and the material Columbia Special S.A.E. Steel.

YOU need Colburn machine tools for your drilling, boring, reaming and other hole-making work. They give you better paying results. These machines are supplied by H. W. Petrie, Limited, on short notice. In fact all lines of equipment are quickly filled by "Canada's Dependable Machinery and Supply House."

H. W. PETRIE LIMITED TORONTO

H. W. PETRIE

Toronto LIMITED Hamilton

If interested tear out this page and place with letters to be answered.

DRILLING MACHINES, SENSITIVE
Barber Mchy. Co., Ltd., Toronto, Ont.
Bilton Mach. Tool Co., Bridgeport, Conn.
W. F. & John Barnes Co., Rockford, Ill.
Canadian Fairbanks-Morse Co., Montreal.
Canadian Machinery Corp., Galt, Ont.
Geo. F. Foss Mch. & S'ply Co., Montreal
Garlock-Walker Mach. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
United States Mach. Tool Co., Cincinnati
Williams Mchy Co., A. R., Toronto, Ont.

DRILLING MACHINES, UPRIGHT AND HORIZONTAL
Barber Mchy. Co., Ltd., Toronto, Ont.
Aurora Tool Works, Aurora, Ind.
John Bertram & Sons Co., Dundas.
Garlock-Walker Mach. Co., Toronto, Ont
Can. Blower & Forge Co., Kitchener.
Canada Mach. Corp., Galt, Ont.
Garvin Machine Co., New York.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mach. Co., Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
A. B. Jardine & Co., Hespeler, Ont.
Knight Metal Products, Toronto.
Landis Tool Co., Waynesboro, Pa.
R. McDougall Co., Galt.
Nat. Automatic Tool Co., Richmond, Ind.
Rockford Drilling Mach. Co., Rockford, Ill
Niles-Bement-Pond Co., New York.
Silver Mfg. Co., Salem, Ohio.
Strelinger, Chas. A. Co., Windsor, Ont.
A. R. Williams Machinery Co., Toronto

DRILLING MACHINES, SPECIAL
Hoefer Mfg. Co., Freeport, Ill.

DRILLING POSTS
Aikenhead Hardware Co., Toronto, Ont.
Keystone Mfg. Co., Buffalo, N.Y.
Rice Lewis & Son, Toronto, Ont.
Silver Mfg. Co., Salem, Ohio.

DRILLS, BENCH
Aikenhead Hardware Co., Toronto.
W. F. & John Barnes Co., Rockford, Ill
Can. Blower & Forge Co., Kitchener.
Can. Fairbanks-Morse Co., Montreal.
Geo. F. Foss Mch. & S'ply Co., Montreal
Garlock-Walker Machinery Co., Toronto.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
U.S. Electrical Tool Co., Cincinnati, O.

DRILLS, BLACKSMITH AND BIT STOCK
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Inc., Rock Island, Que.
Can. Blower & Forge Co., Kitchener.
Cleveland Twist Drill Co., Cleveland.
Geo. F. Foss Mch. & S'ply Co., Montreal
A. B. Jardine & Co., Hespeler, Ont.
Morrow Screw & Nut Co., John, Ingersoll
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
Whitman & Barnes Mfg. Co., Akron, O.
Wilkinson & Kompass, Hamilton, Ont.
Wilt Twist Drill Co. of Can., Walkerville

DRILLS, CENTRE
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
Morrow Screw & Nut Co., John, Ingersoll
Morse Twist Drill & Machine Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto.
Rice Lewis & Son, Toronto, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
Wilt Twist Drill Co., of Can., Walkerville

DRILLS CORE, INTERCHANGEABLE
Eclipse Counterbore Co., Ltd., Walkerville, Ont.

DRILLS, CARBON
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Marshall, Son & Bunney, Toronto.
John Morrow Screw & Nut Co., Ingersoll

DRILLS, ELECTRIC, CORNER
Holden Co., Ltd., Montreal, Que.

DRILLS, ELECTRIC, PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener.
Cincinnati Electrical Tool Co., Cincinnati
Geo. F. Foss Mch. & S'ply Co., Montreal
Haskins Co., R. C., Chicago, Ill.
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
Pilot Steel & Tool Co., Montreal, Que.
Prest-O-Lite Co., Inc., Toronto, Ont.
Strelinger Co., C. A., Windsor, Ont.
U. S. Electrical Tool Co., Cincinnati, O.
A. R. Williams Mach. Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

DRILLS, HAMMER
Samuel Osborne, Ltd., Montreal, P.Q.

DRILLS, EMERY
Garlock-Walker Mach. Co., Toronto, Ont.

DRILLS, HIGH SPEED TWIST
Aikenhead Hardware Co., Toronto, Ont.
Armstrong-Whitworth of Can., Montreal.
Atkins & Co., Ltd. Wm., Sheffield, Eng.
Butterfield & Co., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
Canadian Fairbanks-Morse Co., Montreal
H. A. Drury Co., Montreal.
Geo. F. Foss Mch. & S'ply Co. Montreal
Herbert, Ltd., Alfred, Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Marshall, Son & Bunney, Toronto.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
W. F. & John Barnes Co., Rockford, Ill
Osborne, Samuel, Montreal, P.Q.
Pratt & Whitney Co., Dundas, Ont.
Petrie, H. W. Toronto.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.
Strelinger Co., Chas. A., Windsor, Ont.
Taylor J. A. M., Stair Bldg., Toronto.
Wilt Twist Drill Co. of Can., Walkerville
Wilkinson & Kompass, Hamilton, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

DRILLS, OIL TUBE
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.

DRILLS, PNEUMATIC
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co., Toronto.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
Williams Mchy Co, Ltd., A. R., Montreal
Greenfield Tap & Die Corp., Greenfield, Mass.

DRILLS, PNEUMATIC CORNER
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool Co., Chicago.

DRILLS, RATCHET AND HAND
Aikenhead Hardware Co., Toronto, Ont.
Armstrong Bros. Tool Co., Chicago, Ill.
Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cincinnati Electrical Tool Co., Cincinnati.
Cleveland Twist Drill Co., Cleveland.
Garlock-Walker Mchy. Co., Toronto, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
Wilt Twist Drill Co. of Can., Walkerville.

DRILLS, ROCK
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co., Toronto.
The Foss Mchy. & Supply Co., Montreal.
Holden Co., Ltd., Montreal, Que.
Samuel Osborne Ltd., Montreal, P.Q.
Strelinger, Chas. A. Co., Windsor, Ont.
A. R. Williams Machy. Co., Toronto.

DRILLS, SQUARE & HEXAGON
Globe Engineering Co.

DRILLS, TRACK
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
The Foss Mchy. & Supply Co., Montreal.
Holden Co., Ltd., Montreal, Que.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Wilt Twist Drill Co. of Can., Walkerville.

DRINKING FOUNTAINS, SANITARY
Crane, Ltd., Montreal, Que.
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

DRIVES, CHAIN
See Belting, Chain.

DRIVING TOOLS
The Thos. Pink Co., Ltd., Pembroke, Ont.

DRY CLEANING SYSTEM
Bowser Co., Ltd., S. F., Toronto, Ont.

DRYERS, SAND
Lyman Tube & Supply Co., Montreal, Que.
Pangborn Corporation, Hagerstown, Md.

DRYING APPLIANCES
Baird Machine Co., Bridgeport, Conn.
Sturtevant Co., B. F., Galt, Ont.
W. S. Rockwell Co., New York, N.Y.

DRUM CONTROLS
Volta Manufacturing Co., Welland, Ont.

DUMP CARS
Canadian Fairbanks-Morse Co., Montreal.
MacKinnon Steel Co., Sherbrooke, Que.

DUST EXHAUSTER, ARRESTER SYSTEM
Pangborn Corporation, Hagerstown, Md.

DUST HANDLING EQUIPMENT
Pangborn Corporation, Hagerstown, Md.
Sturtevant Co., B. F., Galt, Ont.

DUST SEPARATORS
Can. Blower & Forge Co., Kitchener, Ont.
Sturtevant Co., B. F., Galt, Ont.

DYNAMOS AND ELECTRICAL SUPPLIES
Canadian Fairbanks-Morse Co., Montreal.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
MacGovern & Co., Montreal, Que.
Strelinger Co., Chas. A., Windsor, Ont.
A. R. Williams Machy. Co., Toronto.

ELECTRICAL SUPPLIES
Can. General Electric Co., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Northern Electric Co., Ltd., Montreal Que

ELECTRIC FURNACES
Electric Furnace Construction Co., Philadelphia, Pa.
Hamilton & Hansell, Inc., New York City
Volta Manufacturing Co., Welland Ont.

ELECTRIC FURNACE REGULATORS, WINCHES, ROOF COOLERS AND ELECTRODE HOLDERS
Volta Manufacturing Co. Welland, Ont.

ELECTRICAL RESISTANCE MATERIALS, NICHROME, KROMORE, CHROMAX, CLIMAX, NICKEL, SILVER, ADVANCE.

ELECTRIC HOISTS, STATIONARY AND MONO RAIL
Canadian Link-Belt Co., Ltd., Toronto,
Canadian Mead-Morrison Co., Limited, Montreal, Que.
Volta Manufacturing Co., Welland, Ont.

ELECTRIC MOTORS
Lincoln Electric Co. of Canada, Ltd., Toronto, Ont.
Sturtevant Co., B. F., Galt, Ont.
Volta Manufacturing Co., Welland, Ont.

ELECTRIC TRUCKS
Cowan Truck Co., Holyoke, Mass.
Goad Engineering Co., Toronto, Ont.

ELEVATOR, ENCLOSURES
Volta Mfg. Co., Welland, Ont.
Canada Wire & Iron Goods Co., Hamilton

ELEVATOR WEIGHTS
Katie Foundry, Galt, Ont.

ELEVATORS AND BUCKETS
Can. Link-Belt Co., Toronto, Ont.
Curtis Pneumatic Machy. Co., St. Louis.

ELEVATING AND CONVEYING MACHINERY
Can. Link-Belt Co., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Petrie, Ltd., H. W., Toronto.

EMBOSSING PRESSES
Dom. Steel Products Co., Ltd., Brantford.
Oliver Machinery Co., Grand Rapids, Mich

EMERY GRINDERS (PNEUMATIC)
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Cleveland Pneumatic Tool Co., Toronto.
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.

EMERY CLOTH
Atkins & Co., E. C., Hamilton, Ont.

EMERY PAPER
Atkins & Co., E. C., Hamilton, Ont.

EMERY AND EMERY WHEELS
Atkins & Co., E. C., Hamilton, Ont.
Brantford Emery Wheel Co., Brantford, Canada.
The Foss Mchy. & Supply Co., Montreal.
Garvin Machine Co., New York.
Canadian Fairbanks-Morse Co., Montreal.
Canada Emery Wheels Co., Hamilton.
Dominion Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Mach. Co., Hamilton, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.
Wilkinson & Kompass, Hamilton, Ont.
Dominion Abrasive Wheel Co., Ltd., Mimico, Ont.

EMERY WHEEL DRESSINGS
Dominion Abrasive Co., Ltd., Mimico, Ont.
Wheel Truing Tool Co., Windsor Ont.

ENAMELWARE
Crane, Ltd., Montreal, Que.

END MILLS
John Morrow Screw & Nut Co., Ingersoll

ENGINEERS—INDUSTRIAL CLEANING (Free Consultation)
Oakley Chemical Co., New York, N.Y.

ENGINEERS
Samuel Osborne (Canada) Ltd., Montreal.

ENGINES—HOISTING, PILE DRIVING, BRIDGE ERECTING, MINING
Canadian Mead-Morrison Co., Limited, Montreal, Que.

ENGINES, STEAM, GAS, GASOLINE
Furniss, Clarke & Co., Montreal, Que.
Canadian Fairbanks-Morse Co., Montreal
Holden Co., Ltd., Montreal, Que.
Johnson Mach. Co., Carlyle, Manchester, Conn.
MacGovern & Co., Montreal, Que.
Sturtevant Co., B. F., Galt, Ont.

ENGINES, HORIZONTAL AND VERTICAL
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Johnson Mach. Co., Carlyle, Manchester, Conn.
Petrie, Ltd., H. W., Toronto.
A. R. Williams Machy. Co., Toronto.

ENGINES, OIL
Holden Co., Ltd., Montreal, Que.
Ker & Goodwin Machine Co., Ltd., Brantford, Ont.

ENGINES, HEAVY OIL, DIESEL TYPE
Dom. Steel Products Co., Ltd., Brantford
Holden Co., Ltd., Montreal, Que.

ENGINES, MARINE
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Sturtevant Co., B. F., Galt, Ont.

ENGINES, STATIONARY, FUEL, OIL, GAS OR GASOLINE
Holden Co., Ltd., Montreal, Que.

ESCUTCHEON PINS
Parmenter & Bulloch, Gananoque, Ont.

EXHAUST HEADS AND HOODS
Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal
Sturtevant Co., B. F., Galt, Ont.

EXHAUSTERS
Can. Blower & Forge Co., Kitchener, Ont.
Pangborn Corporation, Hagerstown, Md.
Petrie, Ltd., H. W., Toronto.
Sturtevant Co., B. F., Galt, Ont.
Can. Driver-Harris Co., Walkerville, Ont.

EXTRACTORS, TAP
Walton Co., The, Hartford, Conn.

EYE BOLTS AND NUTS
Can. Foundries & Forgings, Ltd., Welland, Ont.

EYE PROTECTORS
Standard Optical Co., Geneva, N.Y.

FACTORY GATES
Page Steel & Wire Co., Adrian, Mich.

FACTORY LOCATIONS
City of St. Johns, Quebec.

FACTORY SITES
City of St. Johns, Quebec.

FANS
Baird Machine Co., Bridgeport, Conn.
Can. Blower & Forge Co., Kitchener, Ont.
Sturtevant Co., B. F., Galt, Ont.

FENCING, WIRE
Page Steel & Wire Co., New York, N.Y.

FENCE, IRON AND FACTORY
Can. Wire & Iron Goods, Hamilton, Ont.
Page Steel & Wire Co., Adrian, Mich.

FERRO-TUNGSTEN
Vanadium-Alloys Steel Co., Pittsburgh, Pa

FIBRE, RODS AND SHEETS
Diamond State Fibre Co., Bridgeport, Pa.

FILES
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Wm., Sheffield, Eng.
Ingersoll File Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Marshall, Son & Bunney, Toronto, Ont.
Nicholson File Co., Port Hope, Ont.
Rice Lewis & Son, Toronto, Ont.
Simonds Mfg. Co., Fitchburg, Mass.
Strelinger, Chas. A. Co., Windsor, Ont.
Whitman & Barnes Mfg. Co., Akron, O.
Wilkinson & Kompass, Hamilton, Ont.

FILES, COMMUTATOR SLOTTING
Lyman Tube & Supply Co., Montreal, Que.

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Cochrane-Bly Co., Rochester, N.Y., U.S.A

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Bowser Co., Ltd., S. F., Toronto, Ont.
Can. Wire & Iron Goods, Hamilton, Ont.

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General Combustion Co., Ltd., Montreal, Que.

FIRE CLAY
Elk Fire Brick Co., Can., Ltd., Hamil-
General Combustion Co., Ltd., Montreal, Que.

FINISHING MACHINES
Brown & Sharpe Mfg. Co., Providence, R.I.

FIRE EXTINGUISHERS
Strong, Kennard & Nutt Co., Cleveland, O.

FITTINGS, CAST IRON, SCREWED, FLANGED
Crane, Ltd., Montreal, Que.

FIXTURES
Brown Engineering Corp., Toronto, Ont.
Crescent Mchy. Co., Ltd., Montreal, Que.
Elliott & Whitehall Mech. & Tool Co., Galt, Ont.
Toronto Tool Co., Toronto, Ont.

FLAT SPRINGS
The Dunbar Brothers Co., Bristol, Conn

FLEXIBLE SHAFT EQUIPMENT
Chicago Flexible Shaft Co., Chicago, Ill.
R. C. Haskins Co., Chicago, Ill.

FLOODLIGHTS, ELECTRIC
Holden Co., Ltd., Montreal, Que.
Northern Electric Co., Ltd., Montreal, Que

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Elec. Steel & Metals, Welland, Ont.

FLUMES
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William Hamilton Co., Peterboro, Ont.

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Can. ... & Forge Co., Kitchener.
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Rice Lewis & Son, Toronto, Ont.
Sturtevant Co., B. F., Galt, Ont.

FORGE TOOLS
Kimber & Hillier Mfg., Co., St. Catharines, Ont.

FORGES, OIL
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.

FORGINGS
Mesta Machine Co., Pittsburgh, Pa.
Can. Found. & Forgings, Ltd., Welland.
Nova Scotia Steel & Coal Co., New Glasgow, N.S.

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Dom. Forge & Stamping Co., Walkerville
Steel Co. of Canada, Ltd., St. Catharines
Victoria Foundry Co., Ottawa.
Williams & Co., J. H., Brooklyn, N.Y.

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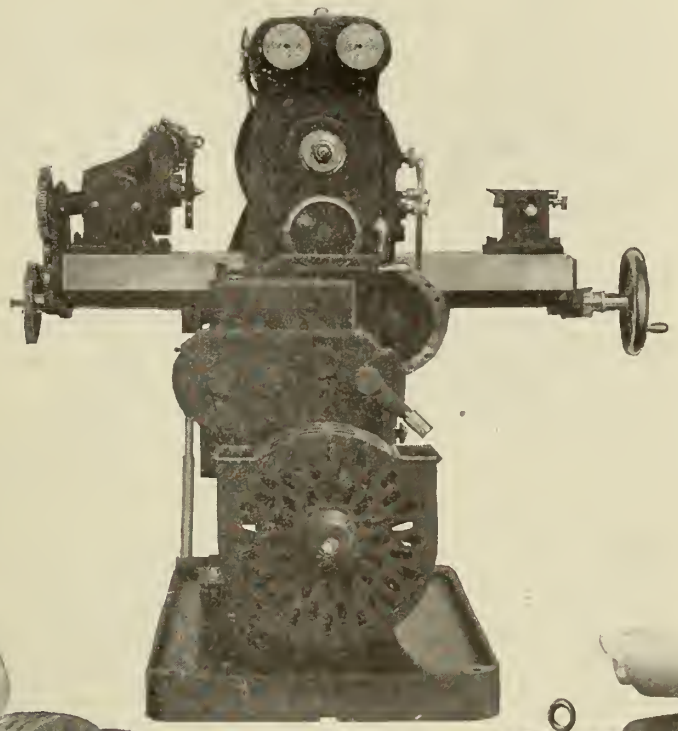
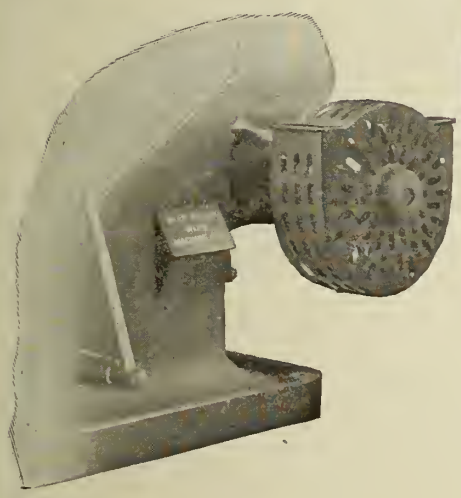
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.
National Machy. Co., Tiffin, Ohio
Petrie, Ltd., H. W., Toronto.
Chicago Flexible Shaft Co., Chicago, Ill.

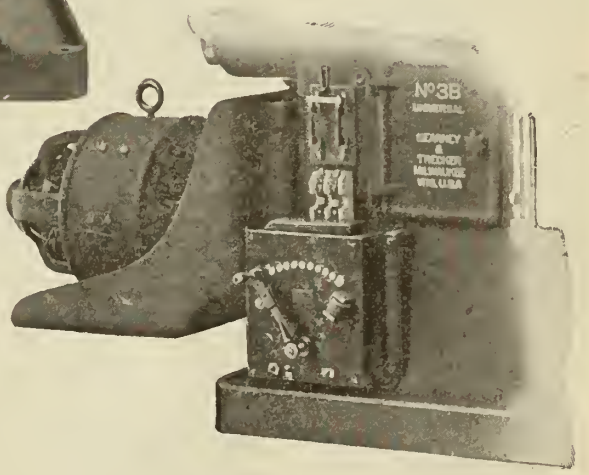
Milwaukee Milling Machines



Standard Drive



Right Angle Drive



Electric Drive

Power Economy in the Constant Speed Drive

With the cone pulley drive, less power is delivered at the lower belt speeds at the very time when the larger periphery of the cutter requires more power.

The remedy lies in the constant speed drive. A belt delivering a certain H.P. to the machine will continue to deliver this same power whether the cutter is large or small. Maximum results are obtained under all conditions.

Milwaukee Milling Machines are all of the constant speed type and accomplish not only a high power saving, but also a very material gain in convenience.

Unit design makes the different styles of drive here illustrated readily and easily substituted one for another. The constant speed motor is especially adaptable.

Write for our catalog and get complete information regarding Milwaukee Milling Machines.

KEARNEY & TRECKER CO. MILWAUKEE, WIS.

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If interested tear out this page and place with letters to be answered.

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FURNACES, CYANIDE AND LEAD HARDENING
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Holden Co., Ltd., Montreal, Que.

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Brown & Sharpe Mfg. Co., Providence, R.I.

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Taylor Instrument Co., Rochester, N.Y.

GAUGES, HYDRAULIC
Taylor Instrument Co., Rochester, N.Y.

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Wells Bros. of Can., Galt, Ont.

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Taylor Instrument Co., Rochester, N.Y.

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Garvin Machine Co., New York.
C. E. Johanson, Inc., Toronto, Ont.
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Hartford, Conn
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Taylor, J. A. M., 318 Stair Bldg., Toronto
Toronto Tool Works, Toronto, Ont.
Wells Brothers Co. of Canada, Galt, Ont.

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Dom. Found. & Steel, Hamilton, Ont.
Kayser-Ellison & Co., Ltd., Montreal.
Williams & Co., J. H., Brooklyn, N.Y.

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Katie Foundry, Galt, Ont.

GEAR BLANKS, RAWHIDE
Lyman Tube & Supply Co., Montreal, Que.

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A. R. Williams Machy. Co., Toronto.

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Gisholt Machine Co., Madison, Wis.

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Can. Link-Belt Co., Ltd., Toronto, Ont.
Morse Chain Co., Ithaca, New York.
Renold of Canada Ltd., Montreal.

GEARS, COMPENSATING
Morse Chain Co., Ithaca, New York.
Can. Link-Belt Co., Ltd., Toronto, Ont.

GEARS, CUT, MORTISE, ANGLE, WORM
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Diamond State Fibre Co., Bridgeport, Pa.
Dom. Steel Products Co., Ltd., Brantford.
Dominion Bridge Co., Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Elliott & Whitehall, Galt, Ont.
Gardner, Robt., & Son, Montreal.
Hamilton Gear & Machine Co., Toronto.
Hull Iron & Steel Found., Ltd., Hull, Q.
Jones & Glasco, Montreal.
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Philadelphia Gear Works, Philadelphia
Victoria Foundry Co., Ottawa.

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Hamilton Gear & Machine Co., Toronto.
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Jones & Glasco, Montreal.
Lyman Tube & Supply Co., Montreal, Que.
Philadelphia Gear Works, Philadelphia.
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Oliver Machinery Co., Grand Rapids, Mich

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Strong, Kennard & Nutt Co., Cleveland.
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Rice Lewis & Son, Toronto.

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Standard Optical Co., Geneva, N.Y.

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Canadian Mead-Morrison Co., Limited, Montreal, Que.

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Jones & Glasco, Montreal.
Morris Crane & Hoist Co., Ltd., Herbert Niagara Falls, Ont.

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Can. Whitney Co., Ltd., Windsor, Ont.

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Garlock-Walker Machinery Co., Toronto.

GRINDERS, BENCH
Superior Machinery Co., London, Ont.

GRINDERS, CENTRE COLUMN, PEDESTAL AND BENCH
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Haskins & Co., R. C., Chicago, Ill.
Wisconsin Electric Co., Inc., Racine, Wis
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Ford-Smith Mach. Co., Hamilton, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal
Garlock-Walker Machinery Co., Toronto.
Holden Co., Ltd., Montreal, Que.
Katie Foundry, Galt, Ont.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford.
Niles-Bement-Pond Co., New York, N.Y.
Perfect Machine Co., Galt, Ont.
United States Elec. Tool Co., Cincinnati.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

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Brown & Sharpe Mfg. Co., Providence, R.I
Cincinnati Milling Mach. Co., Cincinnati.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garvin Machine Co., New York.
Globe Engineering Co., Hamilton, Ont.
Greenfield Machine Co., Greenfield, Mass.
Greenfield Tap & Die Corp., Greenfield, M.
Heald Machine Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.
Manhattan Machine & Tool Co., Grand Rapids, Mich.
Norton Co., Worcester, Mass.
Pratt & Whitney Co., Dundas, Ont.
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Williams Mchy Co., A. R., Toronto, Ont.

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Gardner Machine Co., Beloit, Wis.
Heald Machine Co., Worcester, Mass.

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Foss Mchy. & S'ply Co., G. F., Montreal.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield,
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
United States Elec. Tool Co., Cincinnati.
Wells Bros. of Canada, Galt, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

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Barber Mchy. Co., Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I
Foss Mchy. & S'ply Co., G. F., Montreal.
Greenfield Machine Co., Greenfield, Mass.
Heald Machine Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Norton Co., Worcester, Mass.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

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Garlock-Walker Machinery Co., Toronto.
Greenfield Machine Co., Greenfield, Mass.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool Co., Chicago
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
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Wisconsin Electric Co., Inc., Racine, Wis.
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Wilkinson & Kompass, Hamilton, Ont.

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Bryant Chucking Grinder Co., Springfield, Vermont.
Heald Machine Co., Worcester Mass.

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Fitchburg Grinding Mach. Co., Fitchburg, Mass.

GRINDERS, PNEUMATIC
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Cleveland Pneumatic Tool Co., Toronto.
Garlock-Walker Machinery Co., Toronto.
Heald Machine Co., Worcester, Mass.
Independent Pneumatic Tool Co., Chicago
MacGovern & Co., Montreal, Que.

GRINDERS, PROFILE
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GRINDERS, ROTARY SURFACE
Brown & Sharpe Mfg. Co., Providence, R.I
Bristol Machine Tool Co., Bristol, Conn.
Manhattan Machine & Tool Co., Grand Rapids, Mich.

GRINDERS, TOOL AND HOLDER
Armstrong Bros. Tool Co., Chicago.
W. F. & John Barnes Co., Rockford, Ill.
Blount & Co., J. G., Everet, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I
Ford-Smith Machine Co., Hamilton, Ont.
Greenfield Machine Co., Greenfield, Mass.
Greenfield Tap & Die Corp., Greenfield.
National-Acme Co., Cleveland, Ohio.
Taber Mfg. Co., Philadelphia, Pa.
Wells Bros. of Canada, Galt, Ont.

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Barber Mchy. Co., Ltd., Toronto, Ont.
Manhattan Machine & Tool Co., Grand Rapids, Mich.
Modern Tool Co., Erie, Pa.
Norton Co., Worcester, Mass.
Williams Mchy Co, Ltd., A. R., Montreal

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Brown & Sharpe Mfg. Co., Providence, R.I
Can. Fairbanks-Morse Co., Montreal.
Heald Machine Co., Worcester, Mass.
Petrie, Ltd., H. W., Toronto.
Pratt & Whitney Co., Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Norton Co., Worcester, Mass.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

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Can. Fairbanks-Morse Co., Montreal.
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Gardner & Son, Robt., Montreal.
Garvin Machine Co., New York.
Garlock-Walker Machy. Co., Toronto.
Greenfield Machine Co., Greenfield, Mass.
Haskins & Co., R. C., Chicago, Ill.
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Niles-Bement-Pond Co., New York, N.Y.
Norton Co., Worcester, Mass.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
Wisconsin Electric Co., Racine, Wis.
Williams Mchy Co., A. R., Toronto, Ont.
Williams Tool Corp. of Can. Ltd., Brantford, Ont.

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Brown & Sharpe Mfg. Co., Providence, R.I
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Atkins & Co., E. C., Hamilton, Ont.
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Carborundum Co., Niagara Falls, N.Y.
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Ford-Smith Machine Co., Hamilton, Ont.
Foss Mchy. & S'ply Co. G. F., Montreal.
Norton Co., Worcester, Mass.

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Dennis Wire & Iron Works, London, Ont
B. Greening Wire Co., Hamilton, Ont.
Page Steel & Wire Co., Adrian, Mich.

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Atkins & Co., E. C., Hamilton, Ont.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Can. Fairbanks-Morse Co., Montreal.
Diamond Saw & Stamping Wks., Buffalo.
Ford-Smith Machine Co., Hamilton, Ont.
Kayser-Ellison & Co., Ltd., Montreal.
Lyman Tube & Supply Co., Montreal, Que.
Marshall, Son & Bunney, Toronto.
Norton, Ralph E., Agent, Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal
Plewes, Ltd., Winnipeg, Man.
Pilot Steel & Tool Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto.
Racine Tool & Machine Co., Racine, Wis.
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Simonds Mfg. Co., Fitchburg, Mass.
L. S. Starrett Co., Athol, Mass.
Standard Machy. & Supplies, Montreal.
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Wilkinson & Kompass, Hamilton.
Williams Mchy Co., A. R., Toronto, Ont.

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Atkins & Co., E. C., Hamilton, Ont.
Can. Fairbanks-Morse Co., Montreal.
Ford-Smith Machine Co., Hamilton, Ont.
Garvin Machine Co., New York City.
Victor Saw Works, Hamilton, Ont.
Rice Lewis & Son, Toronto, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
Wilkinson & Kompass, Hamilton, Ont.

HACK SAWS, POWER
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., E. C., Hamilton, Ont.
Can. Fairbanks-Morse Co., Montreal.
Diamond Saw & Stamping Wks., Buffalo.
Foss Mchy. & S'ply Co., G. F., Montreal.
Ford-Smith Machine Co., Hamilton.
Perfect Machine Co., Galt, Ont.
Starrett Co., L. S., Athol, Mass.
Victor Saw Works, Hamilton, Ont.
Williams Machy. Co., A. R., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

HAMMERS, FORGING
Nasal Eng. & Mach. Wks., Philadelphia.

HAMMERS, ELECTRIC
Haskins & Co., R. C., Chicago, Ill.

They have a STANDARD

When business men wish to keep an appointment they set their watches by the same standard clock. They will then be sure to meet without wasting any valuable time. Not only would a business man be at a loss without his watch, but unless he had a standard by which to keep that watch accurate, he would be greatly handicapped throughout his busy day.

How about YOU?

A micrometer is to the mechanic what a watch is to a business man. Unless mechanics have some accurate standard of measurement, however, for constantly checking their measuring instruments, close accuracy cannot be depended upon. A set of Johansson Gages serves as an acknowledged standard on which mechanics can absolutely rely. Several sets in different parts of the shop insure greater accuracy in the plant.

Aikenhead Hardware, Limited, TORONTO. Chas. A. Strelinger, Limited, WINDSOR.
Williams & Wilson, Limited, MONTREAL.

Johansson
ACCURACY

C·E·Johansson·Inc·Poughkeepsie·N·Y·

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Bliss Co., E. W., Brooklyn, N.Y.
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High Speed Hammer Co., Rochester, N.Y.
Jardine & Co., A. B., Hespeler, Ont.
Niles-Bement-Pond Co., New York, N.Y.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Toledo Machine & Tool Co., Toledo.
United Hammer Co., Boston, Mass.
Williams Mchy Co, Ltd., A. R., Montreal

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Canada Machinery Corp., Galt, Ont.
Petrie, Ltd., H. W., Toronto.
West Tire Setter Co., Rochester, N.Y.
Williams Mchy Co, Ltd., A. R., Montreal

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Garlock-Walker Machinery Co., Toronto.
Independent Pneumatic Tool Co., Chicago.
Nazel Eng. & Mach. Wks., Philadelphia.

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Matthews & Co., Jas. H., Pittsburgh, Pa.

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Rice Lewis & Son, Toronto, Ont.
United Hammer Co., Boston, Mass.

HAMMERS, POWER
Nazel Eng. & Mach. Wks., Philadelphia

HAMMERS, STEAM
Canada Machinery Corp., Galt, Ont.
Niles-Bement-Pond Co., New York.

HAND PLANERS
Oliver Mchry. Co., Grand Rapids, Mich.

HAND PLANING AND JOINTING MACHINERY
Oliver Engineering Co., Montreal, P.Q.

HAND LEATHERS OR PADS
Graton & Knight Mfg. Co., Montreal

HANDLES, FIBRE
Diamond State Fibre Co., Bridgeport, Pa.

HANGERS
Brown & Sharpe Mfg. Co., Providence, R.I.
Canadian Link-Belt Co., Ltd., Toronto, Ont.

HANGERS, SHAFT
Algoma Steel Corp., Sault Ste. Marie.
Chapman Double Ball Bearing Co., Toronto.
Gray Ball Bearing Co., Ltd., Toronto.
Baird Machine Co., Bridgeport, Conn.
Can. S K F Co., Toronto, Ont.
Gardner & Son, Robt., Montreal.
Jones & Glassco, Montreal.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co, Ltd., A. R., Montreal

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Shore Instrument & Mfg. Co., New York.

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Hoefer Mfg. Co., Freeport, Ill.

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Shore Instrument & Mfg. Co., New York

HEAT TREATING EQUIPMENT
Chicago Flexible Shaft Co., Chicago, Ill.

HELMETS, SANDBLAST, AMMONIA
Strong, Kennard & Nutt Co., Cleveland

HIGH SPEED STEEL
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Baird Machine Co., Bridgeport, Conn.

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Butterfield & Co., Inc., Rock Island, Que.
London Bolt & Hinge Wks., London, Ont.

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Greenfield Tap & Die Co., Greenfield, Mass
Pratt & Whitney Co., Dundas, Ont.
Taylor, J. A. M., 318 Stair Bldg., Toronto
Wells Bros. of Canada, Galt, Ont.

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Holden Co., Ltd., Montreal, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

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Northern Crane Works, Walkerville, Ont.
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Wright Mfg. Co., Lisbon, Ohio.
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A. Leatty & Sons, Ltd., Welland, Can.
Oliver Engineering Co., Montreal.
Volta Mfg. Co., Welland, Ont.

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Dominion Bridge Co., Montreal, Que.
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Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co, Ltd., A. R., Montreal

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Matthews & Co., Jas. H., Pittsburgh, Pa.

HOLDERS, ELECTRIC
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Clipper Belt Lacer Co., Grand Rapids.

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Dominion Bridge Co., Montreal, Que.
William Hamilton Co., Peterboro, Ont.
Toronto Iron Works, Ltd., Toronto, Ont.

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Independent Pneumatic Tool Co., Chicago.
Quaker City Rubber Co., Philadelphia, Pa.
Wells Bros. Co. of Canada, Galt, Ont.

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Gutta Percha & Rubber, Ltd., Toronto.
Quaker City Rubber Co, Philadelphia, Pa
International Mach. Sply, Ltd., Montreal
Dunlop Tire & Rubber Goods Co., Ltd., Toronto.

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Pangborn Corporation, Hagerstown, Md.
Goodyear Tire & Rubber Co. of Can., Ltd. Toronto
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Intern'l. Machine Tool Co., Indianapolis.

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Dom. Steel Products Co., Ltd. Brantford
Eastern Production Co., Detroit, Mich.
Garlock-Walker Machinery Co., Toronto.
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Metalwood Mfg. Co., Detroit, Mich.
Niles-Bement-Pond Co., New York.
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Petrie, Ltd., H. W., Toronto.
West Tire Setter Co., Rochester, N.Y.
Victoria Foundry Co., Ottawa.

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Starrett Co., L. S., Athol, Mass.

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Garvin Machine Co., New York.
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Hanna & Co., M. A. Cleveland O

IRON, WROUGHT, ROLLED, PIG
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Can. Fairbanks-Morse Co., Montreal.
The Engineering Co.
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Northern Crane Works, Walkerville.
Norton, A. O., Coaticook, Que.
Rice Lewis & Son, Toronto, Ont.
Petrie, Ltd., H. W., Toronto.

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Lyman Tube & Supply Co., Montreal, Que.
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Elliott & Whitehall Mach. & Tool Co., Galt.
Gishort Machine Co., Madison, Wis.
Globe Engineering Co., Ltd., Hamilton.
Horner & Wilson, Hamilton, Ont.
Jones & Lamson, Springfield, Vt.
Toronto Tool Co., Toronto, Ont.

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Dominion Foundries & Steel Ltd., Hamilton, Ont.

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Morton Mfg. Co., Muskegon Heights, M.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Machy. Co., A. R., Toronto.

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Williams & Co., J. H., Brooklyn, N.Y.

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MacKinnon Steel Co., Sherbrooke, Que.
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Atkins & Co., E. C., Hamilton, Ont.

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Garlock-Walker Machinery Co. Toronto.
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Gisholt Machine Co., Madison, Wis.
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Williams Mchy Co., A. R., Toronto, Ont.

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Elliott & Whitehall, Galt, Ont.

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Can. Machinery Corp., Galt.
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G. F. Foss Mchy. & S'ply Co., Montreal
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Bertram & Sons Co., John, Dundas, Ont.
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Foss Mchy. & Sply Co., G. F., Montreal
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Hepburn Ltd., John T., Toronto, Ont.
Lehman Machine Co., St. Louis, Mo.
Niles-Bement-Pond Co, New York.
Rae Mach. Tool Co., Hamilton.
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Strelinger Co., C. A., Windsor, Ont.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
Williams Machy. Co., A. R., Toronto.
Wood Turret Machine Co., Brazil, Ind.

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Bliss Co., E. W., Brooklyn, N.Y.

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Cisco Machine & Tool Co., Cincinnati, O
Canada Machinery Corporation, Galt, Ont.
Knight Metal Products, Toronto.
Lehman Machine Co., St. Louis, Mo.
Rae Mach. Tool Co., Hamilton.
Seneca Falls Mfg Co Seneca Falls N.Y.
Strelinger, Chas. A. Co., Windsor, Ont.

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Lehman Machine Co., St. Louis, Mo.

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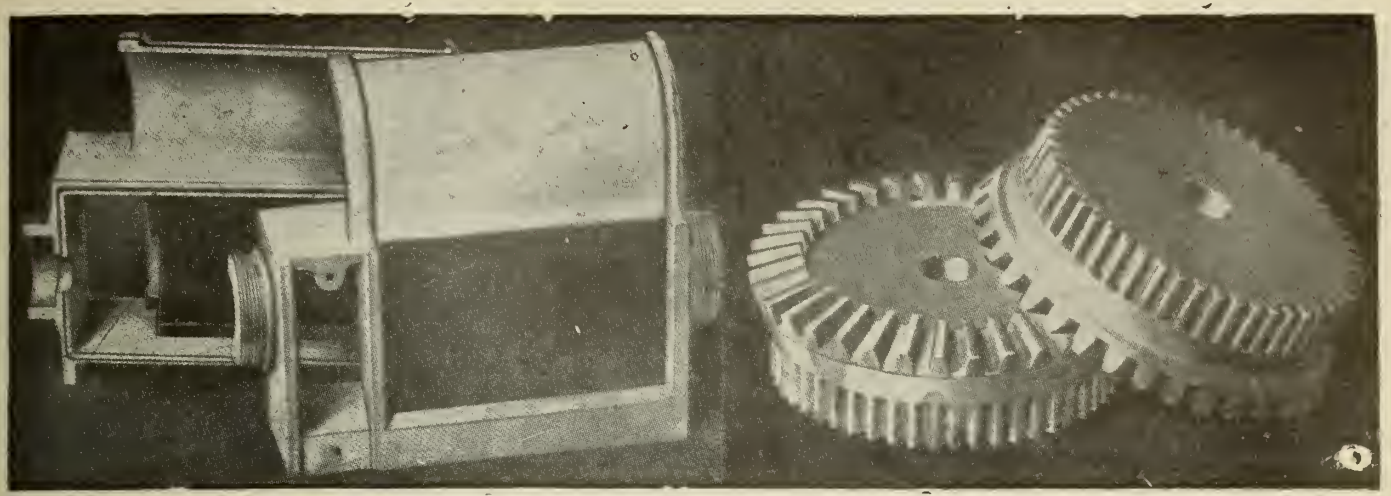

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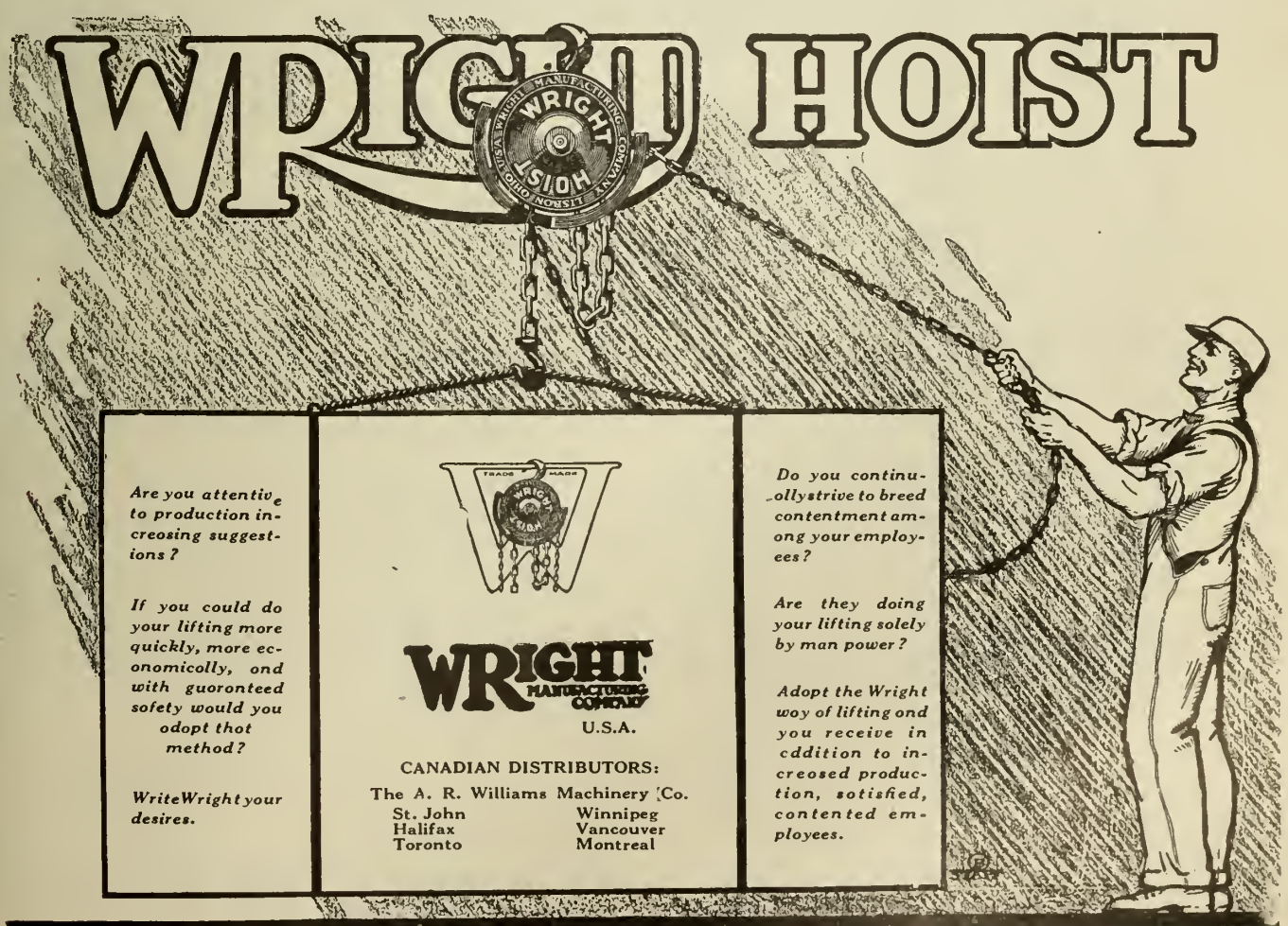

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MACHINERY GUARDS (See Guards)

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Knight Metal Products, Toronto.

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Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
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Strellinger, Chas. A. Co., Windsor, Oot.

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Marshall, Son & Bunney, Toronto.
Petrie, Ltd., H. W., Toronto.
Strellinger, Chas. A. Co., Windsor, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

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Strellinger, Chas. A. Co., Windsor, Oot.

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Canada Machinery Corp., Galt, Ont.
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Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
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Cincinnati Milling Machine Co., Cincinnati
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Strellinger, Chas. A. Co., Windsor, Ont.

MILLING MACHINES, PROFILE

Barber Mchy. Co., Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Strelioger Co., C. A., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

MILLING TOOLS

Aikenhead Hardware Co., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence.
Ford-Smith Mach. Co., Hamilton, Ont.
Geometric Tool Co., New Haven, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
Rice Lewis & Son, Toronto, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

MINE CARS

Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Dominion Bridge Co., Montreal, Que.
Elec. Steel & Metals, Welland, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.

MINING MACHINERY

Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Elec. Steel & Metals, Welland, Ont.
Holden Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto.
Williams Machy. Co., A. R., Toronto.
Williams Mchy Co., A. R., Toronto, Ont

MIXERS, SAND

Frost Mfg. Co., Chicago, Ill.

MORTISING CHAINS

Renold of Canada Ltd., Montreal.

MORTISING MACHINES

Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Strellinger, Chas. A. Co., Windsor, Oot.
Taft-Peirce Mfg. Co., Woonsocket, R.I.

MILLING MACHINES, AUTOMATIC

Bilton Mach. Tool Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Betts Machine Co., Rochester, N.Y.
Petrie, Ltd., H. W., Toronto.
Standard Equipment & Tool Wks., Montreal, P.Q.

MILLING CUTTERS

Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Milling Machine Co., Cleveland.
Deloro Smelting & Refining Co., Ltd, Toronto, Ont.
Herbert, Ltd., Alfred, Toronto, Oot.
Kearney & Trecker Co., Milwaukee, Wis.
Marshall, Son & Bunney, Toronto.
Petrie, Ltd., H. W., Toronto.
Strellinger, Chas. A. Co., Windsor, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

MILLING MACHINES, HAND

Bristol Machine Tool Co., Bristol, Conn.

MILLING MACHINES, THREAD

Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Inc., Chicago, Ill.
Gray Ball Bearing Co., Ltd., Toronto.
United States Mach. Tool Co., Cincinnati.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Smalley Gen. Co., Inc., Bay City, U.S.A.
Standard Equipment & Tool Wks., Montreal, P.Q.
Strellinger, Chas. A. Co., Windsor, Oot.

MILLING MACHINES, HORIZONTAL AND VERTICAL

Barber Mchy. Co., Ltd., Toronto, Ont.
Becker Milling Machine Co., Boston, Mass
Bristol Machine Tool Co., Bristol, Conn.
Brown & Sharpe Mfg. Co., Providence.
Bertram & Sons Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Cochrane-Bly Co., Rochester, N.Y., U.S.A.
Ford-Smith Mach. Co., Hamilton, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Knight Metal Products, Toronto.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Rockford Milling Mach. Co., Rockford, Ill
Strellinger, Chas. A. Co., Windsor, Oot.
United States Mach. Tool Co., Cincinnati.
Whitney Mfg. Co., Hartford, Conn.
Williams Machy. Co., A. R., Toronto.

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Barber Mchy. Co., Ltd., Toronto, Ont.
Becker Milling Machine Co, Boston, Mass.
Bilton Mach. Tool Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence.
Canada Machinery Corp., Galt, Ont.
Cleveland Milling Machine Co., Cleveland.
Cincinnati Milling Machine Co., Cincinnati
Ford-Smith Mach. Co., Hamilton, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Garvin Machine Co., New York.
National Machy. Co., Tiffin, Ohio.
Gooley & Edlund, Inc., Cortland, N.Y.
Hardinge Bros., Inc., Chicago, Ill.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Knight Metal Products, Toronto.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Standard Equipment & Tool Wks., Montreal, P.Q.
Strellinger, Chas. A. Co., Windsor, Ont.

MILLING MACHINES, PROFILE

Barber Mchy. Co., Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Strelioger Co., C. A., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

MILLING TOOLS

Aikenhead Hardware Co., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence.
Ford-Smith Mach. Co., Hamilton, Ont.
Geometric Tool Co., New Haven, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
Rice Lewis & Son, Toronto, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

MINE CARS

Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Dominion Bridge Co., Montreal, Que.
Elec. Steel & Metals, Welland, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.

MINING MACHINERY

Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Elec. Steel & Metals, Welland, Ont.
Holden Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto.
Williams Machy. Co., A. R., Toronto.
Williams Mchy Co., A. R., Toronto, Ont

MIXERS, SAND

Frost Mfg. Co., Chicago, Ill.

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Renold of Canada Ltd., Montreal.

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Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.
Gray Ball Bearing Co., Ltd., Toronto.

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Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
Lincoln Electric Co. of Canada, Ltd., Toronto, Ont.
MacGovern & Co., Montreal, Que.
Northern Elec. Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Sturtevant Co., B. F., Galt, Ont.
U. S. Ordnance, Toronto, Ont.
Volta Mfg. Co., Welland, Ont.
Williams Mach'y Co., A. R., Toronto.

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The Dunbar Brothers Co., Bristol, Conn.

MOTORCYCLE FRAME AND FORK

The Dunbar Brothers Co., Bristol, Conn.

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Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto.
Holden Co., Ltd., Montreal, Que.

MOULDS, RUBBER

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

MULTIPLE INDEX CENTRES

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Graton & Knight Mfg. Co., Worcester M.

MULTI-DRILLING, MULTI-BORING, MULTI-TAPPING MACHINERY,

Nat. Automatic Tool Co., Richmond, Ind

MUNICIPALITIES

City of St. John, Quebec.

NAIL SETS

Morrow Screw & Nut Co., J. Ingersoll, Ont

NAME PLATES, BRONZE, ETCHED AND STAMPED

Matthews & Co., Jas. H., Pittsburgh, Pa.
Turner Brass Works, Sycamore, Ill.

NICHROME CASTINGS

Can. Driver-Harris Co., Ltd., Walkerville

NICKEL

Pilot Steel & Tool Co., Montreal, Que.

NICKEL STEEL

See Steel.

NICKEL SILVER—SHEETS, ROLLS, PLATES and RODS

Brown's Copper and Brass Rolling Mills, New Toronto.

NIPPLE THREADING MACHINES

Landis Machine Co., Waynesboro, Pa
Williams Tool Corp. of Can. Ltd., Brantford, Oot.

NITROGEN

Carter Welding Co., Toronto, Ont.

NUTS, STEEL, CASTELLATED AND COLD PRESSED

Galt Machine Screw Co., Ltd., Galt, Ont.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Williams & Co., J. H., Brooklyn, N.Y.

NUTS, SEMI-FINISH AND FINISHED

Galt Machine Screw Co., Galt, Ont.
National-Acme Co., Cleveland, Ohio.
Wilkinson & Kompass, Hamilton.

NUT LOCKS

Edw. W. Robinson Co., Ltd., Montreal.

NUT RUBBING AND NUT MACHINES (HOT)

National Machy. Co., Tiffin, Ohio.

NUT FACING AND BOLT SHAVING MACHINES

Garvin Machine Co., New York.
National Machinery Co., Tiffin, Ohio.
Petrie, Ltd., H. W., Toronto.
Victor Tool Co., Waynesboro, Pa.

NUT TAPPERS

Bertram & Sons Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
Jardine & Co., A. B., Hespeler.
Landis Machine Co., Waynesboro, Pa
National Machinery Co., Tiffin, Ohio.
Petrie, Ltd., H. W., Toronto.
Strellinger, Chas. A. Co., Windsor, Ont.
Williams Tool Corp. of Can. Ltd., Brantford, Ont.

OILERS

All-Way Oiler Mfg. Co., Toronto, Ont.

OIL SEPARATORS

Can. Fairbanks-Morse Co., Montreal.

OIL STONES

Aikenhead Hardware Co., Toronto, Ont.
Carborundum Co., Niagara Falls, N.Y.
Norton Co., Worcester, Mass.
Rice Lewis & Son, Toronto, Ont.

OIL STONE GRINDERS

Oliver Machy. Co., Grand Rapids, Mich

OIL STORAGE SYSTEMS

Bowser Co., Ltd., S. F., Toronto, Ont.
St. Lawrence Welding Co., Ltd., Montreal.

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Greenfield Tap & Die Corp, Greenfield
Wells Bros. of Canada, Galt, Ont.

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Canadian Link-Belt Co., Ltd., Toronto, Ont.
Canadian Mead-Morrison Co., Limited, Montreal, Que.

OSCILLATING VALVE GRINDERS (PNEUMATIC)

Cleveland Pneumatic Tool Co. of Canada Toronto

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Brantford Oven & Rack Co., Brantford

OVEN TRUCKS, STEEL

Brantford Oven & Rack Co., Brantford.
MacKinnon Steel Co., Sherbrooke, Que.

OVENS FOR DRYING, TEMPER AND OXYGEN, ELECTROLYTIC CELLS UNDER TRUCKS

Welding & Supplies Co., Montreal, Que.
Brantford Oven & Rack Co., Brantford.

OXY-ACETYLENE WELDING AND CUTTING AND OUTFITS

Carter Welding Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
L'Air Liquide Society, Toronto, Ont.
Prest-o-Lite Co., Inc. Toronto, Ont.
Davis-Bournonville Co., Toronto, Ont.

OXYGEN

Carter Welding Co., Ltd., Toronto, Ont.
Dominion Oxygen Co., Ltd., Toronto, Ont.
Nat. Electro Products Ltd., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.

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Cleveland Wire Spring Co., Cleveland.

PACKING, ROD AND SHEET

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Goodyear Tire & Rubber Co., Can., Ltd., Toronto
Gutta Percha & Rubber, Ltd., Toronto.
International Mach. Spts., Ltd., Montreal
Petrie, Ltd., H. W., Toronto.
Quaker City Rubber Co., Philadelphia, Pa

PANS, WET AND DRY

Frost Mfg. Co., Chicago, Ill.

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Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Gutta Percha & Rubber, Ltd., Toronto.
MacKinnon Steel Co., Sherbrooke, Que.

PARTITIONS, WIRE

See Guards

PAPER MILL MACHINERY

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Machinery Co., Toronto.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

PATTERN SHOP EQUIPMENT

Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Oliver Machy. Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto.
Strellinger, Chas. A. Co., Windsor, Ont.

PATTERN MAKERS' LATHES

See Lathes.

PATENT SOLICITORS

Budden, Hanbury A., Montreal.
Fetherstonhaugh & Co., Ottawa.
Marion & Marion, Montreal.
Ridout & Maybee, Toronto.

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Can. Link-Belt Co., Toronto, Ont.

PENSTOCKS

William Hamilton Co., Peterboro, Ont.

PERFORATED METALS AND ORNAMENTAL IRON GOODS

Canada Wire & Iron Goods Co., Hamilton

PHOSPHOR TIN, COPPER AND BRONZE

British Smelting & Refining Co., Ltd., Montreal, Que.

PHOTOSTATS

Commercial Camera Co., Providence, R.I.

PIG IRON

Hanna & Co., M. A., Cleveland, O.
Steel Co. of Canada, Ltd., Hamilton, Ont.

PINS, TAPER

Morrow Screw & Nut Co., J., Ingersoll, Ont

PINS, BELT-LACING

Clipper Belt Lacer Co., Grand Rapids.

PIPE, BLACK & GALVANIZED

Crane, Ltd., Montreal, Que.

PIPE FITTINGS, MALLEABLE AND CAST IRON

International Malleable Iron Co., Guelph.

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Barber Mchy. Co., Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Curtis & Curtis Co., Bridgeport, Conn.
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
McDougall Co., R., Galt.
Petrie, Ltd., H. W., Toronto.
Strellinger, Chas. A. Co., Windsor, Ont.
Wells Bros. Co. of Canada, Galt, Ont.
Williams Tool Co., Erie, Pa.
Williams Machy. Co., A. R., Toronto.
Williams Tool Corp. of Can. Ltd., Brantford, Ont.

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Curtis & Curtis Co., Bridgeport, Conn.
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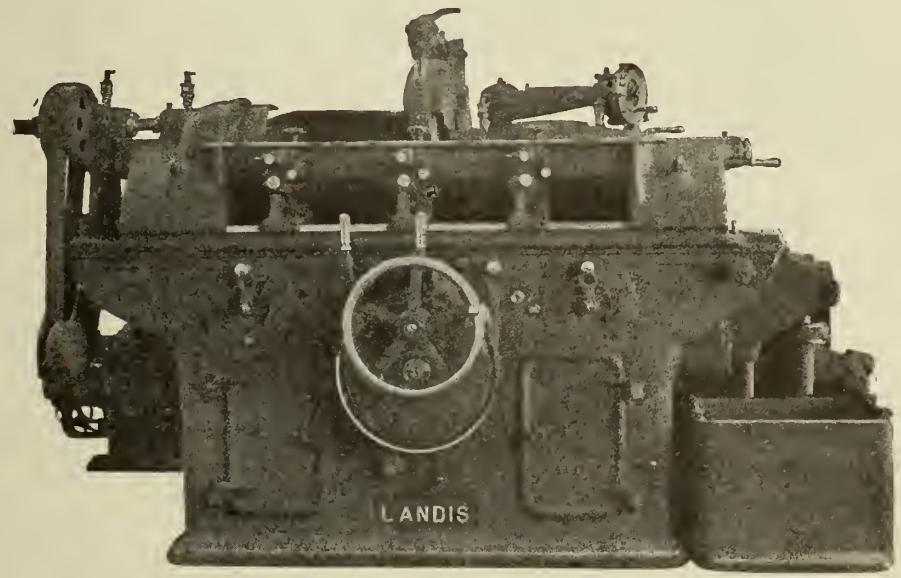
Landis users expect big production

LANDIS



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Can. Fairbanks-Morse Co., Montreal.
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Gardner & Son, Robt., Montreal.
Garlock-Walker Machinery Co., Toronto.
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Morton Mfg. Co., Muskegon Heights, Mich
Niles-Bement-Pond Co., New York.
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Standard Equipment & Tool Wks., Montreal.
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Foss Mchy. & S'ply Co., G. F., Montreal
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Niles-Bement-Pond Co., New York.
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Perrin, Ltd., William, Toronto
Strelinger, Chas. A. Co., Windsor, Ont.
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Aikenhead Hardware Co., Toronto.
Can. Billings & Spencer, Ltd., Welland.
Rice Lewis & Son, Toronto, Ont.

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Cleveland P'matic Tool Co., Can., Toronto.
Curtis Pneumatic Machy. Co., St. Louis.
Garlock-Walker Machy. Co., Toronto.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool Co., Chicago.
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POWER CRANES, HAND
MacKinnon Steel Co., Sherbrooke, Que.

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Brown & Sharpe Mfg. Co., Providence, R.I.
Ford-Smith Machine Co., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto.

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Greenfield Tap & Die Corp., Greenfield.
Petrie, Ltd., H. W., Toronto.
Wells Bros. of Canada, Galt, Ont.

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Petrie, Ltd., H. W., Toronto.

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Gray Ball Bearing Co., Ltd., Toronto.

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Bliss Co., E. W., Brooklyn, N.Y.
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Eastern Production Co., Detroit, Mich.
Metalwood Mfg. Co., Detroit, Mich
Petrie, Ltd., H. W., Toronto.
Toledo Machine & Tool Co., Toledo.
Stoll Co., D. H., Buffalo, N.Y.
Williams Mchy Co., Ltd., A. R., Montreal

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Baird Machine Co., Bridgeport, Conn.
Bliss Co., E. W., Brooklyn N.Y.
Toledo Machine & Tool Co., Toledo.
Stoll Co., D. H., Buffalo, N.Y.

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Perrin, Ltd., William R., Toronto.
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Eastern Production Co., Detroit, Mich.
Metalwood Mfg. Co., Detroit, Mich.
Toledo Machine & Tool Co., Toledo.

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Petrie, Ltd., H. W., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co, Toledo.

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Dom. Steel Products Co., Ltd., Brantford.
Eastern Production Co., Detroit, Mich.
Lourie Manufacturing Co., Springfield, Ill.
Metalwood Mfg. Co., Detroit, Mich.
Niles-Bement-Pond Co., New York.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.
Toledo Machine & Tool Co., Toledo.
Stoll Co., Inc., D. H., Buffalo, N.Y.
Williams Mchy. Co., A. R., Toronto.

PRESSES, HYDRAULIC, HORIZONTAL
Eastern Production Co., Detroit, Mich.

PRESSES, HYDRAULIC, VERTICAL
Eastern Production Co., Detroit, Mich.

PRESSES, HYDRO-PNEUMATIC
Eastern Production Co., Detroit, Mich.

PRESSES, BALING
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Brown, Boggs Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machinery Co., Toronto.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy. Co. A. R., Toronto.

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Brown, Boggs & Co., Hamilton, Ont.
Toledo Machine & Tool Co., Toledo.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., Ltd., A. R., Montreal

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Bliss Co., E. W., Brooklyn, N.Y.
Manhattan Machine & Tool Co., Grand Rapids, Mich.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.

PRESSES, TIRE
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,

PRESSES, TRIMMING
Bliss Co., E. W., Brooklyn, N.Y.
Canada Machinery Corp., Galt, Ont.
Petrie, Ltd., H. W., Toronto.
Stoll Co., D. H., Buffalo, N.Y.

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Holden Co., Ltd., Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que

PROPELLERS
Kennedy & Sons, Wm., Owen Sound.

PROTECTIVE COATINGS
H. H. Robertson, Ltd., Sarnia, Ont.

PSYCROMETERS, SLING
Taylor Instrument Co., Rochester, N.Y.

PULLEYS
Algoma Steel Corp., Sault Ste. Marie, Ont
American Pulley Co., Philadelphia.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., Fortierville, Que.
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Diamond State Fibre Co., Bridgeport, Pa.
Ford-Smith Machine Co., Hamilton, Ont.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Kennedy & Sons, Ltd., W., Owen Sound.
Positive Clutch & Pulley Works Ltd., Toronto.
Petrie, Ltd., H. W., Toronto.

PULLEYS, STEEL SASH, STEEL BELT
American Pulley Co., Philadelphia, Pa.

PULLEYS, FRICTION, CLUTCH
American Pulley Co., Philadelphia, Pa.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., A., Fortierville, Q.
Can. Link-Belt Co., Toronto, Ont.
Carlyle Johnson Mch. Co., Manchester, Ct.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Jones & Glasco, Montreal.
Positive Clutch & Pulley Works, Toronto.
Petrie, Ltd., H. W., Toronto.

PULP MILL MACHINERY
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Hamilton Co., Ltd., Wm., Peterborough, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

PUMPS, AIR LIFT
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Holden Co., Ltd., Montreal, Que.

PUMPS, BOILER FEED
Can. Ingersoll-Rand Co., Ltd. Sherbrooke,

PUMPS, CENTRIFUGAL
Bowser Co., Ltd., S. F., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Ingersoll-Rand Co., Montreal, Que.
Darling Bros., Ltd., Montreal, Que.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

PUMPS, FUEL OIL
Bowser Co., Ltd., S. F., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Darling Bros., Ltd., Montreal, Que.
Trahern Pump Co., Rockford, Ill.

PUMPS, GEARED
Darling Bros., Ltd., Montreal, Que.
Globe Engineering Co., Hamilton, Ont.

PUMPS, HIGH PRESSURE
Perrin, Ltd., William R., Toronto.

PUMPS, HYDRAULIC
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Clarke & Co., Furniss, Montreal, Que.
Garlock-Walker Machinery Co., Toronto.
Darling Bros., Ltd., Montreal, Que.
Elec. Steel & Metals, Welland, Ont.
Metalwood Mfg. Co., Detroit, Mich.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

PUMPS, LUBRICATING, OIL STORAGE
Bowser Co., Ltd., S. F., Toronto, Ont.

PUMPS, RETURN AIR
Can. Ingersoll-Rand Co. Ltd., Sherbrooke,

PUMPS, SPECIAL
Elec. Steel & Metals, Welland, Ont.

PUMPS, RUBBER CEMENT
Bowser Co., Ltd., S. F., Toronto, Ont

PUMPS, KEROSENE, OIL, SELF MEASURING
Bowser Co., Ltd., S. F., Toronto, Ont

PUMPS, LUBRICANT, OIL, WATER
Darling Bros., Ltd., Montreal, Que.
Trahern Pump Co., Rockford, Ill.

PUMPS — ROTARY
General Combustion Co., Ltd., Montreal, Que.

PUMP LEATHERS
Graton & Knight Mfg. Co., Worcester

PUNCHES AND DIES
Atkins & Co., Ltd., Wm., Sheffield, Eng
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Can
Can. Blower & Forge Co., Kitchener, Ont
Crescent Mach. Co., Ltd., Montreal, P.Q.
Can. Fairbanks-Morse Co., Montreal
Elliott & Whitehall Machine and Tool Co., Galt, Ont.
Gardner & Son, Robert, Montreal
A. B. Jardine & Co., Hespeler, Ont.
Marshall, Son & Bimmer, Toronto
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, O
Williams Mchy Co., A. R., Toronto, Ont.

PUNCHES, POWER
John Bertram & Sons Co., Dundas, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd. Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machinery Co., Toronto.
A. B. Jardine & Co., Hespeler, Ont.
Long & Allstatter, Hamilton, Ohio.
Niles-Bement-Pond Co. New York.
Petrie, Ltd., H. W., Toronto.
D. H. Stoll Co., Buffalo, N.Y.
Williams Mchy Co., A. R., Toronto, Ont.

PUNCHING MACHINES, HORIZONTAL
Bertrams, Ltd., Edinburgh, Scotland.
Bertrams & Sons, John, Dundas Ont.
Canada Machinery Corp., Galt, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co. Ltd., Hamilton, Ont.
Garlock-Walker Mach'y. Co., Toronto.
Niles-Bement-Pond Co. New York.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

PUNCHES, HAND
Niles-Bement-Pond Co., New York.

PYROMETERS
Bristol Co., Waterbury, Conn.
Shore Instrument & Mfg. Co., New York
Taylor Instrument Co., Rochester, N.Y.

QUARTERING MACHINES
Bertram & Sons, John, Dundas, Ont.
Canadian Mead-Morrison Co., Limited, Montreal, Que.
Niles-Bement-Pond Co., New York.

QUARRY HOISTS
Canadian Mead-Morrison Co., Limited, Montreal, Que.

RAIL BENDERS
Algoma Steel Corp., Sault Ste. Marie, Ont.

RAILROAD TOOLS
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machinery Co., Toronto.
Holden Co., Ltd., Montreal, Que.
Niles-Bement-Pond Co., New York.
Petrie Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

RASPS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall, Son & Bunney, Toronto.

RAWHIDE PINIONS (See Gears)

REAMERS
Butterfield & Co., Inc., Rock Island, Que.

REAMERS, ADJUSTABLE
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Elliott & Whitehall Machine and Tool Co., Galt, Ont.
Greenfield Tap & Die Corp., Greenfield.
Ingersoll Machy. Co., Ingersoll, Ont.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
McCrosky Tool Corp., Meadville, Pa., U. S. A.
Plewes, Ltd., Winnipeg, Man.
Pratt & Whitney Co., Dundas, Ont.
The Kelly Reamer Co., Cleveland, O.
J. A. M. Taylor, 115 Stair Bldg., Toronto.
Wells Bros. of Can., Galt, Ont

REAMERS, BRIDGE, EXPANDING AND HIGH SPEED
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Aikenhead Hardware Co., Toronto.
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Elliott & Whitehall Machine and Tool Co., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Lyman Tube & Supply Co., Montreal, Que
Marshall, Son & Bunney, Toronto.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Morse Twist Drill & Mch. Co., New Bedford, Mass.
McCrosky Tool Corp., Meadville, Pa., U. S. A.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Samuel Osborne, Ltd., Montreal, P.Q.
Strelinger, Chas. A. Co., Windsor, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

REAMERS, STEEL TAPER AND SELF-FEEDING
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

REAMERS, CHUCKING
Ackworthie Ltd., J., Birmingham, Eng.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Elliott & Whitehall Machine and Tool Co., Galt, Ont.
Greenfield Tap & Die Corp., Greenfield.
Ingersoll Machy. Co., Ingersoll, Ont.
Marshall, Son & Bunney, Toronto.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
Wells Bros. of Canada, Galt, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

REAMERS, HAND
Ackworthie Ltd., J., Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Elliott & Whitehall, Galt, Ont.
Greenfield Tap & Die Corp., Greenfield.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wells Bros. of Can., Galt, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

REAMERS, PIN
Ackworthie Ltd., J., Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield.
Morrow Screw & Nut Co., John, Ingersoll.
Wells Bros. of Can., Galt, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

REAMER FLUTING MACHINES
Garvin Machine Co., New York.

REAMING MACHINES, PNEUMATIC
Cleveland Pneumatic Co. of Can., Toronto
Garlock-Walker Machinery Co., Toronto.
Holden Co., Ltd., Montreal, Que.

RECORDING INTRUMENTS
Bristol Co., Waterbury, Conn.
Gisholt Machine Co., Madison, Wis.
Taylor Instrument Co., Rochester, N.Y.

REELS, WIRE AND TEXTILE MFG.
American Pulley Co., Philadelphia, Pa.

REGULATORS, AUTOMATIC
Electric Steels & Metals, Ltd., Welland.

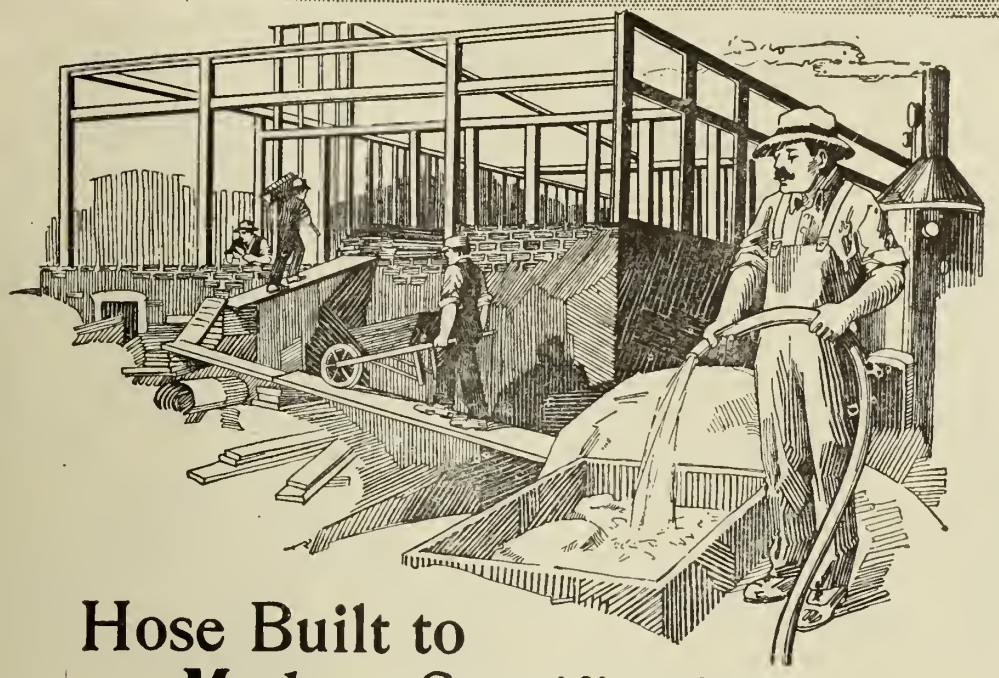
REGULATORS, PRESSURE, TEMPERATURE
Can. Fairbanks-Morse Co., Montreal.
Taylor Instrument Co., Rochester, N.Y.

REPAIR WORK — SAWS
Atkins & Co., E. C., Hamilton, Ont

REPAIR WORK, ALL KINDS
Elec. Steel & Metals, Welland, Ont.

RIVETS,
Aikenhead Hardware Co., Toronto, Ont.
Parmenter & Bulloch Co., Gananoque
Rice, Lewis & Son, Toronto.
Steel Co. of Canada, Ltd., Hamilton.

RIVET HEATERS
Chicago Flexible Shaft Co., Chicago, Ill.



Hose Built to *Modern* Specifications

MOST equipment of fifty years ago has little place in modern industrial plants. Improved methods are constantly needed to keep pace with modern standards of production and efficiency.

Yet until Goodyear entered the hose field, rubber hose was built in much the same old-fashioned manner as it had always been.

But Goodyear went into the foundry, the mine, the paper mill, the railway, the steel plant—studied the *actual* conditions industrial hose must meet in use.

Then new standards were set. A *better* hose was developed to meet the demands of modern industry.

The cover on ordinary water hose was found inadequate to protect it against the sharp objects over which it is constantly dragged. In a great many cases this cover was cut through and the hose destroyed long before it had given the service it should.

To prevent this, Goodyear Water Hose is fitted with a thicker-than-usual cover of exceptionally tough rubber. A cover that prevents wear and gives longer life to the hose.

Added to the good inner tube and strong fabric, it explains why Goodyear Water Hose has set a new standard for economy and freedom from hose troubles.

The efficient construction and unusual economy of Goodyear Water Hose is characteristic of all Goodyear Industrial Hose.

A man trained by Goodyear in hose problems will call upon you without obligation. Phone, wire, or write the nearest branch.

The Goodyear Tire & Rubber Co. of Canada, Limited

BRANCHES—Halifax, St. John, Quebec, Montreal, Ottawa, Toronto, Hamilton, London, Winnipeg, Regina, Saskatoon, Calgary, Edmonton, Vancouver.

GOODYEAR
MADE IN CANADA
INDUSTRIAL HOSE

If interested tear out this page and place with letters to be answered.

RIVETERS, PNEUMATIC, HYDRAULIC, HAMMER, COMPRESSION
Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Montreal.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool Co., Chicago
Niles-Bement-Pond Co., New York.

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Grant Mfg. & Machine Co., Bridgeport
High-Speed Hammer Co., Rochester.
Petrie, Ltd., H. W., Toronto.
F. B. Shuster Co., New Haven, Conn.
Strelinger Co., C. A., Windsor, Ont.

ROAD BUILDING EQUIPMENT
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Holden Co., Ltd., Montreal, Que.

ROAD-MAKING MACHINERY
G. F. Foss Mchy & Sply. Co., Montreal.

RODS, ROPE AND SPRING
Page Steel & Wire Co., Adrian, Mich.

RODS, PURE NICKEL, MONEL METAL, NICHROME
Can. Driver-Harris Co., Ltd., Walkerville.

ROLLER CHAINS
Can. Link-Belt Co., Toronto.
Jones & Glasco, Montreal.
Lyman Tube & Supply Co., Montreal, Que
Renold of Canada Ltd., Montreal.

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John Bertram & Sons Co., Dundas.
Brown, Boggs Co., Ltd., Hamilton.
Can. Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machinery Co., Toronto
Niles-Bement-Pond Co., New York.
Petrie Ltd., H. W., Toronto.
Toledo Machine & Tool Co., Toledo, O.

ROLLS CRUSHING
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

ROLLS AND TABLES
Dominion Foundries & Steel Ltd., Hamilton, Ont.
Elec. Steel & Metals, Welland, Ont.

ROOFING
H. H. Robertson, Ltd., Sarnia, Ont.

ROPE, GALV, MONEL METAL, BRONZE, TILLER AND SASH CORD
Can. Driver-Harris Co., Ltd., Walkerville

ROTARY SHEARS
The Quickwork Co., St. Marys, Ohio

ROLLING MACHINES, SHEET METAL
Manhattan Machine & Tool Co., Grand Rapids, Mich.

ROLLING MILL MACHINERY
Dom. Steel Products Co., Ltd., Brantford
Mesta Machine Co., Pittsburgh, Pa.

ROLL LATHES
Mesta Machine Co., Pittsburgh, Pa.

ROLLS, BENDING, STRAIGHTENING
Manhattan Machine & Tool Co., Grand Rapids, Mich.

ROLLS, CRUSHING
Can. Link-Belt Co., Toronto.

ROOF COOLERS
Electric Steels & Metals, Ltd., Welland

RUBBER MOULDS AND CORES
Elliott & Whitehall, Galt, Ont.

RUBBER MILL DRIVES
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Dom. Steel Products Co., Ltd., Brantford
Can. Link-Belt Co., Toronto.

RUBBER MILL MACHINERY
Bertrams Ltd., Edinburgh, Scotland.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Dom. Steel Products Co., Ltd., Brantford

RUBBER MOULDS & CORES
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

RUBBER PRODUCTS, MECHANICAL
Dunlop Tire & Rubber Goods Co., Ltd., Montreal.

RUBBING BRICKS
Dominion Abrasive Co., Mimico, Ont.

RULES
Brown & Sharpe Mfg. Co., Providence.
James Chesterman & Co., Ltd., Sheffield.
Rice, Lewis & Son, Toronto.
L. S. Starrett Co., Athol, Mass.

RULES, STEEL, STRAIGHT, AND FOLDING
Lufkin Rule Co. of Can., Windsor

RULES, BOXWOOD, FOLDING
Lufkin Rule Co. of Can., Windsor.

RULES, BOARD AND LONG
Lufkin Rule Co. of Can., Windsor

RUST PREVENTATIVES
Oakley Chemical Co., New York, N.Y.

SAW MILL CONVEYORS
Can. Link-Belt Co., Toronto.
Petrie, Ltd., H. W., Toronto.

SAND MILLS
Frost Mfg. Co., Chicago, Ill.

SAND-BLAST EQUIPMENT

SAND BLAST SUPPLIES AND ACCESSORIES
Pangborn Corporation, Hagerstown, Md

SAND BLAST ABRASIVES
Pangborn Corporation, Hagerstown, Md

SAND MIXING MACHINERY
Frost Mfg. Co., Chicago, Ill.

SANITARY DRINKING FOUNTAINS
Pure Sanitary Drinking Fountain Co., Haydenville.

SANDING MACHINES
Canada Machinery Corp., Galt.

SAW MILL MACHINERY
Can. Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt.
Rogers Gardner & Son, Montreal.
Curtis Pneumatic Machy Co., St. Louis
Hamilton Co., Ltd., Wm., Peterborough, Ont.
A. R. Williams Machy. Co., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

SASH SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

SAWS FOR EVERY USE
Atkins & Co., E. C., Hamilton, Ont.

SAWS, CIRCULAR METAL
Atkins & Co., E. C., Hamilton, Ont.
Cochrane-Bly Co., Rochester, N.Y., U.S.A.
Wm. Atkins & Co., Ltd., Sheffield, Eng.
Marshal, Son & Bunney, Toronto.
Plewes Ltd., Winnipeg, Man.
Simonds Mfg. Co., Fitchburgh, Mass.
Tabor Mfg. Co., Philadelphia, Pa.

SAWS, HACK (See Hack Saws)

SAW GUARDS
Ackworthie Ltd., J., Birmingham, Eng.
Atkins & Co., E. C., Hamilton, Ont.

SAWING MACHINES, CIRCULAR, FOR COLD METAL
Cochrane-Bly Co., Rochester, N.Y., U.S.A.

SAWS, METAL, HACK AND BAND
Atkins & Co., E. C., Hamilton, Ont.

SAWS, SILVER STEEL
E. C. Atkins & Co., Inc., Indianapolis

SAW SHARPENERS
Cochrane-Bly Co., Rochester, N.Y., U.S.A.
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Can., Galt, Ont.

SAWS, SLITTING
J. A. M. Taylor, Stair Bldg., Toronto.
Atkins & Co., E. C., Hamilton, Ont.
Elliott & Whitehall Machine and Tool Co., Galt, Ont.

SAWS — HIGH-SPEED FRICTION
Atkins & Co., E. C., Hamilton, Ont.

SAWS — PATTERN SHOP
Atkins & Co., E. C., Hamilton, Ont.

SAWS — SWING
Atkins & Co., E. C., Hamilton, Ont.

SCALES
Can. Kron Scale Co., Montreal, P.Q.

SCALES, MECHANICS'
Lufkin Rule Co. of Can., Windsor.

SCLEROSCOPES
Shore Instrument & Mfg. Co., New York.

SCREENING MACHINERY
Can. Link-Belt Co., Toronto.

SCREW EXTRACTORS
Cleveland Twist Drill Co., Cleveland.

SCREW MACHINES, HAND, AUTOMATIC
Barber Mchy. Co., Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Ltd., Toronto
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield.
A. B. Jardine & Co., Hespeler.
National Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto.
Pratt & Whitney Co., Dundas, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
Warner & Swasey Co., Cleveland, O.
Wells Bros. of Can., Galt, Ont.
Wood Turret Mach. Co., Brazil, Ind.

SCREWS, MACHINE, SET, CAP AND SPECIAL
Galt Machine Screw Co., Galt.
John Morrow Screw & Nut Co., Ingersoll.
National Acme Co. Montreal.
Rice Lewis & Son, Toronto.
Steel Co. of Canada, Ltd., Hamilton.
Wilkinson & Kompass, Hamilton.

SCREW COLLARS
Galt Machine Screw Co., Ltd., Galt, Ont.
John Morrow Screw & Nut Co., Ingersoll.

SCREW MACHINES, PLAIN WIRE FEED
Barber Mchy. Co., Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.

SCREW PLATES
Ackworthie Ltd., J., Birmingham, Eng.
Butterfield & Co., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield.
A. B. Jardine & Co., Hespeler.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto.
J. A. M. Taylor, Stair Bldg., Toronto.
Wells Bros. of Can., Galt.
Wilkinson & Kompass, Hamilton.

SCREWS, SAFETY SET
Galt Machine Screw Co., Ltd., Galt, Ont.

SCREW SLOTTERS
Butterfield & Co., Inc., Rock Island, Que.
Garvin Machine Co., New York.
National Acme Co., Cleveland, O.
Pratt & Whitney Co., Dundas, Ont.

SEPARATORS, MOISTENERS AND OIL FOR COMPRESSED AIR
Pangborn Corporation, Hagerstown, Md.

SELF-OPENING DIES
See Dies.

SEPARATORS, SAND
Pangborn Corporation, Hagerstown, Md.

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Aikenhead Hardware Co., Toronto.
Bristol Co., Waterbury, Conn.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wilkinson & Kompass, Hamilton.

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Jacobs Mfg. Co., Hartford, Conn.

SHAPERS
Barber Mchy. Co., Ltd., Toronto, Ont.
John Bertram & Sons Co., Dundas.
Can. Fairbanks-Morse Co., Montreal.
Canadian Machinery Corp., Galt.
Cochrane-Bly Co., Rochester, N.Y., U.S.A.
Geo. F. Foss Mchy. & Sply. Co., Montreal
Robt. Gardner & Son, Montreal.
Garlock-Walker Mach'y. Co., Toronto.
Herbert, Ltd., Alfred, Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Milwaukee Shaper Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto.
Rae Mach. Tool Co., Hamilton.
Strelinger Co., C. A., Windsor, Ont.
Standard Equipment & Tool Wks., Montreal.
Walcott Lathe Co., Jackson, Mich.
Williams Mchy Co., A. R., Toronto, Ont.

SHAPERS, GEAR
Fellows Gear & Shaper Co., Springfield, V.
Knigh Metal Products, Toronto.

SHAFTING
Algoma Steel Corp., Sault Ste. Marie, O.
Can. Fairbanks-Morse Co., Montreal.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machy. Co., Ltd., Toronto
Jones & Glasco, Montreal.
Niles-Bement-Pond Co., New York.
Can. Drawn Steel Co., Hamilton.
Peckovers, Ltd., Toronto, Ont.
Petrie, Ltd., H. W., Toronto.
Pratt & Whitney Co., Dundas.
Rice, Lewis & Son, Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
A. R. Williams Machy. Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

SHARPENING STONES
Norton Co, Worcester, Mass.
Rice, Lewis & Son, Toronto.

SHEARING MACHINES, ANGLE IRON, BAR AND GATE
John Bertram & Sons Co., Dundas.
Bertrams Ltd., Edinburgh, Scotland.
Canada Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machy. Co., Ltd., Toronto
A. B. Jardine & Co., Hespeler, Ont.
Long & Allestatter Co., Hamilton, Ohio.
Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co., Toledo, O.

SHEARS, POWER
John Bertram & Sons Co., Dundas.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co. Ltd., Hamilton.
Can Blower & Forge Co, Kitchener.
Canada Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machy. Co., Ltd., Toronto
Long & Allestatter, Hamilton, Ohio.
A. B. Jardine & Co., Hespeler, Ont.
National Machy. Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
H. D. Stoll Co., Inc., Buffalo, N.Y.
Strelinger, Chas. A. Co., Windsor, Ont.
Toledo Machine & Tool Co., Toledo, O.
Williams, White & Co., Moline, Ill.
Williams Mchy Co., A. R., Toronto, Ont.

SHEARS, ROTARY
The Quickwork Co., St. Marys, Ohio.

SHEARS, PNEUMATIC
Toledo Machine & Tool Co., Toledo, Ohio

SHEARS, PLATE CUTTING, SLITTING
Dom. Steel Products Co., Ltd., Brantford
Quickwork Co., St. Marys, Ohio.

SHEARS, SPLITTING
Dom. Steel Products Co., Ltd., Brantford

SHEARS, IRREGULAR AND CIRCLE CUTTING
The Quickwork Co., St. Marys, Ohio.
D. H. Stoll Co., Inc., Buffalo, N.Y

SHEARS, SERPENTINE
The Quickwork Co., St. Marys, Ohio.

SHEARS, SQUARING
Brown, Boggs & Co., Hamilton, Ont.
D. H. Stoll Co. Inc., Buffalo N.Y.

SHEET METAL WORKING MACHINERY
D. H. Stoll Co., Inc., Buffalo N.Y.

SHEET METAL WORKING TOOLS
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Barber Mchy. Co., Ltd. Toronto, Ont.
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Brown, Boggs & Co., Hamilton.
Peck, Stow & Wilcox Co., Southington, C.
Petrie, Ltd., H. W., Toronto.
D. H. Stoll Co., Inc., Buffalo N.Y.
Strelinger, Chas. A. Co., Windsor, Ont.

SHEETS, CRUCIBLE, CAST
British Smelting & Refining Co., Ltd., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal

SHEETS, BLACK AUTO AND GALVANIZED
Peckovers, Ltd., Toronto, Ont.

SHEETS, NICKEL RESIST. ALLOY
Can. Driver-Harris Co., Ltd Walkerville.

SHELVING, STEEL
Dennis Wire & Iron Works, London

SHIPYARD MACHINERY, SHOP FURNITURE
Dennis Wire & Iron Works, London.

SIDE TOOLS
Armstrong Bros. Tool Co., Chicago.
J. H. Williams & Co., Brooklyn, N.Y.

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Can. Link-Belt Co., Toronto, Ont.
Jones & Glasco, Montreal.
Renold of Canada Ltd., Montreal.

SLEDGES
Aikenhead Hardware Co., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.
Wilkinson & Kompass, Hamilton, Ont

SLEDGES, CAST IRON
Katie Foundry, Galt, Ont.

SLICING CLAMPS
Peck, Stow & Wilcox Co., Southington, Conn.

SLINGS, CHAINS
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

SLOTTERS
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
Herbert, Ltd., Alfred, Toronto, Ont.
National-Acme Co., Cleveland, Ohio.
Niles-Bement-Pond Co., New York.

SMOKESTACKS
William Hamilton Co., Peterboro, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

SNIPS, TINNERS AND SHEET METAL WORKERS
Kearney & Trecker Co., Milwaukee, Wis.
J. Morrow Screw & Nut Co., Ingersoll, Ont

SOCKETS
Brown & Sharpe Mfg. Co., Providence.
Butterfield & Co., Inc., Rock Island, Que.
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Keystone Mfg. Co., Buffalo, N.Y.
Modern Tool Co., Erie, Pa.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.

SOIL PIPE FITTINGS, CAST IRON
Katie Foundry, Galt, Ont.

SOLDERING IRONS
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Brown, Boggs & Co., Hamilton, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.

SOLDER
British Smelting & Refining Co., Ltd. Montreal, Que.
Aikenhead Hardware Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.
Tallman Brass & Metal Co., Hamilton.

SPELTER
British Smelting & Refining Co., Ltd., Montreal, Que.

SPEED REDUCING GEARS
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Jones & Glasco, Montreal.

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Can. Steel Foundries, Ltd., Montreal.
Cleveland Wire Spring Co., Cleveland.
Dunbar Bros. Co., Bristol, Conn.
Garlock-Walker Machinery Co., Toronto.

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Bliss, E. W. Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada.
Brown Engineering Corp., Toronto, Ont.
Dom. Steel Products Co., Ltd., Brantford.
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Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Globe Engineering Co. Ltd., Hamilton.
Hamilton Co., Ltd., Wm., Peterborough.
A. B. Jardine & Co., Hespeler, Ont.
Katie Foundry, Galt, Ont.
Ker & Goodwin Machine Co., Ltd., Brantford, Ont.
McCrosky Tool Corp., Meadville, Pa., U. S. A.
National-Acme Co., Cleveland, Ohio.
Mesta Machine Co., Pittsburgh, Pa.
Rae Mach. Tool Co., Hamilton.
Stoll Co., D. H., Buffalo, N.Y.
Victoria Foundry Co., Ottawa, Ont.
William R. Perrin, Ltd. Toronto.
Williams Tool Corp. of Can. Ltd., Brantford, Ont.

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Crescent Machine Co., Ltd., Montreal, Que.
McClean Machine & Tool Co., Ltd., Hamilton, Ont.
Hoggson & Pettis Mfg. Co., New Haven, Conn.

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Eclipse Counterbore Co., Ltd., Walkerville, Ont.

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Garvin Machine Co., New York.

SPRING MAKING MACHINERY (AUTOMATIC)
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SPRINGS STEEL
Barnes Co., Wallace, Bristol, Conn.

SPROCKETS, COMPENSATING
Morse Chain Co., Ithaca, New York.

SPROCKETS, SPRING
Morse Chain Co., Ithaca, New York.

SPROCKETS, CHAIN
Can Link-Belt Co., Toronto, Ont.
Grant Gear Works, Boston, Mass.
Jones & Glasco, Montreal.
Lyman Tube & Supply Co., Montreal, Que
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works Philadelphia
Renold of Canada Ltd., Montreal.

SPRINGS FOR TOYS AND ELECTRIC DEVICES
The Dunbar Bros. Co., Bristol, Conn.

SPROCKET WHEELS, CAST
Can. Link Belt Co., Toronto, Ont.
Lyman Tube & Supply Co., Ltd., Montreal

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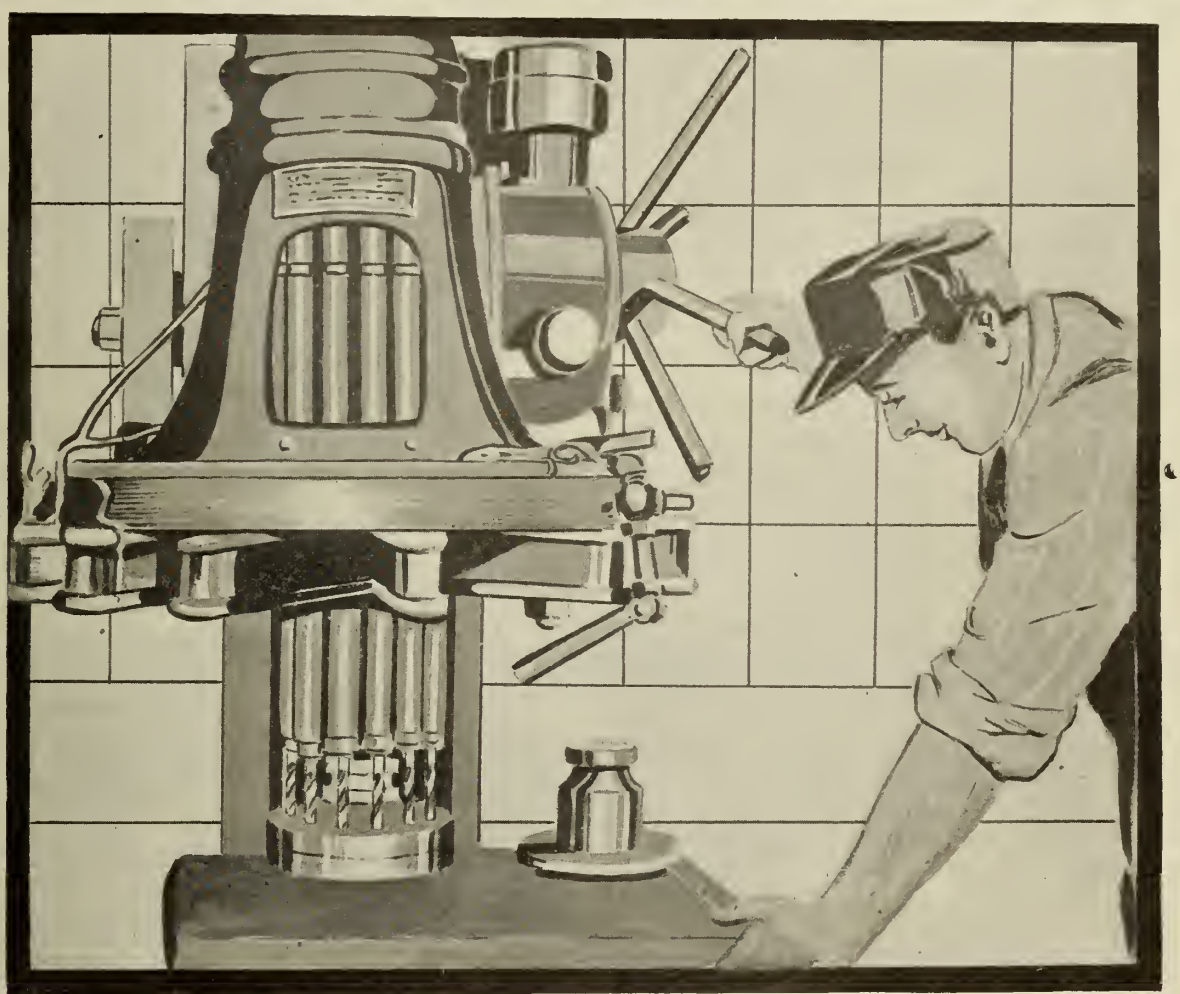

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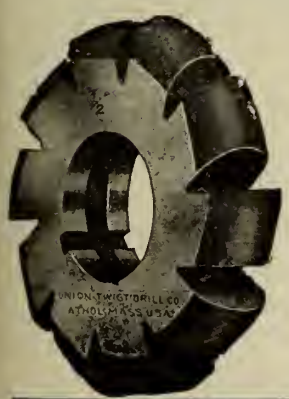
All we ask is that you give Butterfield tools a trial—**those who use them once use them again!**



BUTTERFIELD & COMPANY DIVISION

Union Twist Drill Co.

ROCK ISLAND QUE., CANADA

Toronto Office: 220 King St. West

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SANDERS
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SAW BENCHES
Oliver Mach. Co., Grand Rapids, Mich.

SAW GUARDS
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SAWING MACHINES
Herbert Ltd., Alfred, Toronto, Ont.

SAWS SWING
Oliver Mach Co., Grand Rapids, Mich.

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Herbert Ltd., Alfred, Toronto, Ont.

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Greenfield Tap & Die Corp., Greenfield, Mass.
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STEAM SEPARATORS AND TRAPS
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STEAM TURBINES
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Sturtevant Co., B. F., Galt, Ont.

STEEL BALLS
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Illingworth Steel Co., John, New York
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Marshall, Son & Bunney, Toronto.

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Baines & David, Toronto.
Firth & Sons, Thos., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.
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Lincoln Electric Co. of Canada, Ltd., Toronto, Ont.
Marshall, Son & Bunney, Toronto.
Peckovers, Ltd., Toronto, Ont.
Samuel Osborne (Can.), Ltd., Montreal.
Vanadium-Alloys Steel Co., Pittsburgh

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United Alloy Steel Corp., Canton, Ohio.

STEEL CHROME VANADIUM
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Norton, Ralph B., Agent, Montreal.
Atkins & Co., Ltd., Wm. Sheffield, Eng.
Marshall Son & Bunney, Toronto.
United Alloy Steel Corp., Canton, Ohio.

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Kayser-Ellison & Co., Ltd., Montreal.
Lyman Tube & Supply Co., Ltd., Montreal
Norton, Ralph B., Agent, Montreal.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall Son & Bunney, Toronto.
United Alloy Steel Corp., Canton, Ohio.

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Davidson Mfg. Co., Ltd., Montreal, Que.
Dominion Foundries & Steel Ltd., Hamilton, Ont.
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Jollette Steel Co., Montreal, Que.
Kennedy & Sons, Wm., Owen Sound.
Electric Steel & Metals Co., Welland.
Nova Scotia Steel & Coal Co., Windsor.
Swedish Crucible Steel Co., Windsor.

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United Alloy Steel Corp., Canton, Ohio.

STEEL, COLD ROLLED
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Kayser Ellison & Co., Ltd., Montreal.
Rice Lewis & Son, Toronto, Ont.
Swedish Steel & Importing Co. Ltd., Montreal.
Union Drawn Steel Co., Hamilton, Ont.

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United Alloy Steel Corp., Canton, Ohio.

STEEL FJAB
Lincoln Electric Co., of Canada, Ltd., Toronto, Ont.

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Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal
United Alloy Steel Corp., Canton, Ohio.

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Wm. Atkins & Co., Sheffield, Eng.
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Deloro Smelting & Refining Co., Ltd Toronto, Ont.
H. A. Drury Co., Ltd., Montreal.
Firth & Sons, Thos., Montreal, Que.
Illingworth Steel Co., J., New York.
Kayser Ellison & Co., Sheffield, Eng.
Latrobe Electric Steel Co., Latrobe, Pa
Marshall, Son & Bunney, Toronto, Ont
Osborne, Samuel, Montreal, P.Q.
Plewes, Ltd. Winnipeg, Man.
Pilot Steel & Tool Co., Montreal, Que.
Ralph B. Norton, Montreal, Que.
Rice Lewis & Son, Toronto, Ont.
Swedish Steel & Importing Co., Ltd., Montreal.
Vanadium-Alloys Steel Co., Pittsburgh.

STEEL, CHROME, MANGANESE
Jollette Steel Co., Montreal, Que.

STEEL, OPEN HEARTH
Illingworth Steel Co., John, New York
United Alloy Steel Corp., Canton, Ohio.

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Kayser-Ellison & Co., Ltd., Montreal
Lincoln Electric Co. of Canada, Ltd., Toronto, Ont.

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STEEL, SPRING AND REINFORCING
Peckovers, Ltd., Toronto, Ont.
United Alloy Steel Corp., Canton, Ohio.

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Algoma Steel Corp., Sault Ste. Marie
Dom. Iron & Steel Co., Sydney, N.S.
MacKinnon Steel Co., Sherbrooke, Que.
Peckovers, Ltd., Toronto, Ont.

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Armstrong, Whitworth of Can., Montreal
Atkins & Co., Wm., Sheffield, Eng.
Baines & David, Toronto.
Can. Fairbanks-Morse Co., Montreal.
Drury Co., H. A., Montreal, Que.
Deloro Smelting & Refining Co., Ltd, Toronto, Ont.
Firth & Sons, Thos., Montreal, Que.
Hawkridge Bros. Co., Boston, Mass.
Kayser-Ellison & Co., Ltd., Montreal.
Lincoln Electric Co., of Canada, Ltd., Toronto, Ont.
Lyman Tube & Supply Co., Ltd., Montreal
Marshall, Son & Bunney, Toronto, Ont.
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Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son Toronto, Ont.
Vanadium-Alloys Steel Co., Pittsburgh.

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Armstrong, Whitworth of Can., Montreal.
Dominion Foundries & Steel Ltd., Hamilton, Ont.
Drury, H. A., Co., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.
Vanadium-Alloys Steel Co., Pittsburgh.
Wells Bros. of Can., Galt, Ont.

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Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros., of Can., Galt, Ont.

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Rice Lewis & Son, Toronto, Ont.
Wells Bros., Co., of Canada, Galt, Ont.

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Bertrams, Ltd., Edinburgh, Scotland.

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Page Steel & Wire Co., Adrian, Mich.

SURFACE PLATES
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STRUCTURAL STEEL WORKS
William Hamilton Co., Peterboro, Ont.

SWITCHBOARDS
Northern Electric Co., Ltd., Montreal Que

SWITCHES, RAILWAY
Can. Steel Foundries, Ltd., Montreal.

TABLES, DRAWING
Bowmont Drawing Table Co., Adrian, Mich.

TABLES, SAND-BLAST
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TANKS, AIR, EXPANSION
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Marshall, Son & Bunney, Toronto.

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TANKS, LUBRICATING, OIL STORAGE
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Can. John Wood Mfg. Co., Ltd., Toronto

TANKS, PNEUMATIC AND CLOSET
Can. John Wood Mfg. Co., Ltd., Toronto

TANKS, RUBBER CEMENT
Bowser Co., Ltd., S. F., Toronto, Ont.

TANKS, STEEL, WATER PRESSURE
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Dominion Bridge Co., Montreal, Quebec.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
MacGovern & Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Toronto Iron Works, Ltd, Toronto.

TANK WAGONS
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Toronto Iron Works, Ltd., Toronto.

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Can. Hanson Van Winkle Co., Ltd.,
Lincoln Electric Co. of Canada, Ltd., Toronto, Ont.

TANKS
Can. Ingersoll-Rand Co., Ltd., Sherbrooke
Elec. Steel & Metals, Welland, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
Williams Hamilton Co., Peterboro, Ont.

TAPER PINS
Galt Machine Screw Co., Ltd., Galt, Ont.

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James Chesterman & Co., Ltd., Sheffield, Eng.
Rice Lewis & Son, Toronto, Ont.

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Can. Ingersoll Rand Co., Ltd., Sherbrooke, Que.
Garvin Machine Co., New York.
The Geometric Tool Co., New Haven.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Niles-Bement-Pond Co., New York.
Rickert-Shafer Co., Erie, Pa.
National-Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto.
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Strelinger, Chas. A. Co., Windsor, Ont.
Whitney Mfg. Co., Hartford, Conn
Williams Tool Corp. of Can. Ltd., Brantford, Ont.

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Ingersoll Mach. Co., Ingersoll, Ont.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Pilot Steel & Tool Co., Montreal, Que.
Victor Tool Co., Waynesboro, Pa.

TAPS, GUN, HAND, BOILER
Butterfield & Co., Inc., Rock Island, Que
Greenfield Tap & Die Corp., Greenfield, Mass.
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TAPS, MACHINE RELIEVED
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield Mass.
Wells Bros. of Can. Galt, Ont.

TAPS, MACHINE SCREW
Butterfield & Co., Inc., Rock Island, Que
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

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Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Inc., Rock Island, Que
Greenfield Tap & Die Corp., Greenfield
Ingersoll Mach. Co., Ingersoll, Ont.
Marshall, Son & Bunney, Toronto.
Wells Bros. of Can., Galt, Ont.

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Greenfield Tap & Die Corp., Greenfield.
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Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Foss Mchy. & Sply. Co., G. F., Montreal.
Geometric Tool Co., New Haven.
Greenfield Tap & Die Corp., Greenfield.
Ingersoll Mach. Co., Ingersoll, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Morse Twist Drill & Mchy. Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Rice Lewis & Son, Toronto, Ont.
Starrett Co., L. S., Athol, Mass.
Strelinger, Chas. A. Co., Windsor, Ont.
Taylor, J. A. M., 318 Stair Bldg., Toronto.
Wells Bros. of Canada, Galt, Ont.

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Taylor Instrument Co., Rochester, N.Y.

THERMOMETERS, RECORDING AND INDEX
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National Machy. Co., Tiffin, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Wells Bros. Co. of Canada, Galt, Ont.

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Greenfield Tap & Die Corp., Greenfield.
Landis Machine Co., Waynesboro, Pa.
Pratt & Whitney Co., Dundas, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
Wells Bros. of Canada, Galt, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

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Petrie, Ltd., H. W., Toronto.
Wells Bros. Co. of Canada, Galt., Ont.

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Smalley-General Co., Bay City, Mich.

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See Screws.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

TIN—PIG AND BAR
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TINSMITHS' TOOLS
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Petrie, Ltd., H. W., Toronto.

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Perrin, Ltd., William B., Toronto.
West Tire Setter Co., Rochester, N.Y.

TOOL CASES
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Armstrong Bros. Tool Co., Chicago.
Cleveland Twist Drill Co., Cleveland.
Deloro Smelting & Refining Co., Ltd. Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

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Williams & Co., J. H., Brooklyn, N.Y.

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TOOL ROOM PARTITIONS
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Rice Lewis & Son Toronto, Ont.

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Petrie, Ltd., H. W., Toronto.

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Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool Co., Chicago
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Machy. Co., A. R., Toronto.
U. S. Electrical Tool Co., Cincinnati, O

TOOLS, FORMING
Davidson Tool Mfg. Co., New York, N.Y
Deloro Smelting & Refining Co., Ltd. Toronto, Ont.

TOOLS, LUMBERING
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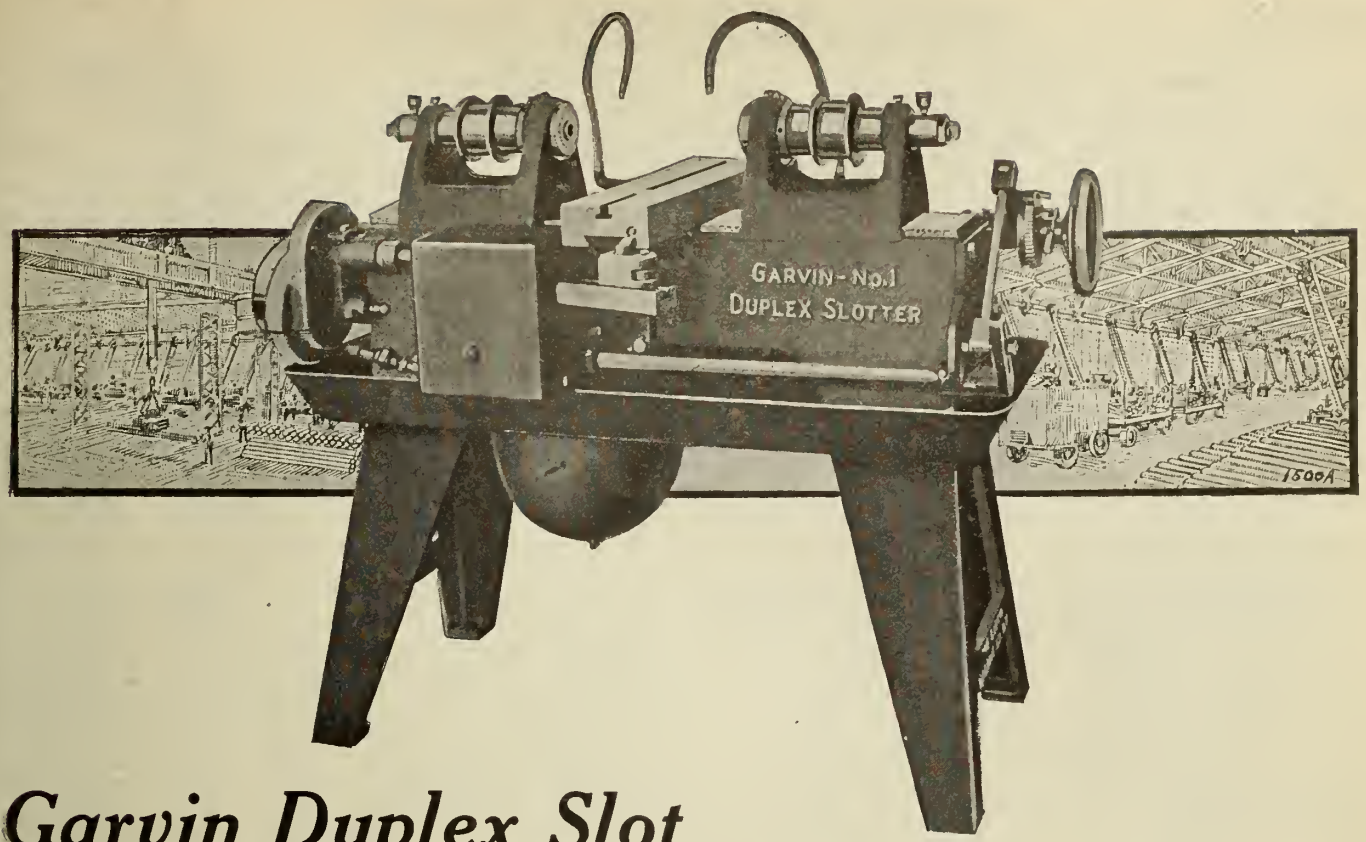
Armstrong Bros. Tool Co., Chicago.
Gisholt Machine Co., Madison, Wis.
Williams & Co., J. H., Brooklyn, N.Y.

TOOLS, SCREW MACHINE
Foster Machine Tool Co. Elkhart, Ind.

TOOLS, SHOP
Strelinger Co., C. A., Windsor, Ont.



Garvin Duplex Slot Millers Boost Output and Profit

The use of Garvin Duplex Slot Milling Machines combines a jump in the rate of production and a cutting of manufacturing cost.

How else can you machine slots, channels, keyways, elongated holes, etc., to equal advantage? A Garvin Duplex Slot Miller cuts from two sides at once, feeds automatically and stops itself at the proper time. You can set up two pieces in parallel or mill a through cut from both sides. In either case you work much more surely and speedily than by the old methods of jig drilling and slotting out, partial sawing or slowly butt milling.

Machine can be set for any depth of feed and either head independently adjusted along the bed to suit differing cutters and varying positions of work on the table. Garvin Duplex Slot Millers, while built for a special work, are flexible enough to cover a wide field.

If yours is a quantity production problem and the work of the kind above mentioned, you will want to look into the possibilities of Garvin Duplex Slot Milling.

There is a special circular No. 229 describing these machines. Let it tell you the story in full.

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The GARVIN MACHINE COMPANY, Spring & Varick Sts., New York, N.Y.

GARVIN

BUILDER OF BETTER MACHINE TOOLS

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Crescent Machine Co., Ltd., Montreal, Que.
McClean Machine & Tool Co., Ltd., Hamilton, Ont.
McCrosky Tool Corp., Meadville, Pa., U. S. A.

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Int. Mach. & Supply Co., Ltd., Montreal.

TORCHES, GASOLINE, KEROSENE AND ALCOHOL
Turner Brass Works, Sycamore, Ill.

TORCHES, STEEL
Armstrong, Whitworth of Can., Montreal.
Prest-O-Lite Co., Inc., Toronto, Ont.

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Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.

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Brown Hoisting Machinery Co., Cleveland, Ohio.

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MacGovern & Co., Montreal, Que.
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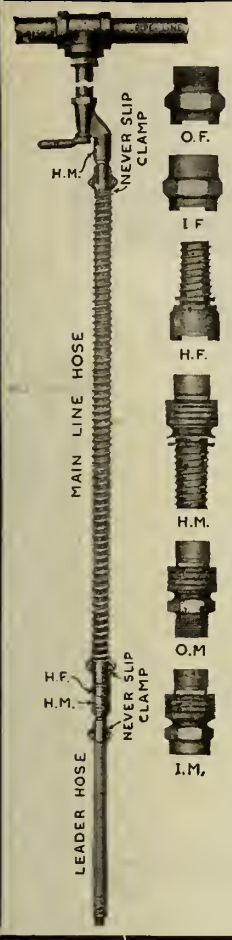

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They are absolutely air-tight under all pressures.
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They interchange in sizes most commonly used.
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The Cleco Never Slip Hose Clamp

Made in same sizes as Bowes Couplings

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Grooved Nipples when attached to hose with the wire clamp cannot "blow-out," as one-half of the Wire Clamp lies in Nipple Groove, and the other half on the hose, uniting nipple and hose permanently.

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Use Annealed Wire No. 14

Write for Bulletin 38 illustrating Cleco Hose Fittings, Couplings, Valves, etc.

IMPORTANT:—The Small Leaks in your "AIR LINE" mean serious loss in DOLLARS. Have you any idea of the amount of "Air" wasted in small leaks at your connections? Air Leakage through 1-16 in. opening equals 5.32 cu. ft. per minute at 80 lbs. It will pay you to install Bowes Couplings and stop costly leaks.

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4—28″ x 12′ Boye & Emmes, 3-step cone and double back gear, quick change gear, rebuilt and guaranteed to be in first-class condition.
2—24″ x 12′ C.M.C. Lathes, 3-step cone and double back gear.
1—26″ x 10′ C.M.C. Lathe, 3-step cone and double back gear.
1—22″ x 10′ Milwaukee Lathe, semi-quick change.
2—20″ x 8′ American Lathes, all geared head, quick change gear.
1—24″ x 8′ Boye & Emmes.
1—18″ x 8′ Greaves Klusman Lathe, second-hand, 3-step cone and double back gear and standard change gear, taper attachment.
4—21″ x 8′ LeBlond Lathes, quick change gear, double back gear, complete with regular equipment.
4—21″ x 10′ LeBlond Lathes, quick change gear, double back gear, complete with regular equipment.
2—19″ x 10′ Sidney Lathes, 3-step cone, quick change gear and double back gear.
4—20″ x 10′ Walcott Lathes, 3-step cone, quick change gear and double back gear.

PLANERS

1—30″ x 30″ x 14′ Putnam Planer, second-hand.
1—Preston Pony Planer, 16″ x 8′.
1—16″ Preston Buzz Planer.
1—12″ Round Cylinder Buzz Planer, second-hand.

SHAPERS

1—28″ Smith & Mills single pulley gear box drive shaper. New.
1—25″ Smith & Mills, cone pulley drive. New.
1—16″ Smith & Mills cone pulley drive back geared crank shaper. New.
1—24″ Back Geared Bertram Shaper, second-hand.
1—26″ Back Geared Kelley Shaper, second-hand.

DRILLS—NEW

1—4′ Mueller Single Pulley gear box drive radial drill.
2—12″ Class "B" Henry & Wright high-speed ball-bearing drill presses.
1—18″ Edlund High Speed ball-bearing drill press.

DRILLS—SECOND-HAND

1—30″ American Tool Works Sliding Head Drill.
1—24″ Sibley, back geared.

BOLT THREADERS—NEW.

1—2″ Hall Pipe Threading Machine.

MILLING MACHINES—NEW.

1—No. 2 Kempsmith Full Universal Milling Machine, complete with regular equipment.
1—No. 1 Kempsmith Full Universal Milling Machine, complete with regular equipment.

MILLING MACHINES—SECOND-HAND

1—No. 2 Ford Smith Plain Milling Machine in first-class condition.
1—No. 21 Garvin Plain Milling Machine.
1—No. 2 Rockford Plain Milling Machine, complete with vise and dividing head, regular equipment.
1—No. 2 Cincinnati Miller (plain), complete with vise and regular equipment.

RACINE SAWS

3—No. 7 Racine Saws, having a capacity of 12 x 12″. New.
1—No. 4 Racine High Speed Metal Cutting Machine, capacity 6 x 6, 3-speed gear box drive. New.
2—Racine 6″ standard machines. New.
1—Peerless 6 x 6 standard machine. New.
1—14″ band saw (Crescent pattern), second-hand.
50—No. 1 Racine hack saws, rebuilt, 6″ capacity.

DRILL GRINDER

1—Wilmarth & Morman Twist Drill Grinder, style "B" point. New.

Also the following rebuilt machines which we have just purchased, all of which are guaranteed to be in first-class condition:

2—21″ x 8′ LeBlond Lathes, 3-step cone, double back gear and quick change gear.
2—21″ x 10′ LeBlond Lathes, 3-step cone, double back gear and quick change gear.
10—19″ x 8′ LeBlond Lathes, 3-step cone, double back gear and quick change gear.
6—20″ x 8′ Walcott Lathes, 3-step cone, double back gear and quick change gear.
3—20″ x 10′ Walcott Lathes, 3-step cone, double back gear and quick change gear.
2—20″ x 10′ Sidney Lathes, 3-step cone, double back gear and quick change gear.
2—22″ x 10′ Reed Prentice Lathes, 3-step cone, double back gear and quick change gear.
1—22″ x 10′ Milwaukee Lathe, semi-quick change.

All the above machines are fitted with 4-jaw Independent Chucks.

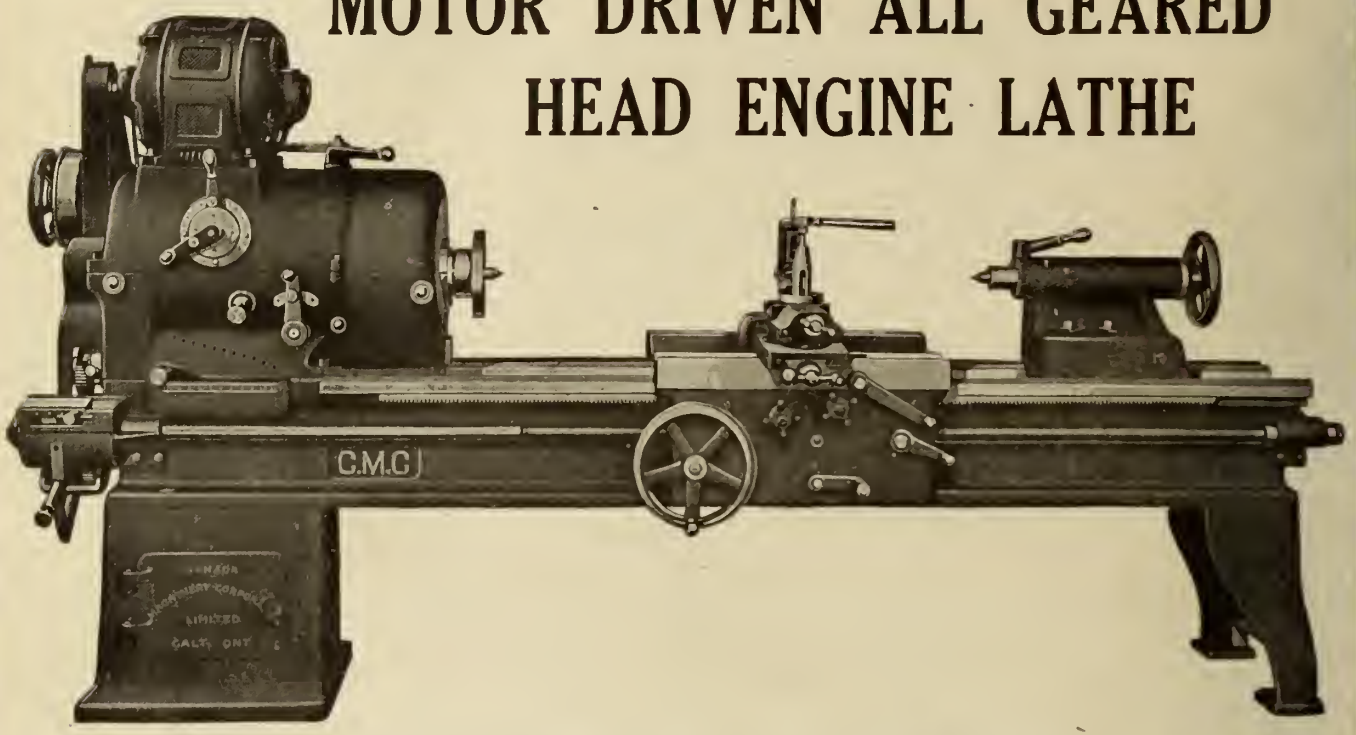
Send for full particulars and prices to

THE GEO. F. FOSS MACHINERY & SUPPLY CO., LIMITED

305 St. James St. MONTREAL

Foss QUALITY Foss SERVICE Foss

ADVANTAGES OF THE C.M.C. MOTOR DRIVEN ALL GEARED HEAD ENGINE LATHE



Built in Sizes from 16 inches to 26 inches

This lathe has many advantages over the belt driven machines and other all geared lathes.

You place the machine, attach the wires and commence operation. You may place it where and how you like, regardless of shafting alignment or position—where it is most convenient or least in the way of other equipment as your fancy suits.

You may operate it at will—when all other machines are still for that matter. It is just the thing for overtime rush jobs or repairs.

There are no belts to catch clothing or fingers.

Headstock—Eighteen speeds are obtained with only thirteen gears, giving a maximum number of speeds with a minimum number of parts; as many eight and twelve speed heads have as many or more gears than this design.

CANADA MACHINERY CORPORATION, GALT, ONTARIO
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CANADIAN MACHINERY
AND MANUFACTURING NEWS

Vol. XXIV., No. 10 | Published by the MacLean Publishing Company, Limited, Toronto | September 2, 1920 | $4.00 a Year Subscription Price

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MACHINISTS' TOOLS

"Thoroughly dependable for the most exacting requirements of the mechanic and manufacturer."

B·S

All the Fine Qualities That Good Work Demands

Pratt & Whitney Small Tools enjoy an enviable reputation for excellence that has been well earned in the high production shops of the country. Where stamina as well as exceptional accuracy and precision are required P & W Tools have more than held their own. Our line is complete. It includes taps, dies, milling cutters, reamers, punches, drills, etc., both of standard and special design and in sizes to suit every requirement.

Prompt service is assured at our nearest store, where P & W Small Tools are carried in stock for immediate delivery.

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The BERTRAM Page

MACHINE TOOLS

We have available for immediate shipment, subject to prior sale, the following motors

Canadian Westinghouse Motors

	R.P.M.	Volts	Phase	Cycle	PRICE EACH F.O.B. Dundas
1—75 H.P. Type C.C.L.	700	550	3	25	$910
1—50 H.P. Type H.S.	720	550	3	25	900
1—40 H.P. Type C.C.L.	710	550	3	25	925
3—30 H.P. Type C.C.L.	715	550	3	25	965
1—20 H.P. Type C.C.L.	710	550	3	25	400
1—15 H.P. Type C.C.L.	720	550	3	25	550

Canadian General Electric Motors

2—30 H.P. 1 Form K	750	550	3	25	440
1— 2 H.P. A 20/2	1,435	550	3	25	85

Canadian Crocker Wheeler Motors

2—75 H.P. Size 123 FQ	750	550	3	25	1,205
1—50 H.P. Size 124 AQ	500	550	3	25	885
2—50 H.P. Size 122 AQ	750	550	3	25	900
1—40 H.P. Size 122 Q	750	550	3	25	525
6—30 H.P. Size 120 Q	750	550	3	25	660
1—25 H.P. Size 119 Q	750	550	3	25	610
3—20 H.P. Size 118 Q.	750	550	3	25	560
*1—10 H.P. Size 116 Q	750	550	3	25	445
*4— 5 H.P. Size 114 AQ	750	550	3	25	245

*NEW

All these motors are in first-class condition. Motors over 5 H.P. are complete with oil-immersed auto starters, and all are equipped with Base and Pulley.

The John Bertram & Sons Co., Limited

DUNDAS. ONTARIO. CANADA.

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Canadian Machinery and Manufacturing News, September 2nd, 1920. Vol. 24, No. 10. Published weekly at 143-153 University Avenue, Toronto, Canada. Subscription price in Canada, $4; United States, $4.50. Entered as second-class matter at the Post Office Department, Ottawa, Canada. Entered as second-class matter July 1, 1912, at the Post Office Department at Buffalo, under the Act of March 3rd, 1879.

STAR HACK SAWS ARE NOW SOLD BY THE MAKERS

For 37 years we have made Star Hack Saws and owned the famous Star name and brand—selling our saws through the Millers Falls Co.

This arrangement is terminated August 15th by mutual consent and we will hereafter market Star Saws ourselves direct to the trade. This development from sales agency representation to direct selling has been going on in every line of business. Factories have found out that when they sell their own products they are in a position to give the most effective trade and users' service on the goods they make.

This is exactly what the Clemson selling service now means to Star Saw users and the trade. It means a closer understanding and a more constructive service, because the same organization that makes Star Saws will now be in direct contact with the customers who buy and use them.

Star Saws themselves will continue the quality leadership that for 37 years has made them the standard blades. Star reputation has cost us a life-time of effort that makes us guard it jealously and concentrate our every resource and energy in maintaining and increasing it.

The high speed qualities of the steel—the undercut hook on the teeth—and the toughness secured by special heat treatment—these recognized points of Star Saw superiority are thus standardized by uniform methods of production. Thus you can be sure of securing satisfactory service from every blade you buy in the famous green box —whether it is a power or hand blade —all hard or flexible.

CLEMSON BROS. INC.

MIDDLETOWN, N.Y.

Star Hack Saw Blades are made of tungsten steel. Machine and Hand Blades — Flexible and Hard.

Clemson representatives cover the country in giving Star service. Write our office at Middletown, N.Y.

Does Your Production Need A Tonic?

A manufacturing proposition may often be likened to a man who lacks pep. A tonic is necessary! Many a Canadian manufacturer whose production lacked pep found the most efficient tonic in *Wilt Tools.* Wilt Tools consist of High Speed and Carbon Twist Drills, Reamers and Milling Cutters. They are made by a special process that assures maximum and uniform results when driven hard, hour after hour and day after day. If production in your shop needs a tonic, fortify yourself with Wilt mechanical and moral support.

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Wilt Twist Drill Company of Canada, Limited
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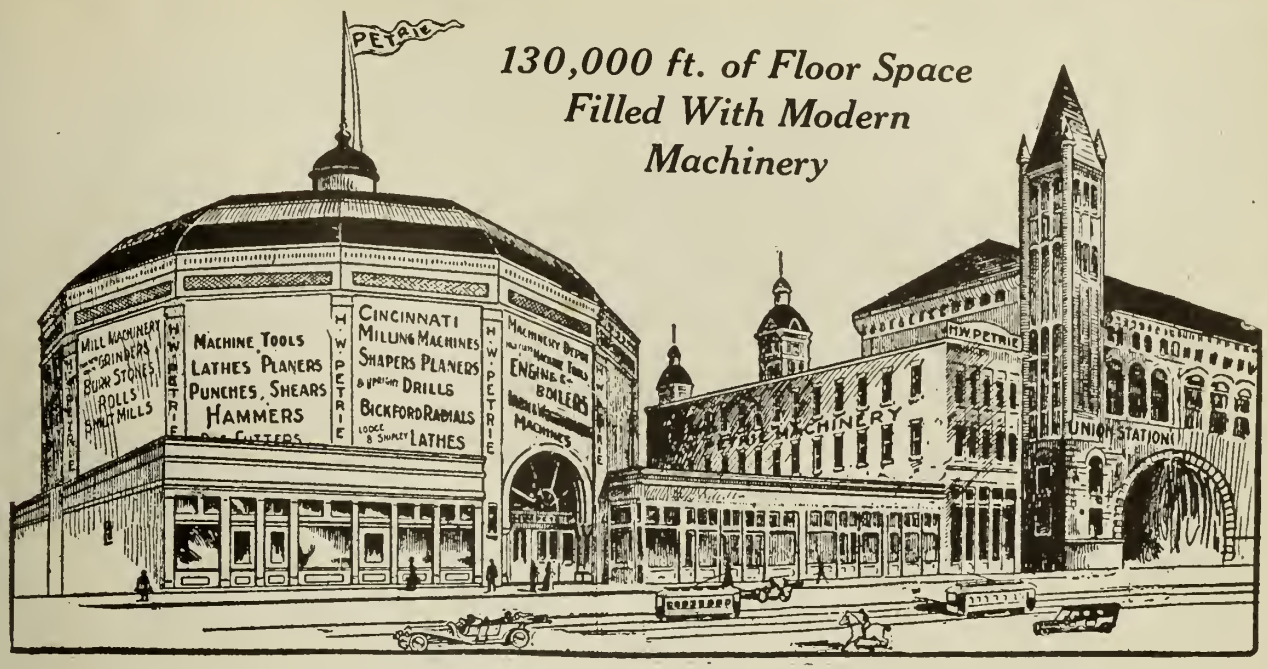

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When at Toronto During Exhibition

DO you wish to see the finest assortment of machine tools ever shown in Toronto by a single firm? Then pay a visit to our showrooms when you attend the Canadian National Exhibition.

Our main warehouse is just to the right as you step out of the Union Station door (note illustration above).

At the corner of Bathurst and Niagara Streets (close to east entrance to Exhibition Grounds) we also have 3½ acres of space devoted to an extensive variety of machinery.

Your visit to Toronto will not be complete unless you see the **Petrie** lines.

H. W. Petrie, Limited

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PETRIE

No Job Too Big For — Little David

No chipping job is ever too hard or too big for a Little David Chipping Hammer. It is powerful, sturdy, economical in the use of air and has a combination one-piece Piston and Poppet Type Throttle Valve, giving Piston Valve nicety of control with Poppet Valve freedom from leakage.

The beveled seat remains tight throughout the life of the tool. The one-piece spring steel trigger has a long bearing in the handle and will stand up under lots of abuse. The control is very sensitive, ranging from a light tap to a heavy hammer blow.

Bulletins describing this and other Little Davids are free.

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Little David AIR TOOLS

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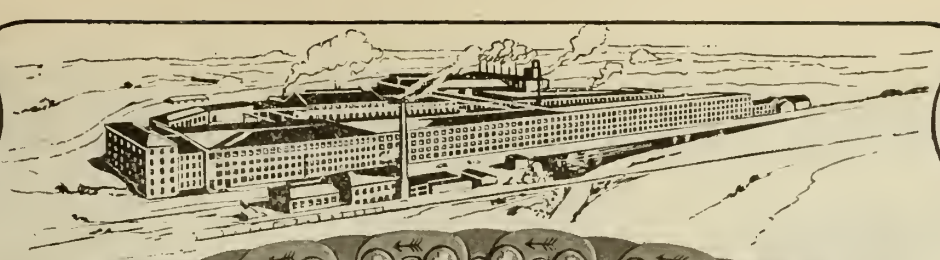

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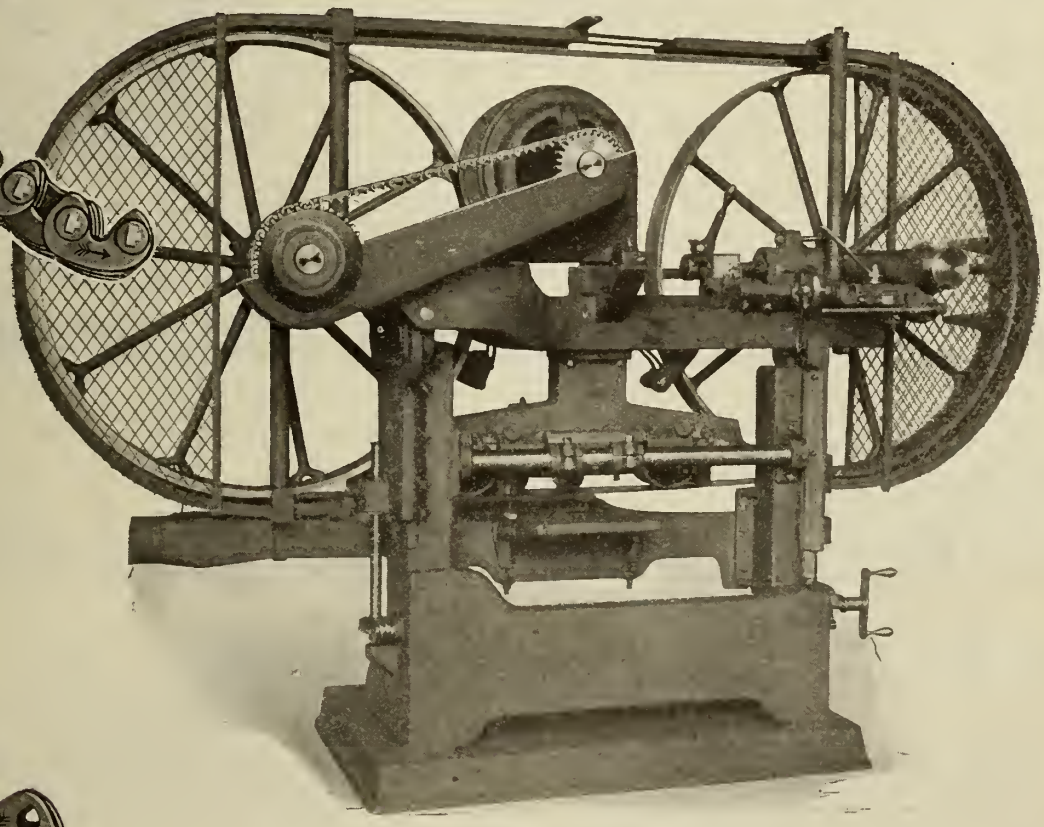

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Wherever you are having belt trouble let MORSE ENGINEERS investigate, giving your problem the careful research of experienced power transmission experts. Why not examine the efficiency and success of MORSE Silent Chain Drives?

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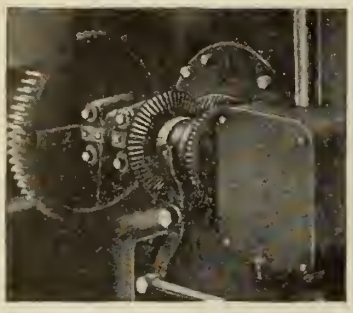
THE JOHNSON FRICTION CLUTCH



Johnson Clutch Installation on a Newton Milling Machine

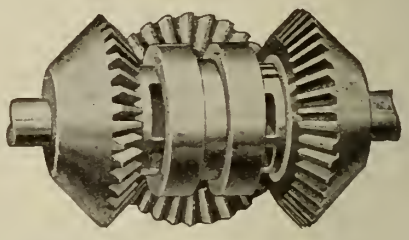
Clutches for Reversing Functions

A reversing clutch is a very common requirement on machinery, and one which is encountered in many different forms. Whatever the situation may be, a Johnson Clutch offers the best method of handling it.

The bevel gear assembly shown here is one of the ways in which a Johnson Double Clutch is frequently applied for reversing functions. Many of the best machine tools are equipped in this manner.

Write for our Yellow Catalog, and Booklet,

"Clutches As Applied To Machine Building."



Double Clutch in Nest of Bevel Gears

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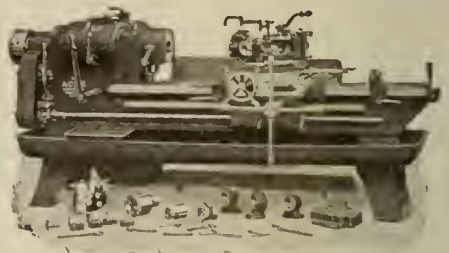
THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.

Cincinnati Acme Flat Turret Lathes

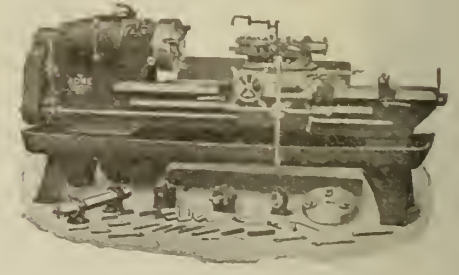
Does Both Bar and Chuck Work

Cincinnati Acme Flat Turret Lathes are designed for both bar and chuck work. The head is cast solid with the body, giving constant, true alignment of the spindle with the vees upon which the carriage travels. They are fast, accurate, reliable and economical. Only the gears doing the actual work run, thus giving full returns on all power.

Decide if you can use this machine, with the full facts before you. We shall be glad to send all details.



3¼ in. x 36 in. Flat Turret Lathe with Bar Equipment.



3¼ in. x 36 in. Flat Turret Lathe with Chucking Equipment.

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Cincinnati, Ohio, U.S.A.

Canadian Agents: Rudel-Belnap Machinery Co., Montreal, Toronto

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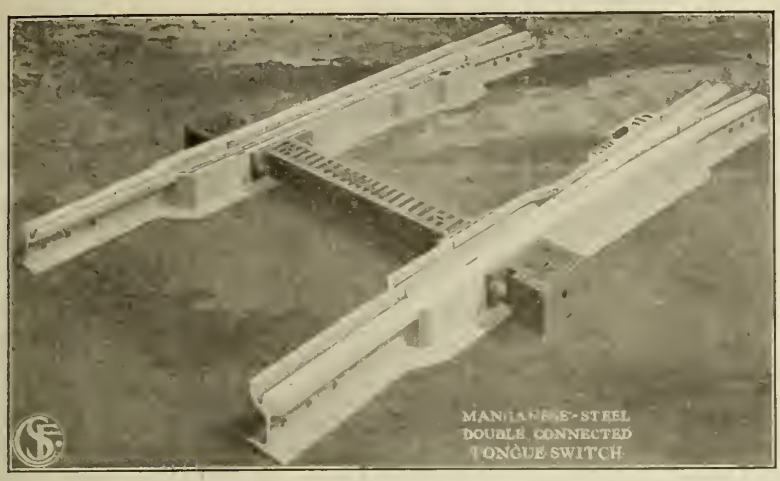

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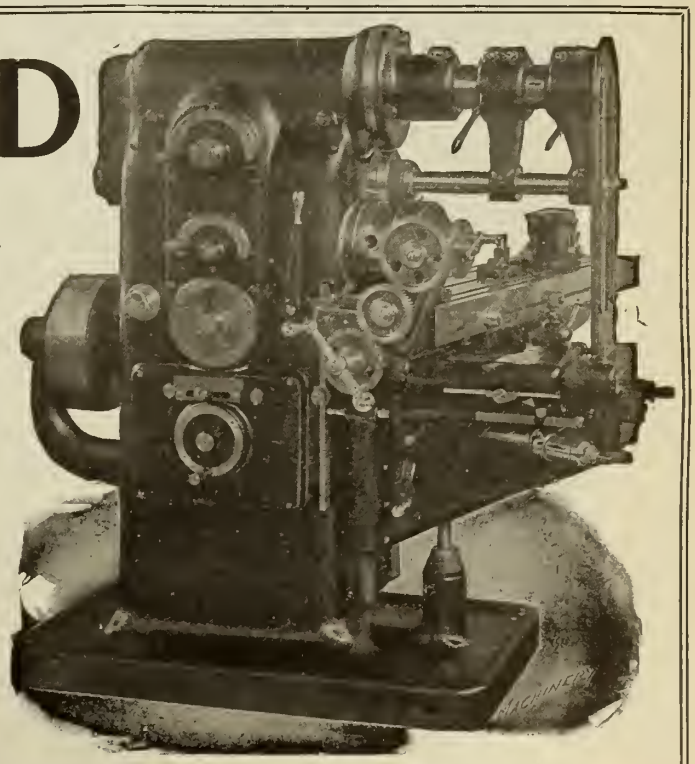
In the tool room, in the shop, in the manufacturing or jobbing establishment this "Miller" is beyond comparison.



Has Power to Spare

Put the power of the "Rockford" to the severest tests. It's built to more than meet the demands likely to be made upon it. It is the pace-maker of the machine shop.

Look into the merits of this machine. Write to us without delay.

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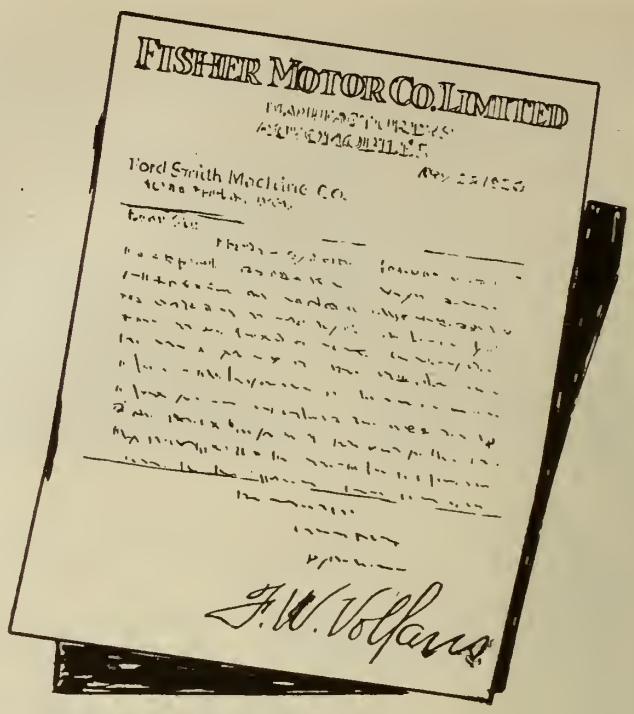
Ford-Smith Millers are Preferred

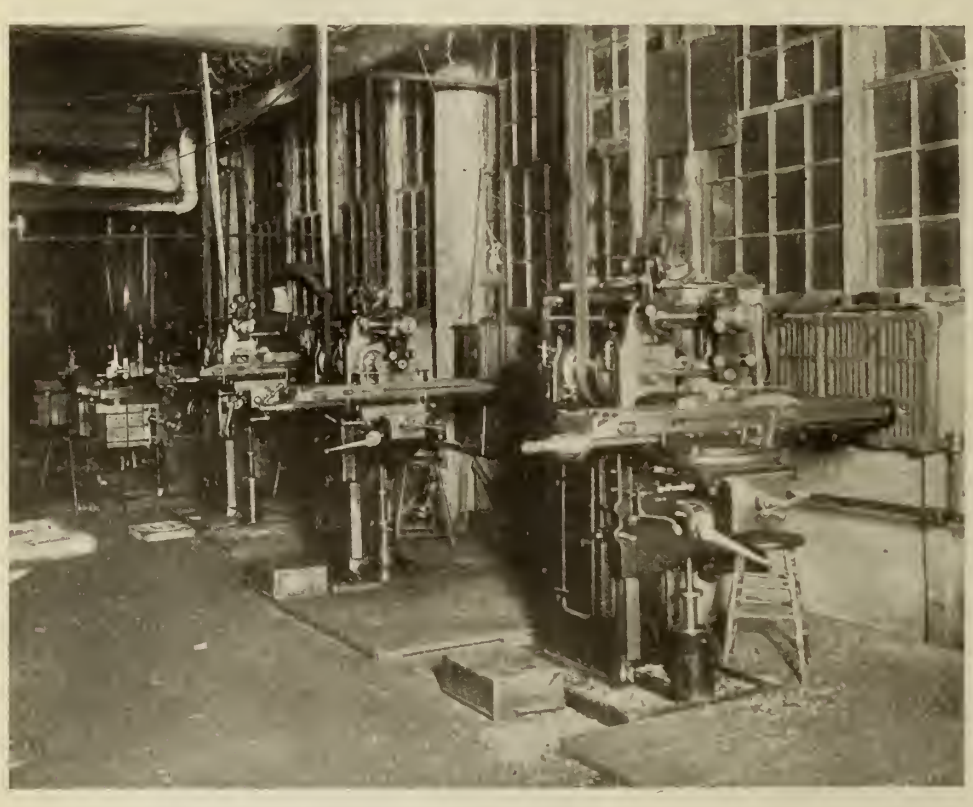
The Dies which are used for the manufacture of Die-Castings must be machined to the greatest degree of accuracy, and the Ford-Smith Milling Machines (*illustrated below*) were purchased after the most careful investigation. They have been in operation for several months, and are giving perfect satisfaction.

Extract from letter of Mr. F. W. Vollans, general manager of the Fisher Motor Company, Orillia, Ontario. The battery of Ford-Smith No. 2 Millers installed in die shop of their die-casting department and illustrated below are the machines to which he refers.


FISHER MOTOR CO. LIMITED

Ford Smith Machine Co.

F. W. Vollans



The Machines Which are Giving Perfect Satisfaction

The "perfect satisfaction" of the performance of these millers is equalled by all other Ford-Smith machines. Each is subjected to the same exacting tests before leaving the factory.

Full particulars of the Ford-Smith millers will be forwarded upon request.

The Ford-Smith Machine Co., Ltd.

HAMILTON, ONTARIO, CANADA

FOREIGN AGENTS:

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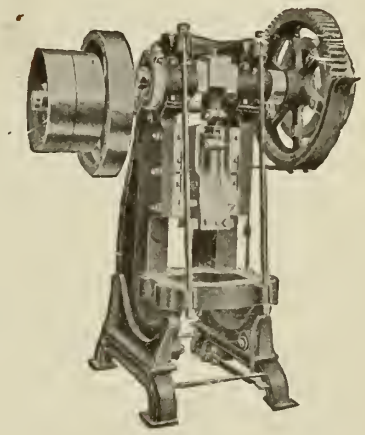
British & Canadian Hydraulic Tube Co., Johannesburg, S. A.

BROWN-BOGGS

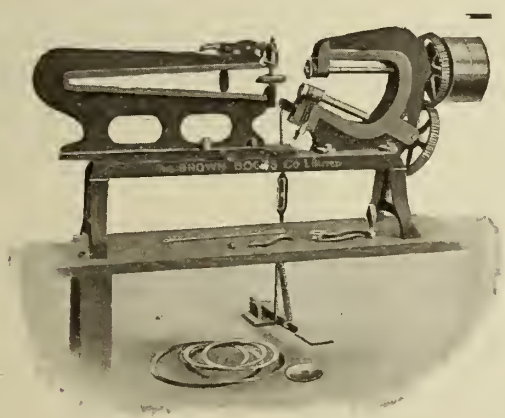
B B

The present reputation enjoyed by B-B products is not a matter of "luck," but the natural outcome of over forty years' persistent effort.



No. 215—Power Press

They hold first place to-day because of their consistent merit—merit which is demonstrated with every operation a "B-B" tool performs.



No. 36—Ring and Circular Shear

The "B-B" line consists of machines and tools for sheet metal; tinsmiths' tools and machines; presses; dies; shears; punches; drop hammers; canners' processing machinery; evaporating machines and special machinery.

We shall be pleased to send you our catalog containing full particulars of the machines in which you are interested.

THE BROWN-BOGGS CO., LIMITED
HAMILTON, CANADA

If interested tear out this page and place with letters to be answered.

A SELF-CONTAINED HYDRAULIC UNIT

EASTERN UNIVERSAL HYDRAULIC PRESS. Supplied in 20-35 and 50-ton capacities, full hydraulic depending on no springs or weight for return of ram, delivering pressure instantly at a speed of 1½ in. per second return of ram 3 in. per second.

Length of Ram Travel.....6 in.
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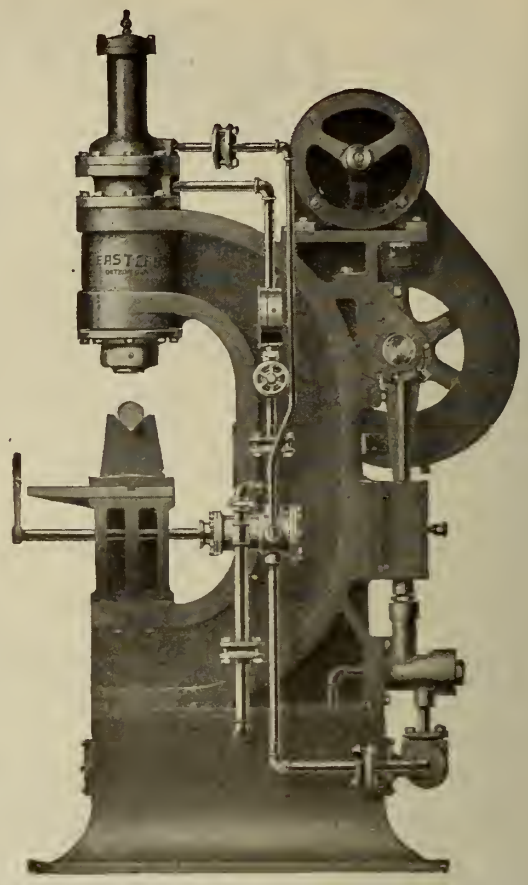
Length of Table .....8 ft.
Width of Table .....10 in.
Table to Ram .....10 to 14 in.

EASTERN UNIVERSAL PRESSES are tested before leaving our plant at 33 1/3% overload. They are furnished with rolling centres and are unexcelled for straightening of motor crankshafts, heavy wheel shafts, broaching splines in drive plate, differential gears, and others. Straightening front axles and spindles.



Write for details

EASTERN PRODUCTION COMPANY

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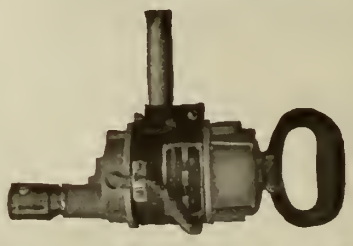
GALT, ONTARIO

Eastern Representatives: The Canadian B. K. Morton Company Limited, 49 Common St., Montreal, Que.

U. S. Electric Drills and Grinders

Save Time, Labor and Money



They can be attached to any lamp socket.

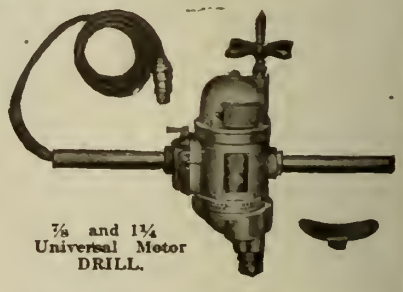
For drilling in metal they are superior to any other kind of portable drill. Cost 50% less to run than air drills.

3 SIZES
3-16 in., W.G.T., 6 lbs.
¼ in., W.G.T. 9 lbs.
⅜ in., W.G.T. 12 lbs.

All motors wound for 110 or 220 volts.

Direct or alternating current.

Try a few of our Electric Drills and Grinders and you'll send us an order for more. Our guarantee protects you.



⅜ and 1¼ Universal Motor DRILL.

For Sale By
The Canadian Fairbanks-Morse Co., Limited
Montreal, St. John, N.B., Toronto, Winnipeg, Calgary, Vancouver

THE UNITED STATES ELECTRICAL TOOL CO.
CINCINNATI, OHIO

W. ATKINS & Co Ld Sheffield ENG

THE
HIGH SPEED STEELS
For superior cutting power:
"DOUBLE WACO" AND
"WACO SUPERIOR"
CARBON TOOL STEELS FOR
ALL PURPOSES
"Turtle" Brand, unequalled for reliability.
MINERS' DRILL STEELS.
Solid and hollow, all sections.

Representative
MARSHALL SON & BUNNEY
39 Richmond St East
TORONTO

Crucible
AND
Open Hearth Steel
Tool Steel
"ARGO" BRAND *HIGH-SPEED* STEEL

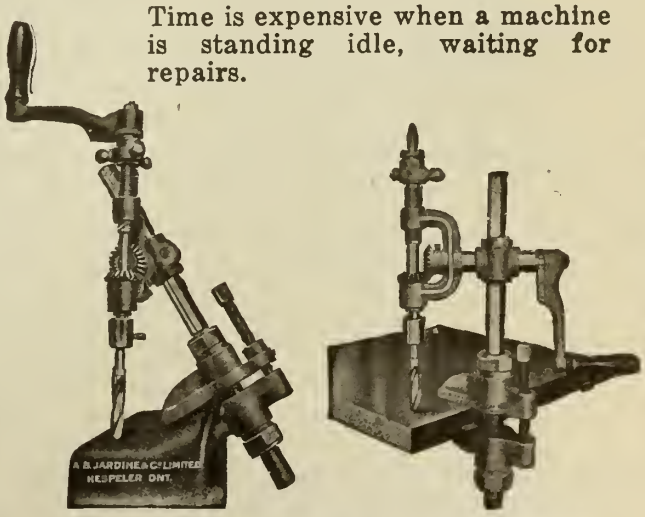
The John Illingworth Steel Co.
1856

Frankford, Phila.
New York Office 217 Broadway

RALPH B. NORTON, AGENT
124 Craig St. W.
Montreal, Canada

Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.



On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, $26.50 net.
Sold by all Machinery and Supply Houses

A. B. JARDINE & CO., Limited
HESPELER, ONTARIO

If interested tear out this page and place with letters to be answered.

Even lump limestone is handled rapidly

This Brownhoist locomotive crane loads large lump limestone from storage into the railroad cars for shipment. The stone is received in large lumps, is very hard and, therefore, very difficult to handle. But the Brownhoist crane with Brownhoist bucket loads many 50-ton cars each day and quickly cuts its way into the pile containing thousands of tons.

Work on such a large scale would be impossible if handled by hand. But the Brownhoist with only one operator and a groundman not only does the loading, but will switch the cars as well. This means that the cars can be moved whenever necessary, and without the use of a switching engine. Any way you consider it, the Brownhoist not only does the work better; it does it faster and much more economically as well.

If your handling costs are too high, write for Catalog K, which shows Brownhoist locomotive cranes at many different kinds of work. It may give you an idea as to how best to solve your own handling problem.

BROWNHOIST

Products include:

Locomotive Cranes
Grab Buckets
Drag-Line Buckets
Electric Hoists
Tramrails & Trolleys
Overhead Tr. Cranes
Pillar & Jib Cranes
Heavy Dock Machinery
Suspended Concrete Bins

Write for Catalogs

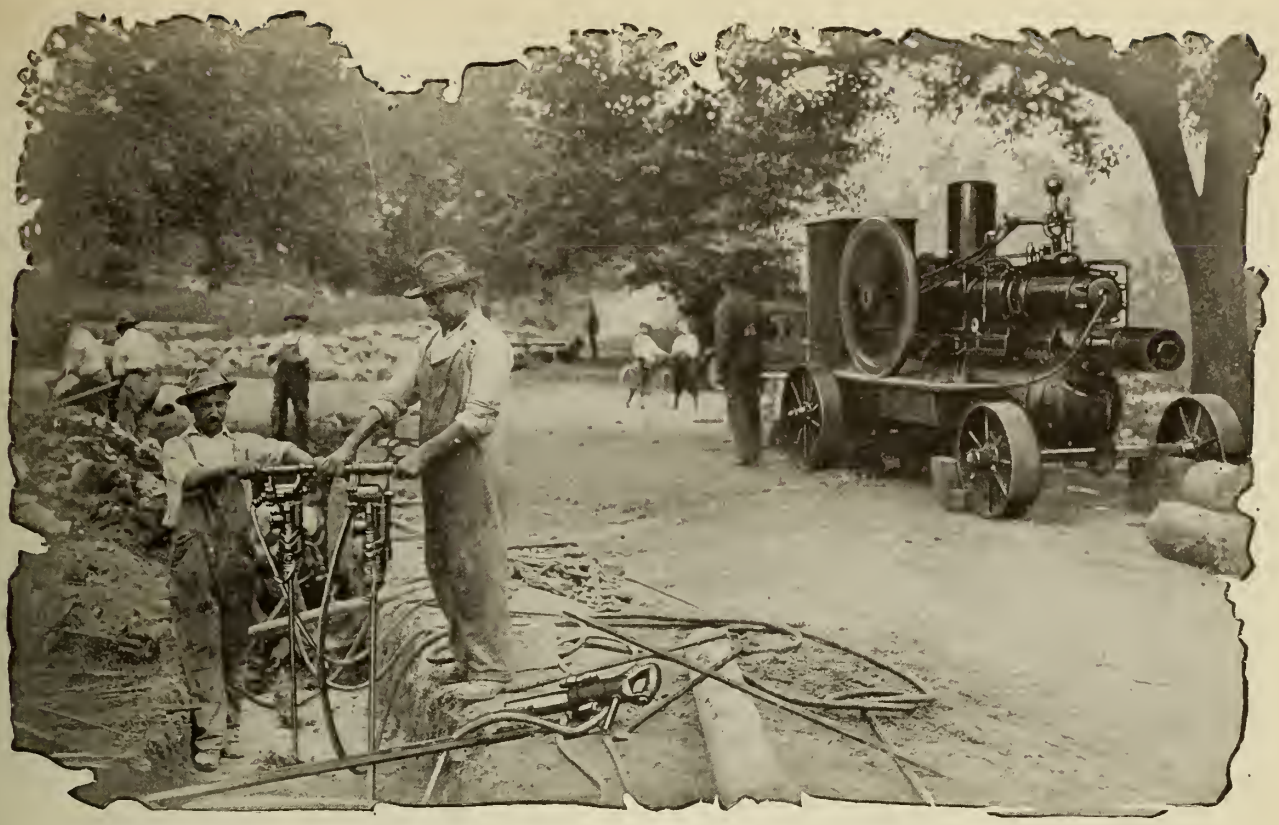
The Brown Hoisting Machinery Company

40 Years in Crane Business

Cleveland, Ohio, U.S.A.

Engineers and Manufacturers of Heavy Dock Machinery, Bridge Cranes, etc., as well as Smaller Cranes and Hoists

Branch Offices in New York, Pittsburgh, Chicago, and San Francisco
European Rep., H. E. Hayes, 12 Rue de Phalsbourg, Paris



When contractors strike a snag

STUBBORN rock, low air pressure, hung-up drills, non-portable air supply, compressor or drill failures—are no "snags" to this contractor.

On work like this Hummer Rock Drills, with their self-rotating feature, put down holes much faster than cumbersome mounted type drills. Their "air-washed" ball valves prevent "hang-ups" due to dirt or mud. They drill like demons, with negligible kick-back.

Even with a leeway of several hundred feet, moving as the job progresses, these drills receive an unfailing air supply from a Chicago Pneumatic Portable Air Compressor — "the compressor with the Simplate valve." It moves anywhere a wagon can go, providing *dependable* air power *when* and *where* it is needed.

Hummer Rock Drills and Chicago Pneumatic Portable Compressors make an ideal "team" for most contractors. Hummers are convertible into either "wet" or "dry" types. Chicago Pneumatic Portable Compressors are furnished in several capacities for operation on either electricity, gasoline or fuel oil.

You'll be interested in Bulletins 399, 34-K and 34-Y.

Sales Representatives

The Holden Company, Limited

354-356 St. James Street, Montreal, Canada

Sales and Service Branches: TORONTO, 342 Adelaide Street, West WINNIPEG, 150 Princess Street VANCOUVER, 81 Pender Street

Canadian Factory: Canadian Pneumatic Tool Company, Montreal

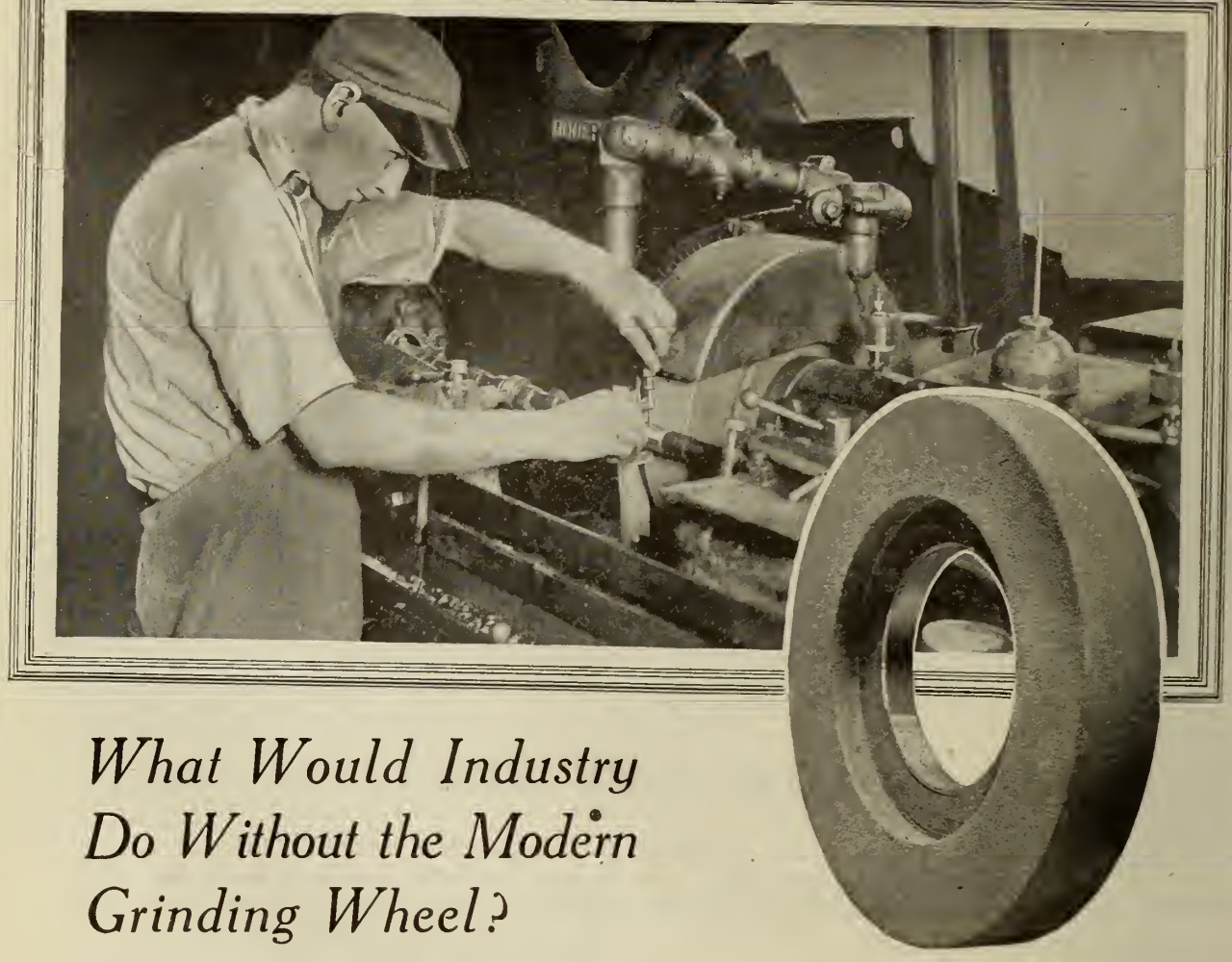
P-85-H

BOYER PNEUMATIC HAMMERS · LITTLE GIANT PNEUMATIC AND ELECTRIC TOOLS
CHICAGO PNEUMATIC AIR COMPRESSORS · VACUUM PUMPS · PNEUMATIC HOISTS,
GIANT OIL AND GAS ENGINES ROCK DRILLS · COAL DRILLS

CHICAGO PNEUMATIC

Depend upon *that Name*

If interested tear out this page and place with letters to be answered.



What Would Industry Do Without the Modern Grinding Wheel?

IMAGINE, for instance, Detroit's great plants trying to produce the countless, accurate, interchangeable parts of the automobile without such necessary tools as Aloxite Grinding Wheels.

Production would be painfully limited—

Extreme accuracy impossible.

You will find Aloxite Wheels doing a mighty big share of the cam shaft, the crank shaft and the tool room grinding.

You will find them in the foundries snagging the steel and malleable castings.

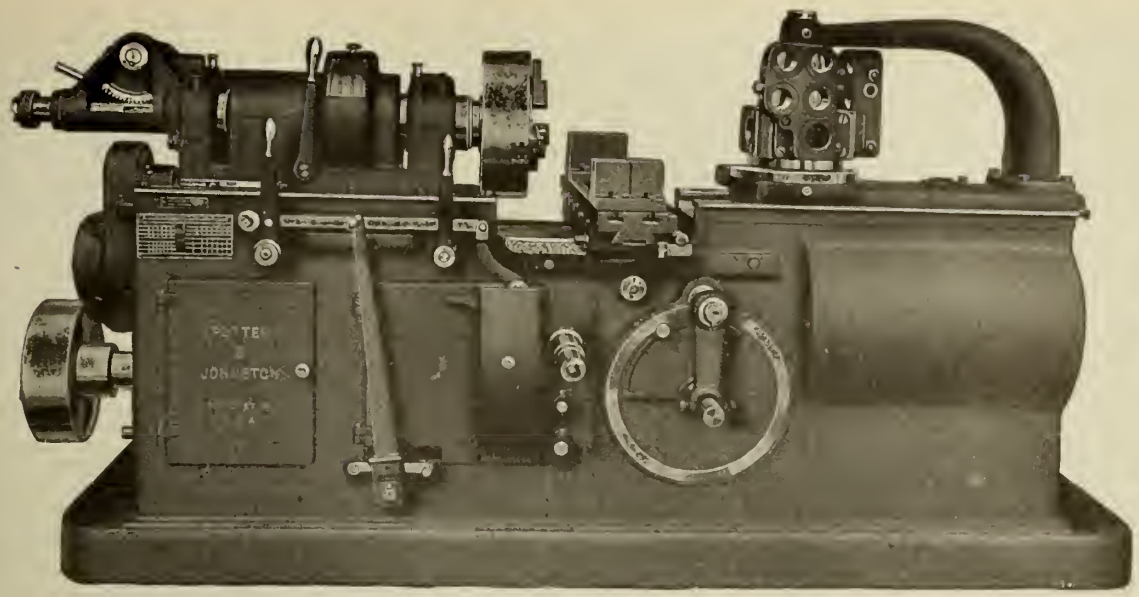
Clean, free, fast and cool cutting Aloxite Wheels that keep up production figures —that keep down grinding costs.

It's just a question of getting the right wheel in the right place—Carborundum Service sees to that.

THE CARBORUNDUM COMPANY, NIAGARA FALLS N. Y.

New York, Chicago, Boston, Philadelphia, Cleveland, Detroit, Cincinnati, Pittsburgh, Grand Rapids, Milwaukee

Aloxite Grinding Wheels

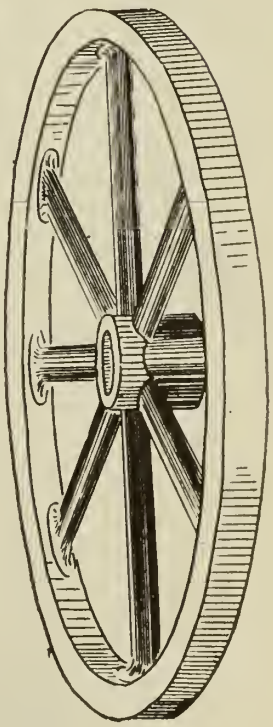


From a Small Gear to a Large Fly Wheel

If you have any duplicate work, castings, cut-off stock, or forgings, write us and let us give you production estimate.

The accuracy and all-around reliability of the P & J's, coupled with the ease of operation and economy of this machine, are responsible for the large batteries that have been installed by a great many of the large manufacturing concerns.

One man can operate several machines—the operator simply placing the pieces in the chuck and taking it out when the cut is finished.



Bulletin 41

Canadian Offices: POTTER & JOHNSTON MACHINE CO.

ROELOFSON MACHINE & TOOL CO., LIMITED

Head Office and Showrooms:

11 WELLINGTON ST. EAST, TORONTO, CANADA

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GOODYEAR

MADE IN CANADA

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

For Outside Drives— KLINGTITE—an All-Weather Belt

The service given on outside drives by Goodyear Klingtite Belting (formerly Extra Power) is unusual enough to be of interest to every belt user.

Not because there are a great number of outside drives—but because the outside drive is just about the ultimate test of a belt's ability.

The specially designed fabric of Goodyear Belting gives it the strength to withstand brutal outside service.

But the best of cotton will rot and whip to pieces outdoors if not protected.

So we have forced generous quantities of high-grade rubber through and through the plies of Goodyear Klingtite Belting, forming one solid unit, proof against weather and ply separation, yet flexible, pulley-hugging, efficient.

The special friction surface on Goodyear Klingtite Belts (formerly Extra Power) grips through dust or moisture and prevents slipping.

How well these belts serve is evidenced by this letter from the Beaver River Lumber Co. regarding their Extra Power Belt (now Klingtite). At last report (June, 1920) *this belt was still in service after 32 months' use,* when this mill was burned recently.

In their letter the Beaver River Lumber Co. say: "The belt driving the conveyor runs direct from a small engine to the conveyor drive. It is subject to steam and heat in the engine room and to cold and dampness on the outside. Under these conditions, there is no sign of deterioration and there is no slippage."

The same testimony is advanced by hundreds of farmers and threshermen who bought Goodyear Klingtite Belts (under their old name of Extra Power) for severe outside service on the farm.

If you have an outside drive, by all means investigate Goodyear Klingtite Belts. If you have *any* transmission drive, let a Goodyear Belting man show you how Goodyear Belts, which are good enough for outside service, will render heaping value on inside work. 'Phone, wire or write the nearest Goodyear Branch and a man will call without obligation to you.

The Goodyear Tire and Rubber Co. of Canada, Limited

Halifax, St. John, Quebec, Montreal, Ottawa, Toronto, Hamilton, London, Winnipeg, Saskatoon, Regina, Calgary, Edmonton, Vancouver.

KLINGTITE BELT

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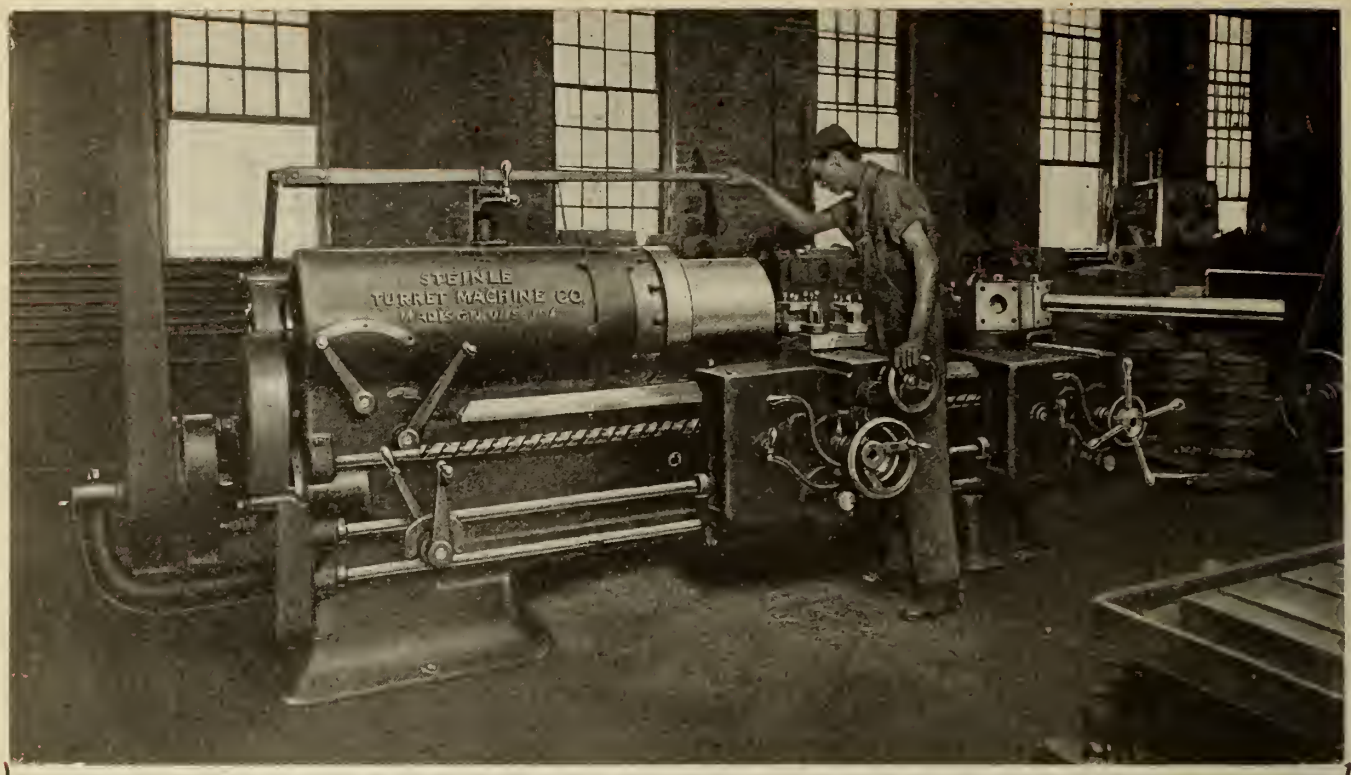


Finishing a 16 Inch Pulley in 60 MINUTES

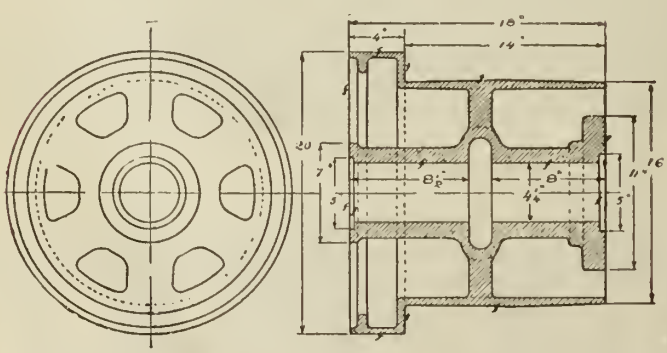
Speaks Well For "STEINLE" Design and Construction

It is a demonstration of the ability of the Steinle Heavy Duty High Power Turret Lathe to pull maximum cuts at as high cutting speeds as the best tool steel will stand.

Especially is this made apparent when it is realized that the surface machined on each pulley is 1,446 square inches, the surfaces machined including turning the 16-in. diameter, turning and facing the 20-in. diameter flange, boring the hub, and counterboring and facing one end of hub. All surfaces received a roughing and finishing cut.

Steinle lathes are built and equipped to handle with equal facility large or small castings or forgings or bar work up to 6¾ in.

Why not send us your blueprints so that we may show what "Steinle saving" means as applied to your work?

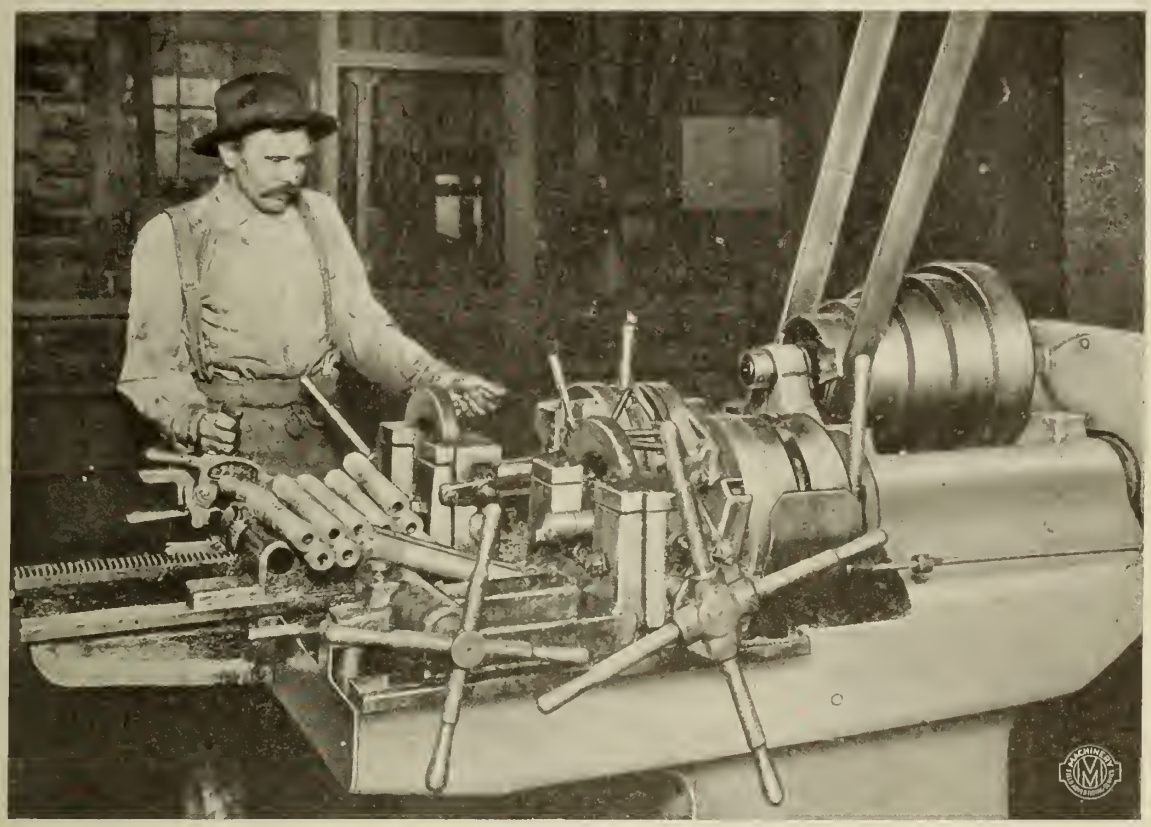


STEINLE TURRET MACHINE COMPANY

Originator of the Full Swing Side Carriage Turret Lathe

Madison, Wis., U.S.A.

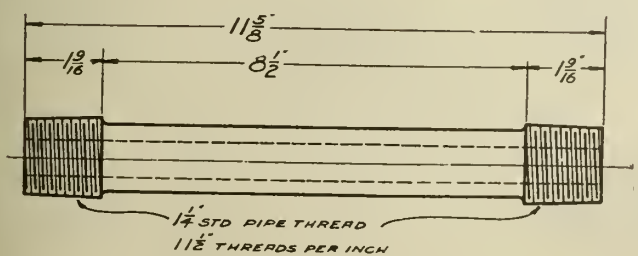
AGENTS—Machine Tool Engineering Company, Singer Building, New York City; Cadillac Tool Company, Dodge Power Building, Detroit, Michigan; L. G. Henes, 75 Fremont Street, San Francisco, California, and Title Insurance Building, Los Angeles, California. FOREIGN—Leo. C. Steinle, 53 Victoria Street, London, England.



Threading Bolts for Safety Boilers with a

LANDIS

THREADING MACHINE



AN excellent example of Landis threading efficiency is found in the St. Louis plant of the Heine Safety Boiler Company. The illustration shows the "Landis" threading stay bolts for Heine boilers. Production is very creditable indeed, both ends of fifty-two stay bolts being threaded per hour, and this rate is maintained day in and day out.

Though this Landis Threading Machine has been in continuous service nine years, it is apparently in as good condition as ever and the owners are very much satisfied with the excellent results which it continues to give.

Landis Threading Tools are fundamentally correct in principle, and, therefore, give gratifying results. Large output, long life, low cost of upkeep and greater accuracy are what the possessors of these famous machines get in their threading departments.

Ask for Latest Landis Catalogue.
It will tell you what you want to know.

LANDIS MACHINE COMPANY, Inc.

Waynesboro, Pennsylvania, U.S.A.

If interested tear out this page and place with letters to be answered.

CANADA
FOUNDRIES & FORGINGS
LIMITED

PRODUCED AT
JAMES SMART PLANT
BROCKVILLE, CANADA

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

PERRIN
FOR
RELIABILITY

Hydraulic
Screw
and
Filter
Presses

Made in Canada

Hydraulic Truck Tire Press

WILLIAM PERRIN LIMITED - TORONTO

Harris Heavy Pressure

The Babbitt Metal that's at the Front in Efficiency and Economy

Order a Box from our nearest Factory

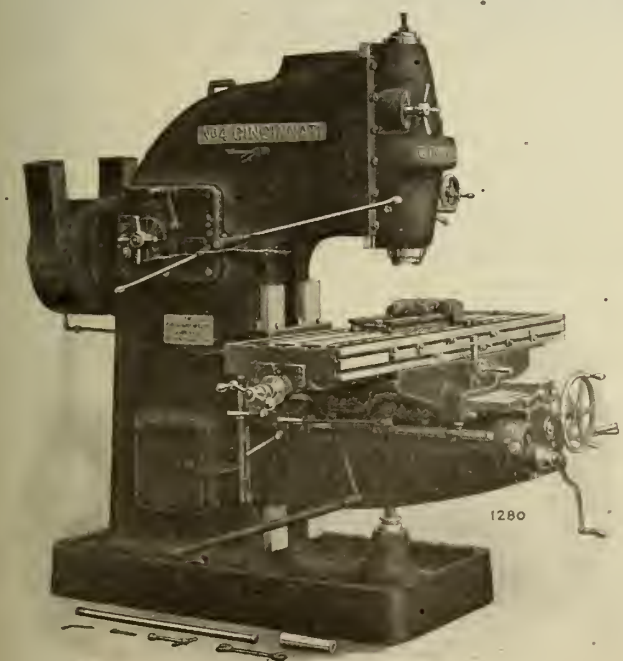
Our Guarantee is Back of Every Pound of Babbitt Metal We Make

Manufactured by

The Canada Metal Company, Limited

TORONTO - CANADA
HAMILTON WINNIPEG
MONTREAL VANCOUVER

The New Cincinnati No. 4 High Power Vertical



Intermittent feed, power quick traverse.

Square gibbing with narrow guides.

Feed changes at front of knee by one lever.

Safety couplings in feed transmissions.

Individual feed control levers.

Automatic lubrication.

Centralized oiling.

Stream lubrication.

Hardened sliding gears throughout.

Starting lever at front.

Automatic brake.

Cincinnati standard flanged spindle end.

Spindle can run in either direction.

Ask for a catalog of the new No. 4 and 5 High Power Cincinnati Millers.

Patent Rights Fully Reserved

THE CINCINNATI MILLING MACHINE COMPANY

CINCINNATI, OHIO

H. W. PETRIE, LTD., Toronto
H. W. PETRIE OF MONTREAL, Ltd.
327 St. James Street, Montreal

GENERAL SUPPLY CO., Winnipeg
HALLIDAY MACHINERY CO., Vancouver

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A SPECIALLY DESIGNED LABOR-SAVER

FOR ERECTING CERTAIN CLASSES OF MACHINERY OR FOR LAYING SEWER AND WATER PIPE

We have standard designs that will meet a large variety of requirements

Ask for Book 76

THE HERBERT MORRIS CRANE AND HOIST COMPANY LIMITED

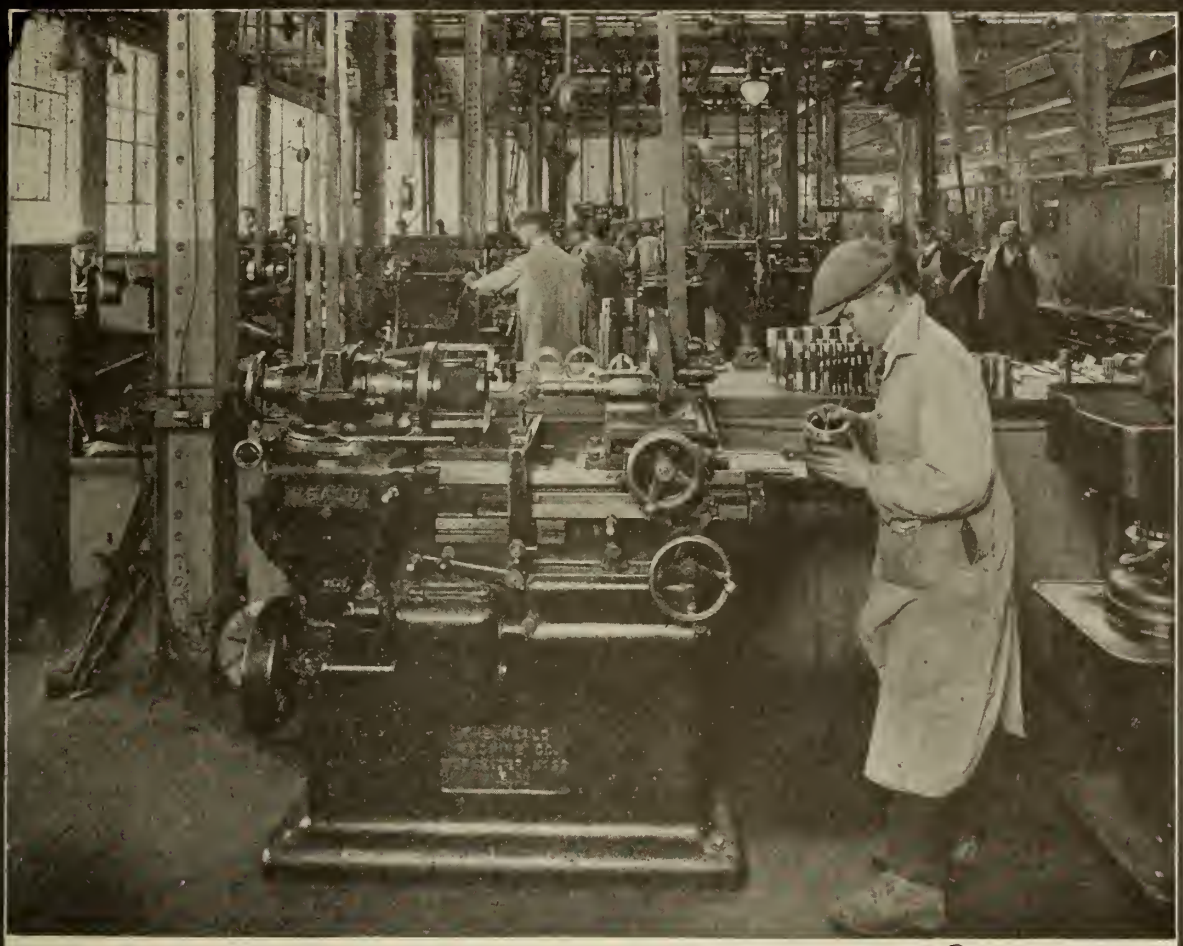
HEAD OFFICE AND WORKS:

NIAGARA FALLS, CANADA

ELECTRIC AND HAND OPERATED OVERHEAD CRANES

Elevating Trucks, Storage Battery Trucks

JIB CRANES, ASH HOISTS, RUNWAYS



All Tool Room Work Centers on a Heald No. 70 Internal Grinder

The foreman said, "We could not build tools, especially gages, without that grinder. It is practically indispensable. For instance, nearly all tools are hardened and require extreme accuracy, that's where the Heald comes into play. It is built stiff and rigid, will grind work that other internals fall down on. Not a chatter mark shows and you get a mirror-like finish to any desired correctness. Then, again, it is so convenient to change wheel-heads without bothering about adjustments or speeds, and the punishment we give them would ruin the ordinary head. If you want an INTERNAL GRINDING MACHINE, not a 'temporary polisher,' get a Heald."

Heald No. 70 Internal Grinder has not only been found to be an absolute necessity in this tool room, but is acknowledged the most useful and used of any machines in the department.

The work head can be swiveled to 45 deg. or 4-in. taper to the foot. This is particularly advantageous for taper gages.

A radius truing device can be secured for this machine which will either convex or concave the wheel, as desired for curved surfaces.

Every machine is equipped for either wet or dry grinding and has an 8-in. draw-in collet chuck.

Write for Literature and Blue Border Bulletins.

THE HEALD MACHINE COMPANY
WORCESTER, MASS.

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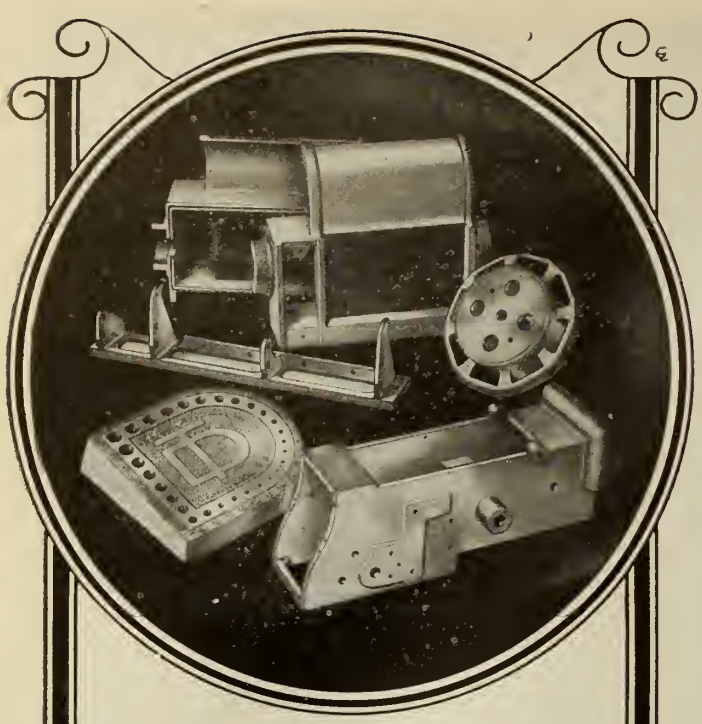


FRANKLIN DIE-CASTINGS

They Simplify Production and Reduce Costs

For nearly thirty years Franklin Die-Castings have aided the development of many fields of industry by reducing costs and simplifying production.

Wherever Franklin Die-Castings are adaptable they lower the cost of production through the saving of time, labor, equipment and material otherwise spent in machining.

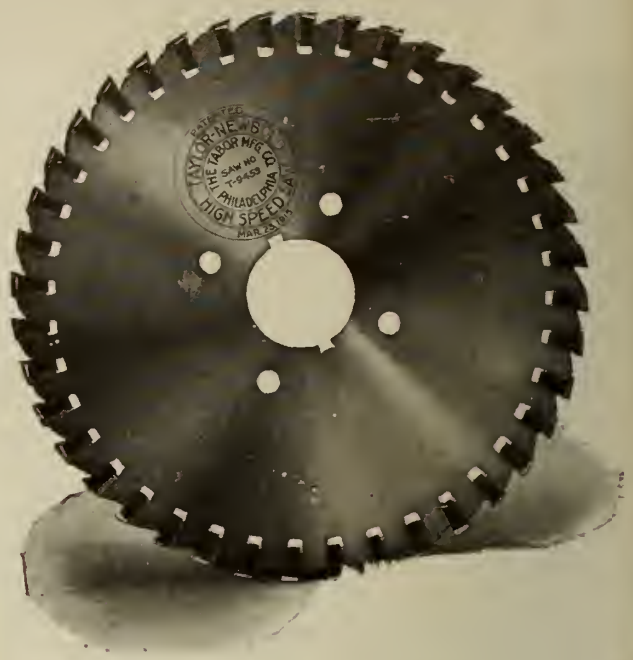
Franklin Die-Casting methods often make it possible to produce a device in fewer parts. It is through such advantages, derived from the use of Franklin Die-Castings, that many products have been made commercially practical.

In 1892 we originated the die-casting industry. From our long experience, we can advise you whether the die-casting principle can be applied correctly and profitably to your special needs.

THE FRANKLIN DIE-CASTING CORPORATION
Gifford and Magnolia Streets SYRACUSE, N.Y.

We cast in Aluminum, Tin, Lead and Zinc base alloys. Estimates made from samples, drawings or blueprints.
Send for Booklet

THE IMPROVED
TAYLOR-NEWBOLD



INSERTED TOOTH COLD SAW
WRITE FOR BULLETIN T-S
Tabor Mfg. Co., Philadelphia, Pa., U.S.A.

Gray Iron and Semi Steel Castings of all Descriptions

From 5 lbs. up to 4 tons

Foundry capacity, 15 tons per day.

Difficult castings our specialty.

Mixtures regulated by chemical analysis and all castings sandblasted.

Estimates from blue prints submitted promptly.

If desired, we can make patterns to your drawings.

G. W. MacFarlane Engineering, Limited
Paris, Ontario

The

NAZEL AIR HAMMER

NOTED FOR ITS BLOW AND CONTROL

A self-contained unit, HAMMER AND COMPRESSOR COMBINED, built in three types, six sizes arranged for BELT OR DIRECT MOTOR DRIVE, with capacities up to 7 inches square, for all manner of jobbing, manufacturing and certain classes of drop forgings.

Nazel Engineering & Machine Works
Dept. F., Philadelphia, Pa.

1/3 to 1/2 Reduction in Milling Cost

This will be the result of taking small milling jobs from your big millers and putting them up to

The U.S. MILLER

The Miller for Small Work

A small machine takes up less space, requires less power, is easier to operate and is more accurate. The Paramount Miller of its size. Drop us a line for full details.

United States Machine Tool Company
Cincinnati, Ohio, U.S.A.

Economy in Production

If you could operate a machine continuously for, say, 8 hours without re-sharpening the tool, instead of 5 or 6 hours, would the difference mean anything to you? The answer is obvious. The gain in production, made possible by an uninterrupted run of such length, would represent hundreds of dollars annually on one machine alone—and thousands of dollars on a group of machines.

That such a saving is possible has been demonstrated time and time again by competitive tests between ordinary cutting oils and

LARCUL CUTTING OILS

This remarkable oil gives long life to the cutting edge of the tool because it carries off the heat rapidly, preventing the tool from losing its temper. There is a saving in tool cost, a saving of the time customarily spent in re-sharpening, and a saving of the time lost in stopping and starting the machine. Three distinct gains in production.

LARCUL AMBER CUTTING OIL

A transparent oil that contains no harmful chemicals. May be used straight or with paraffin oil. For use on all kinds of automatic machines, turret machines, gear cutters, gear shapers, hobbing machines, broaching machines, nut tappers, profilers, etc.

LARCUL EBONY CUTTING OIL

Identical with Larcul Amber in cutting characteristics. Particularly efficient for pipe threading, bolt threading, nut tapping, on turret machines running on high and low carbon and alloy steels, and on automatic machines for forming, turning, boring, threading, etc.

Let us give you a demonstration.

Cataract Refining Company
LIMITED
Toronto - Ontario

SCIENTIFIC LUBRICANTS *for* SCIENTIFIC LUBRICATION

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OAKITE CLEANS

Four Times Faster

THIS Tractor Plant has greatly simplified and expedited its cleaning work by using Oakite.

Formerly removed the heavy cutting oil from track pins by immersion for one hour in hot soda solution.

Oakite materials now thoroughly clean these parts *in 15 minutes.*

Only one tank i now required to keep up with the work, as against three tanks previously employed.

In seeking advice on cleaning problems, look for broad experience and ability. It is the surest, safest way to find sound counsel.

This Advertisement is one of a series based on actual occurrences.

How may we serve you?

OAKITE MANUFACTURED BY OAKLEY CHEMICAL CO. 44 THAMES STREET NEW YORK

MINISTRY OF MUNITIONS
G R

The Disposal Board
Have
STOCKS
Lying in the United Kingdom and
AVAILABLE FOR EXPORT
of
ENGINEERING STORES

Ferrous and Non-Ferrous Metals
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Aircraft
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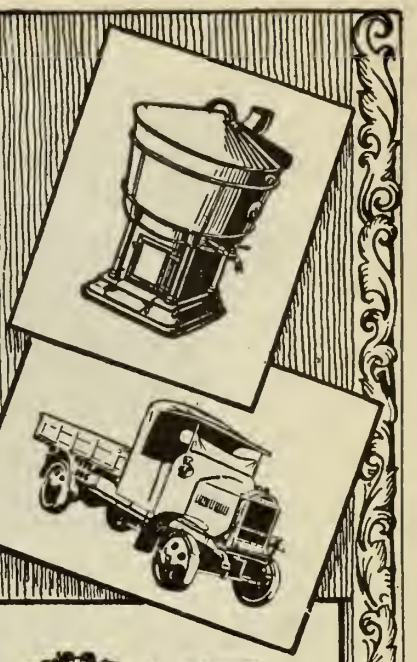
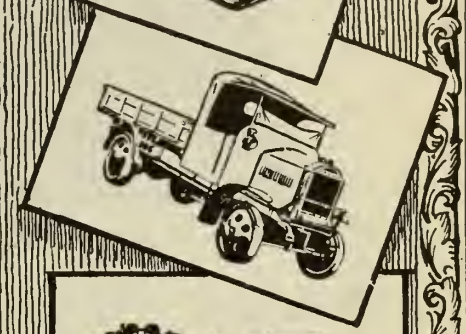
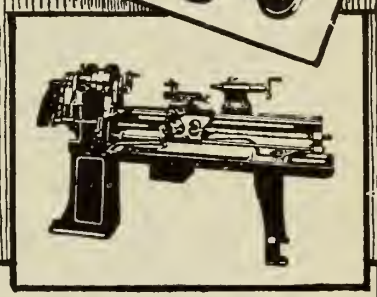
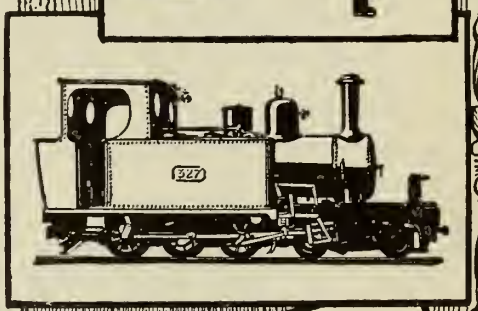
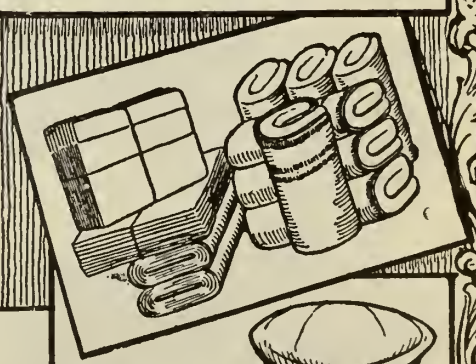
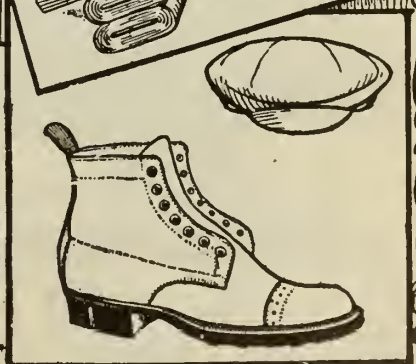
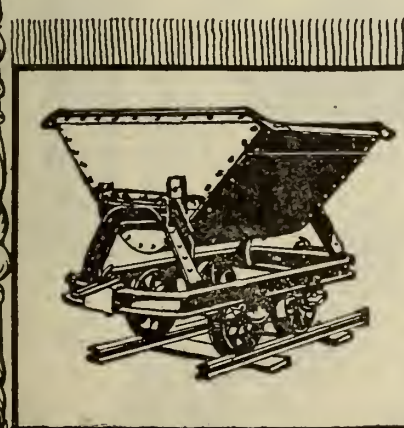
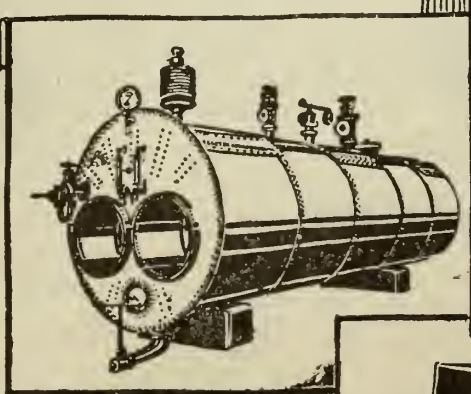
Textiles and Clothing
Motor Boats, etc., etc.
Boots and Leather Equipment, etc.

Buyers should instruct their representatives in the United Kingdom to communicate with D. B8 Canadian Export Department, Ministry of Munitions, Whitehall Place, London, S.W.

Cable Address:
"DISPEXPORT, MUNORGIZE, LONDON"

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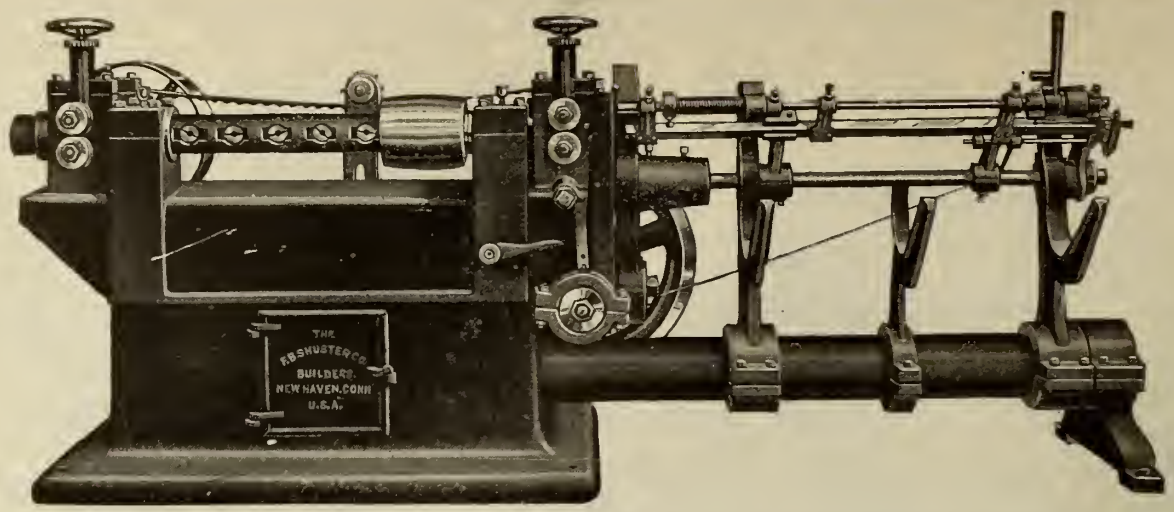

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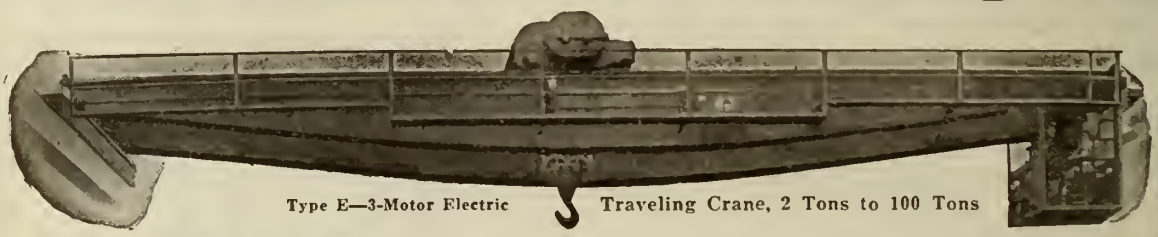

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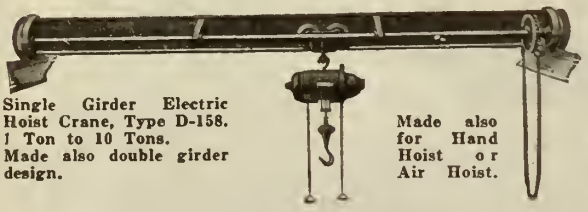

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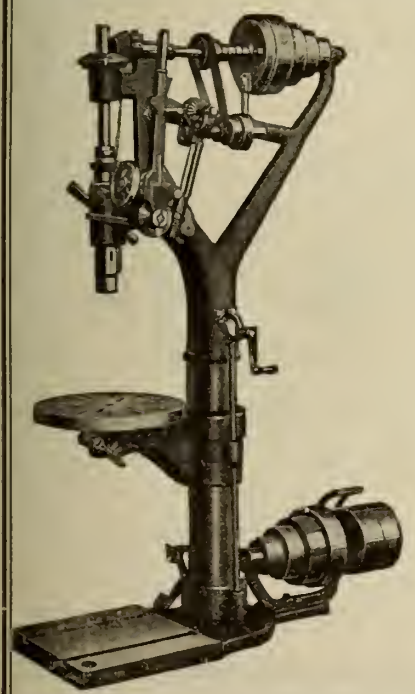

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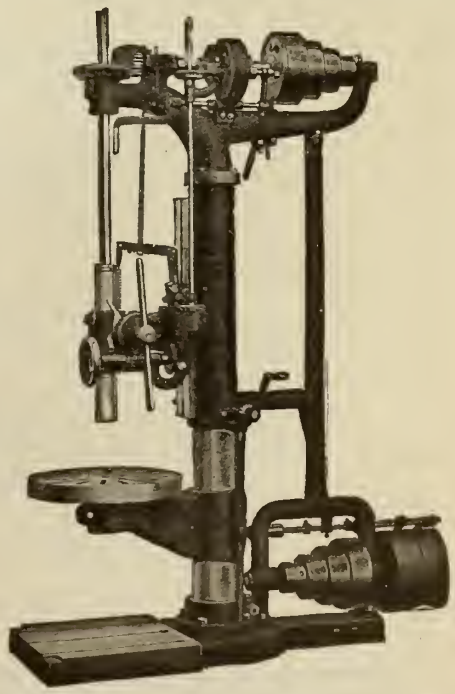

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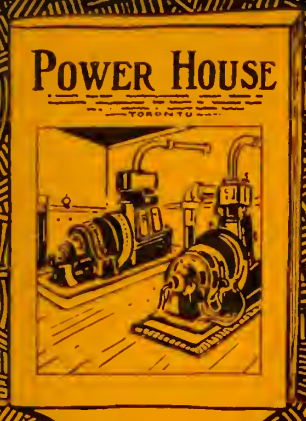

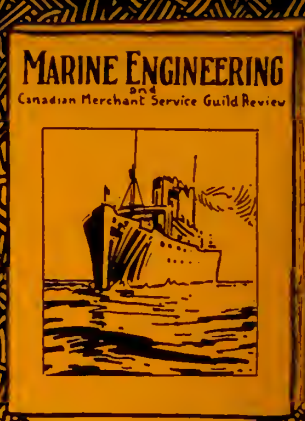

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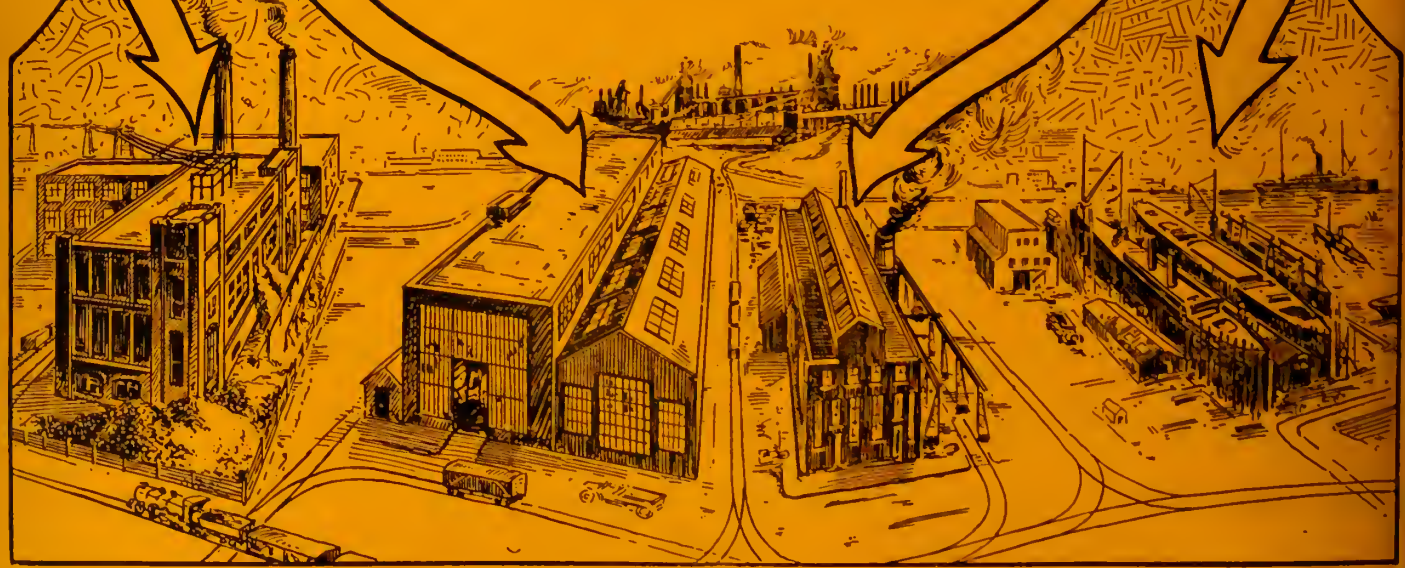

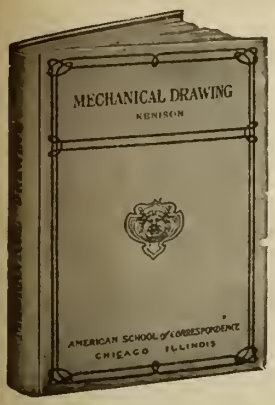

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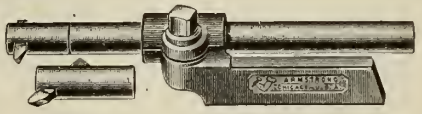

No.	Size Shank Inches	Diam. Bar Inch	Size Cutter Inch Sq.
00B	5-16x 3-4	1-2	3-16
8	3-8 x 7-8	9-16	3-16
9	1-2x1 1-8	3-4	1-4
10	5-8x1 3-8	15-16	5-16
11	3-4x1 5-8	1 1-8	3-8
12	7-8x1 3-4	1 5-16	7-16
13	1 x2	1 1-2	1-2

This cut shows Double-Ended Cutter roughing out cored hole; also angle cutter boring and facing end.

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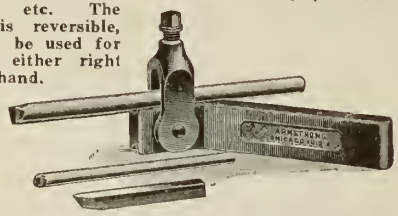

No.	Size of Shank Inches	Size of Bars Furnished Diam. Inches	Size of Square Cutter Inches
15	3-8 x 3-4	1-8 and 1-4	1-4
16	1-2 x 1	3-16 and 5-16	5-16
17	5-8 x 1 1-4	1-4 and 3-8	3-8
18	3-4 x 1 1-2	5-16 and 7-16	7-16

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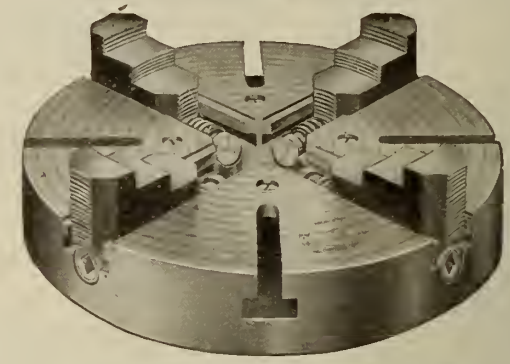

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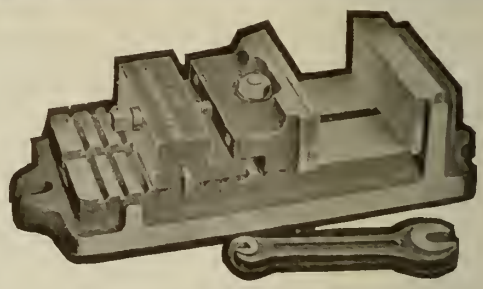

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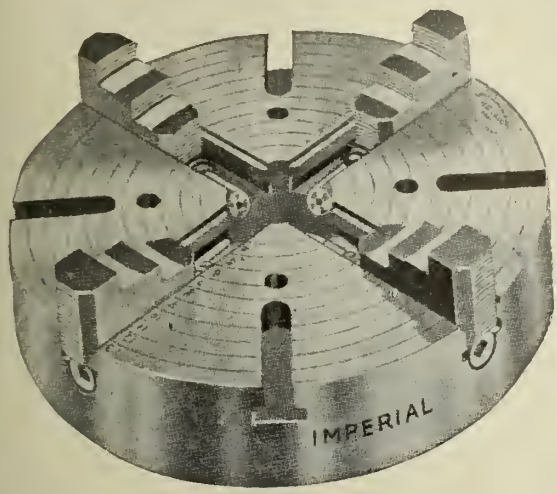

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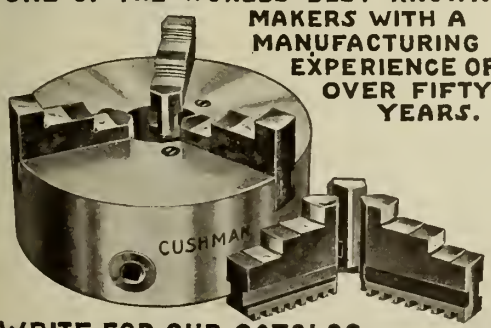

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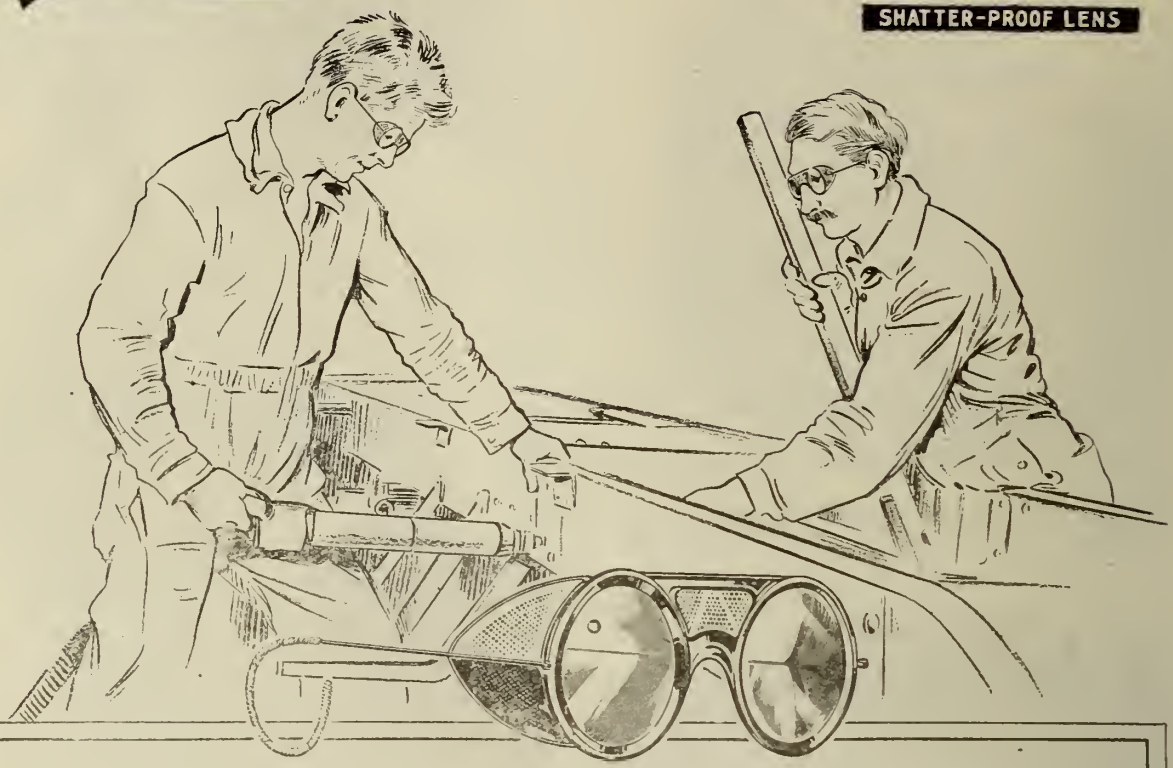

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Note the lateral and vertical adjustment. It operates anywhere on surface 18" high by 36" wide.

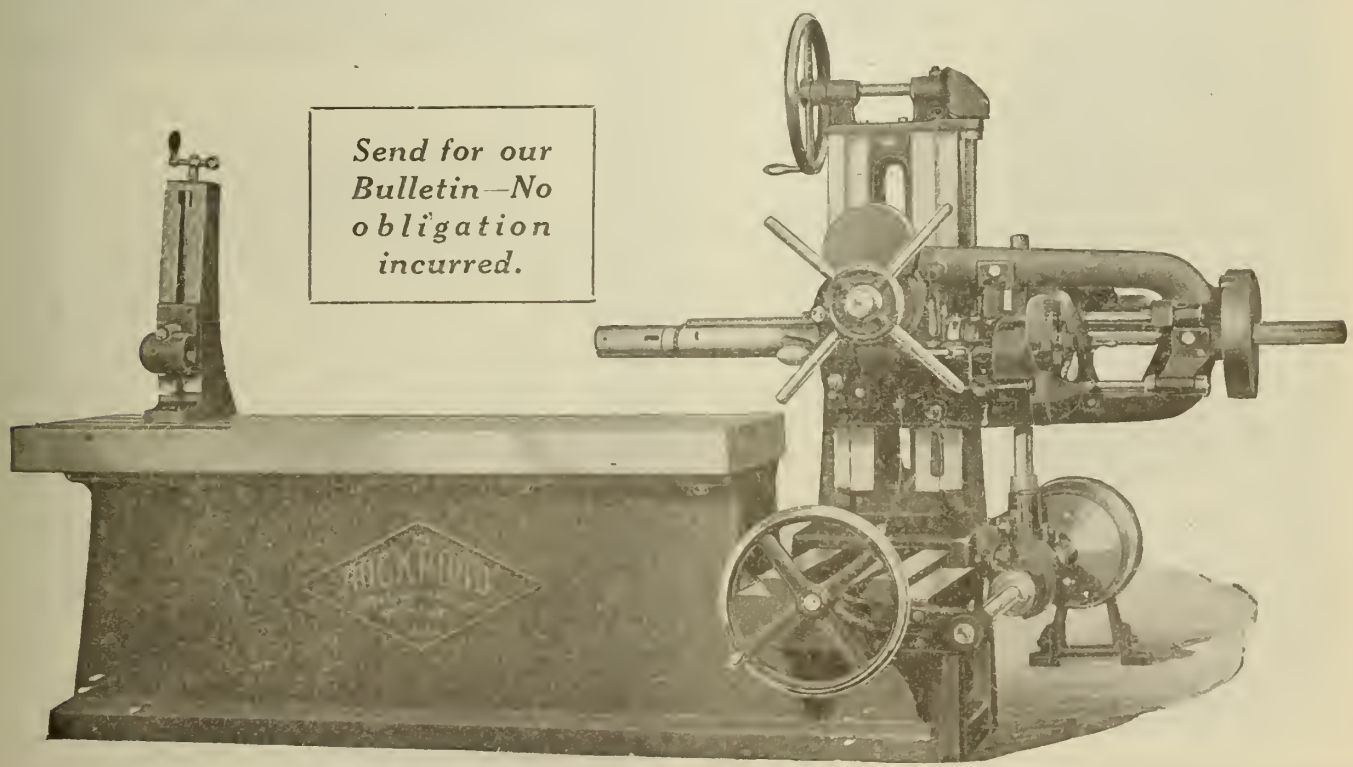
Rockford Drilling Machines are made of the finest materials by skilled workmen. That the design is right is proven by the service they are rendering to manufacturers throughout the country. The design, the materials and the workmanship combine to make Rockford Drilling Machines dependable at all times.

THE ROCKFORD DRILLING MACHINE CO., ROCKFORD, Ill.

CANADIAN AGENTS:
RUDEL-BELNAP MACHINERY CO., MONTREAL and TORONTO

FOREIGN REPRESENTATIVES:—Burton Griffiths, London. Buck & Hickman, London E., England. R. S. Stokvis & Zonen, Inc., France, Belgium, Holland, Russia. Allied Machinery Co., 51 Chambers St., New York City, South Africa, China, Italy, Brazil, Portugal, Balkan States. Casamitjana Hermanos, Barcelona, Spain.

Send for our Bulletin—No obligation incurred.



VENUS PENCILS

The world's most famous pencil

THE degree stamped on a VENUS PENCIL is the world's standard of that degree. The engineer whose pencil is his tool can absolutely depend on the stamping of any degree of VENUS PENCIL being always **exactly uniform** no matter when purchased.

For instance, the engineer using a 2H, 4H, and 6H of the VENUS may duplicate his supply with absolute confidence in its uniformity, as well as the certainty that it is true to marking.

17 Black Degrees—3 Copying

For general writing and sketching, 2B-B-HB-F-H
For clean, fine lines, 2H-3H-4H-5H-6H
For bold heavy lines, 6B-5B-4B-3B
For delicate thin lines, 7H-8H-9H

Plain Ends, per doz. $1.50
Rubber Ends, per doz. 1.75

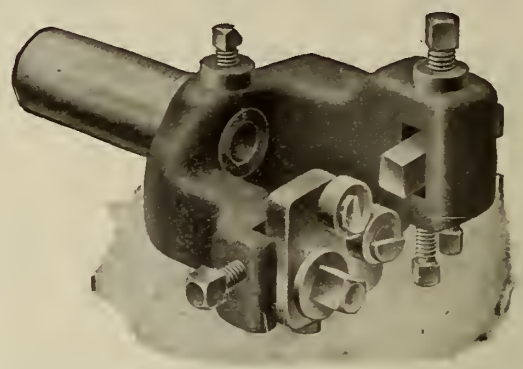
At Stationers and Stores throughout the world.

American Lead Pencil Co.

238 Fifth Ave., New York
and London, Eng.
Factory: Hoboken, U.S.A.
Factory: London, Eng.

The largest selling quality pencil in the world

TURRET-LATHE TOOLS & HOLDERS



COMPLETE EQUIPMENT FOR CAPSTAN LATHES FULLY ILLUSTRATED IN OUR TOOL LIST E.

J. ACKWORTHIE LTD.
COLESHILL STREET,
BIRMINGHAM
ENGLAND

DUNBAR SPRINGS

ACCURACY ASSURED

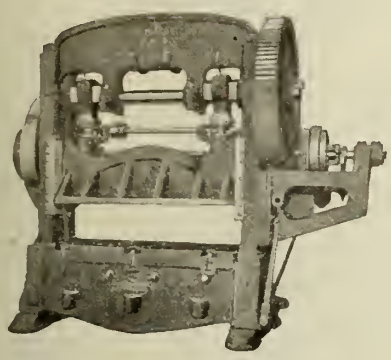
You can always depend upon Dunbar Springs being accurate. Before proceeding with any order the first few springs are carefully tested and checked up for this very purpose.

Seventy-two years' experience making flat and spiral springs of every description enables us to furnish you with springs of the highest quality, that can be depended upon under all conditions.

Send blue prints for estimates.

The Dunbar Brothers Co.
BRISTOL, CONN.

The "TOLEDO"
DOUBLE CRANK PRESSES



Different in construction and performance; the design embodies all the essentials for speed, accuracy and durability. There are over 250 sizes, a size and type for practically every sheet metal or drop-forge requirement.

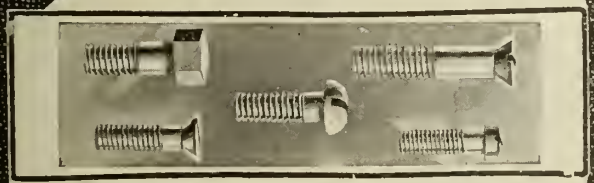
"We fit the press to the needs"

The Toledo Machine & Tool Co.
Toledo, Ohio

Representatives: Allied Machinery Co. of America, 19 Rue de Rocroy, Paris, France; Via XX Settembre 12, Turin, Italy; 16 Siedengasse, Zurich, Switzerland.

Wood Screw Making Machinery

SEND FOR CATALOGUE
Series B6



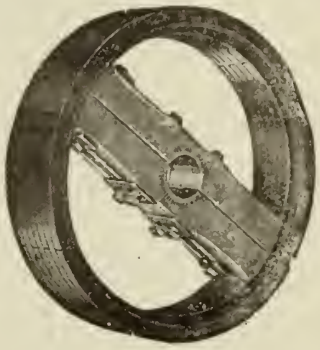
For sixty years we have constantly manufactured machinery for making screws, always studying to improve and refine our product.

Write or Wire us.

Cable address: "Cook,"
Hartford, U.S.A.
Codes: Liebers
Western Union

Asa S. Cook Co.
Hartford, Conn.

BERNARD
Wood Split Pulleys

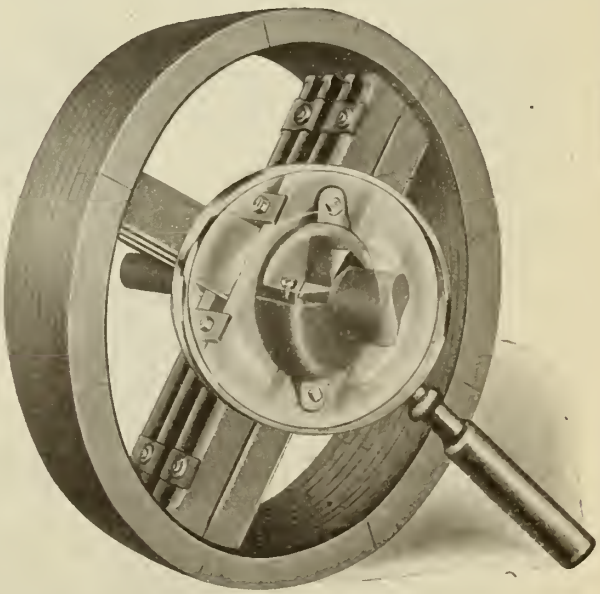


Save Power

Wood Split Pulleys are lighter and they have an efficient Belt Gripping Surface

With the installation of Bernard Wood Split Pulleys you start on the road to lower overhead. Their cost is low.

Safety **Satisfaction**



BERNARD SAFETY COLLAR

Put them to the test

The A. Bernard Industrial Co.
Manufacturers of High-Grade Power Transmission Appliance
Office and Works: Fortierville, Que., Can.

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The Greenfield

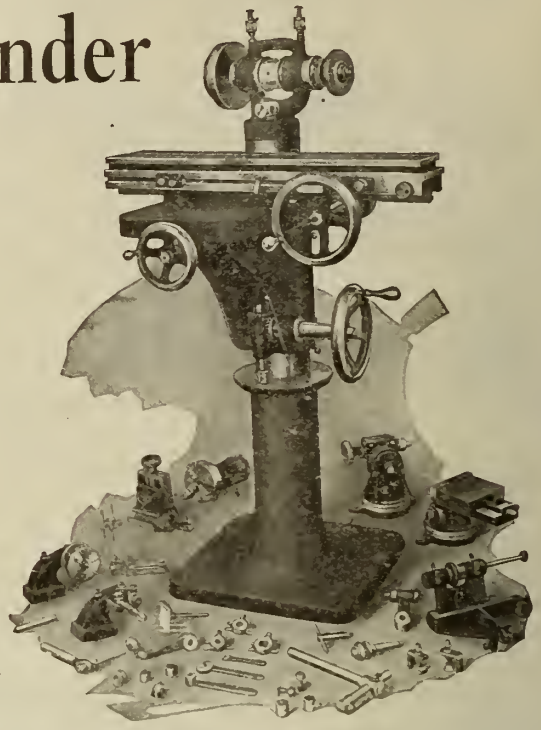
Universal Grinder

An all-round machine for your tool room

Equipped with attachments for the grinding of milling cutters, reamers, taps, etc., and capable of handling cylindrical, internal and surface grinding, the Greenfield is truly an all-round tool-room machine.

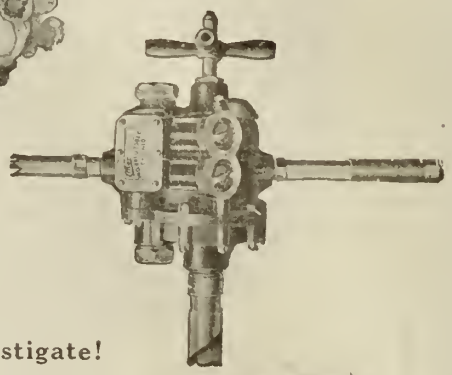
The attachments are all very simple in design and easily adjusted upon the machine, being graduated so that any desired angles can be at once obtained.

The head is made from a solid casting and embodies rigid arch construction. Spindle turns in large bronze bearings without vibration. Write for full particulars.

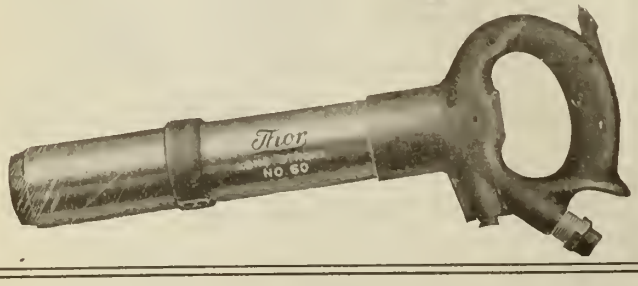


Greenfield Machine Company
GREENFIELD, MASS., U.S.A.

Thor



There's a Thor Tool Built Especially for Your Work. Investigate!



Symbolic of Power, Endurance and High Efficiency

Thor is the mightiest god in Norse Mythology. Our ancestors believed that the thunder was the roll of his chariot wheels; the wind, his onward rush; the striking of his hammer, the lightning. **Thor** was symbolic of power, endurance and high efficiency. So we have attached the name **Thor** to our powerful, enduring pneumatic tools.

Thor, the god, was equal to many men, and so **Thor** tools are equal to many men. One man with a Thor can do the work of five with hand tools. Their construction is based upon scientific principles, is without complicated parts, and is trouble-proof. Every man who desires increased production and economy should investigate Thor Tools.

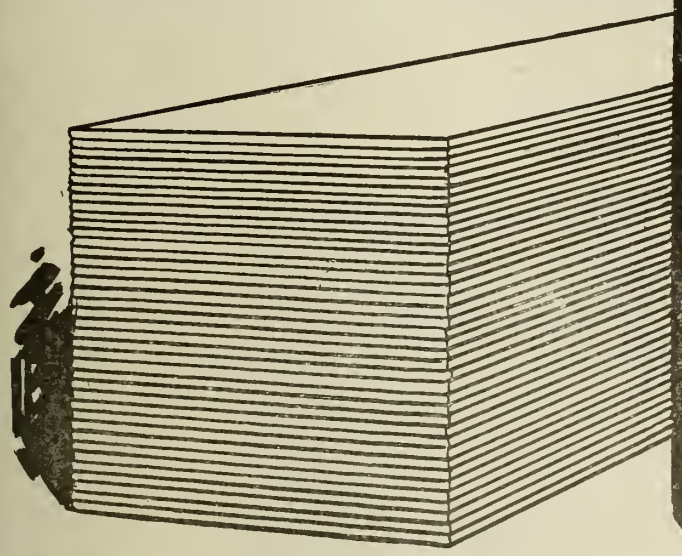
Catalogue on request.

INDEPENDENT PNEUMATIC TOOL COMPANY

334 St. James Street, MONTREAL

32 Front St. W., Toronto 123 Bannatyne Ave. E., Winnipeg; 1142 Homer St., Vancouver

Deep Drawing Plate



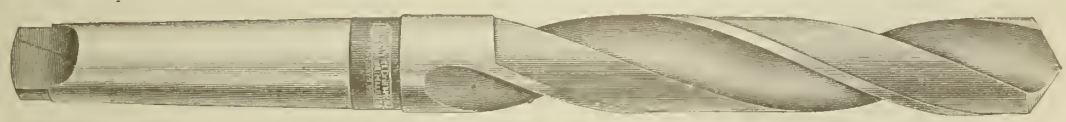
WE manufacture plates of various drawing qualities for such work as

AUTOMOBILE FRAMES
CRANK CASES
BRAKE DRUMS
and
PRESSED STEEL PARTS
of all descriptions

DOMINION FOUNDRIES and STEEL, LIMITED
HAMILTON, ONTARIO

When in Doubt

ORDER THE GENUINE



"Morse" Twist Drills

As they produce only

Straight, Accurate Holes

Morse Twist Drill & Machine Co., New Bedford, Mass., U. S. A.

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Quebec's Foremost Industrial Centre

St. Johns is directly connected by rail with the Montreal docks, 27 miles distant, affording manufacturers first-class facilities for foreign trade.

The City of St. Johns, situated on the Richelieu River in the Province of Quebec—which, as regards industries, bears the same relation to Canada as New England to the United States—is recognized as Quebec's foremost industrial centre.

Transportation facilities are unequalled. Seven railroads, including Canada's two great transcontinental lines, run through the city and are inter-connected in the St. Johns yards by a terminal switching company at very low rates. The Richelieu, which is a link in the chain of canals from New York to the St. Lawrence, furnishes the city with a direct water route to the Eastern seaboard of the U.S. and the Great Lakes, insuring every facility in assembling raw products and an extensive market for the distribution of the finished article as well as the benefits of competition by water rates.

St. Johns is known as the cheapest labour market in Canada. Skilled and unskilled labour is plentiful and labour troubles are quite unknown.

Electric power is cheap and plentiful and the excellent railway and canal connections assure a satisfactory coal supply.

In addition to the natural advantages of St. Johns as an industrial site, the city also offers the following extraordinary inducements: tax exemptions for a period of fifteen years; all public improvements required; a bonus of 5 per cent. on your pay-roll for five years. If you desire it the city will advance this to you to be applied to the purchase or erection of any building suited to your purpose.

For More Specific Information Write

The Secretary of the City Council

St. Johns, Quebec, Canada

MAPLELEAF

MOTOR TRUCKS

1½ to 5 tons capacity

Built in Canada

Simple, Rugged Construction Insures Reliability

Simplicity of design, ruggedness of construction and a detachable head, high-powered motor give to *Mapleleaf Motor Trucks* a permanent dependability which means great saving to its owners.

Mapleleaf Trucks are designed and constructed to give satisfactory service under Canadian conditions. Their ease of operation is particularly appreciated by drivers who have to cover long distances.

All Mapleleaf Trucks are built to a standard. Parts are numbered and interchangeable on all trucks of each model, thus ensuring promptness in the filling of orders for parts.

Any type of body can be supplied for our trucks—standard platform and stake, box, hydraulic or hand hoist dumps, metal-lined bodies, or any other type which may be called for.

Send for our catalog: it contains full information of the various features of Mapleleaf Trucks.

The Mapleleaf Manufacturing Co., Limited

Montreal ∴ Canada

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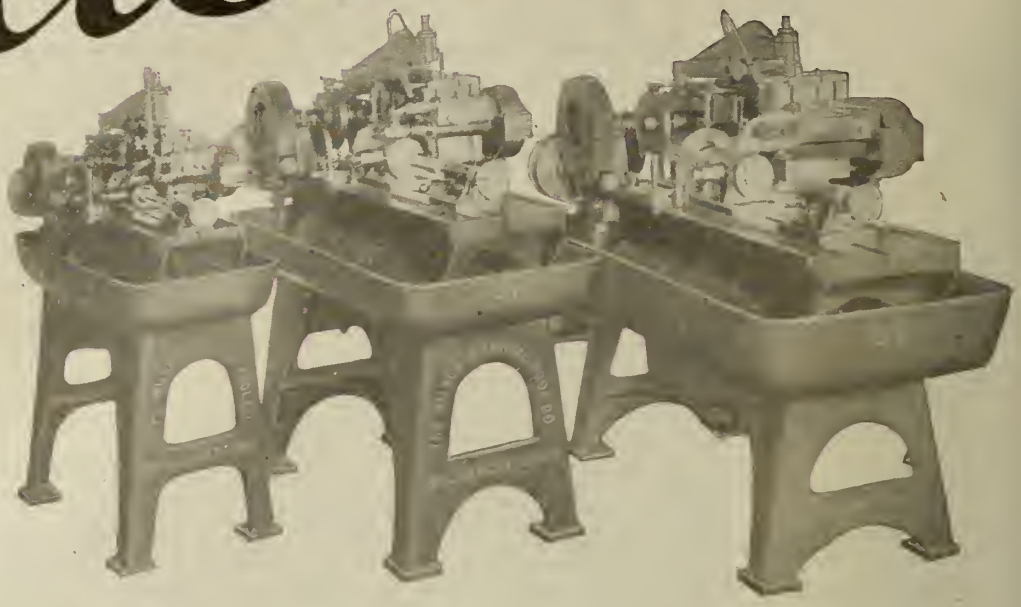
Bilton GEAR MILLERS



Fully Automatic

Their adaptability is almost unlimited on small work—such as cutting spur, bevel, miter, angle gears, saws, ratchets, sprockets, cutters, knurls, taps, cylinders, form cutting, manufacturing, milling, etc.

A big time saver, as indexing takes place during return stroke of cutter — which is removing metal 90% of the time.

Write us for Catalog 30-6

Over 500 leading manufacturers now use the Bilton for high production on accurate work

Bilton Machine Tool Co. Housatonic Avenue **Bridgeport, Conn., U.S.A.**

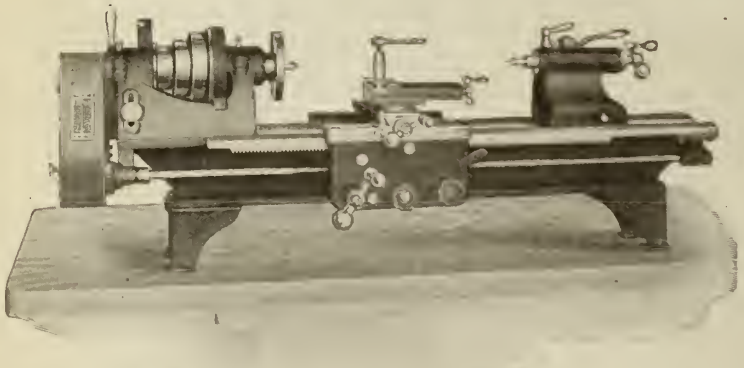
Foreign Agents: Alfred Herbert, Ltd. Chas. Churchill & Co., Ltd.

STAR LATHES

For Exacting Work

Tool Makers, Model Makers, Scientific Instrument Makers, in fact anyone in need of a high-grade small screw cutting engine lathe should know more about the "Star" Style "K" Bench Lathe. Its many attachments and unusual accuracy fit it for the most varied and exacting requirements.

Like all "Star" lathes it is equipped with the new patented Micrometer Cross-Feed stop, which insures a positive stop at any given depth of cut. This stop may be used in connection with taper attachment and is invaluable for all kinds of outside and inside work. It eliminates all guesswork, saves making trial cuts to obtain a desired dimension and insures uniformity in making duplicate parts.



9" x 4 ft. Style "K" Star Bench Lathe

Get a "Star" Style "K" Bench Lathe for your delicate exacting jobs—it will save you time, worry and expense.

The many exclusive features of "Star Lathes" are fully described in the "Star" catalogue. A copy will be sent you upon request.

The Seneca Falls Mfg. Co., Inc. 366 West Falls Street Seneca Falls, New York

Alloys to Specification—Phosphor Tin and Copper—Pig Metals, Etc.

LIONROYAL

the general service Babbitt

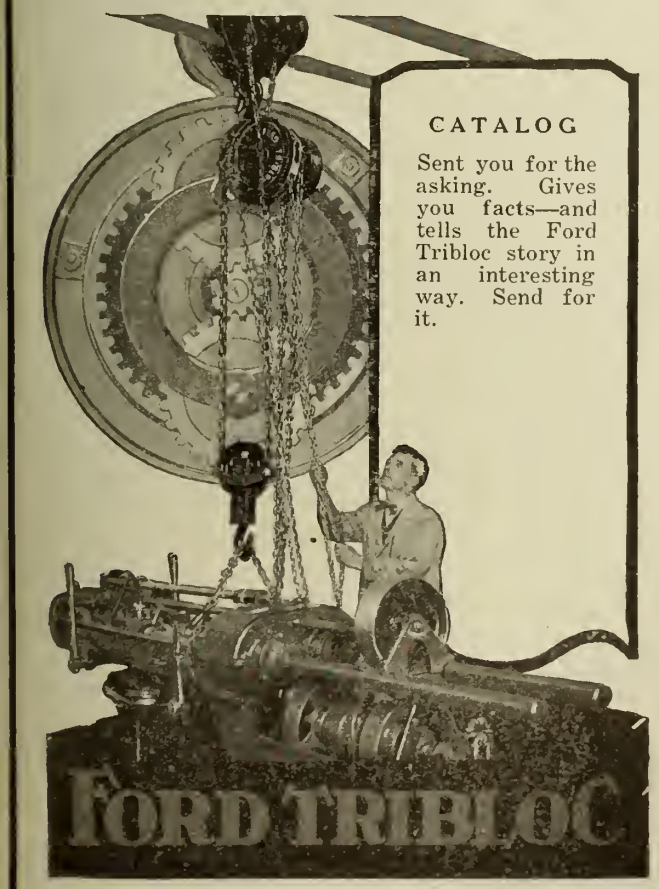
LIONROYAL fulfils every bearing need in a more thorough way than other general service Babbitts. The reason is:

We have alloyed copper *into* the other ingredients, obtaining for LIONROYAL a durability impossible to secure in a copper coated alloy. Coating a Babbitt with Copper is camouflage—it does not increase its wearing abilities.

We offer you a Babbitt which is honest in every particular—it not only looks the part, but is guaranteed to be every bit as honest in service.

ALLOYED IN CANADA UNDER THE STANLEY PROCESS

BRITISH SMELTING & REFINING Co. Limited.
Drummond Building Montreal.



CATALOG

Sent you for the asking. Gives you facts—and tells the Ford Tribloc story in an interesting way. Send for it.

POWER

At Two Points Simultaneously

The Planetary Drive in[illegible]
by providing double the normal traction area for each gear. Power, received from the hand wheel, is delivered at two points simultaneously by means of the small central pinion. Thus the breaking of two gears at the same time would be necessary before the load would fall. The FORD TRIBLOC is manufactured for **reliable** service. It is in every sense a chain hoist of the highest quality. It operates with practically no care or attention, handling any class of load to capacity. And 3½ to 1 is the factor of safety **throughout.**
FORD Chain Hoists are made in capacities from half a ton to twenty and more, in standard and special designs for every service.

FORD CHAIN BLOCK CO.
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UNITED

OPEN HEARTH AND ELECTRIC FURNACE ALLOY STEELS

Chrome-Vanadium
3½% and 5% Nickel
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Chrome
Magnet—Tungsten and Chromium
Chrome-Carbon
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Specialists in Alloy Steels.

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THE MASTER METAL ☐ THE MASTER METAL

STELLITE

Not Steel—but its master

It has been estimated that high speed steel has decreased the cost of manufacture in the machine shops of Canada and the United States at least $200,000,000 a year.

Stellite will effect a still greater saving!

Excessive speeds heat high speed steel cutting tools to such an extent that they burn and crumble.

Heat up to 2,000 deg. F. but serves to make **Stellite** tougher, more lasting, capable of even deeper cuts than when cold!

You should learn just what **Stellite** can accomplish on **your** work, in **your** shop. We shall be glad to show you.

DELORO
Smelting & Refining Company Limited

Head Office and Works: DELORO, CANADA

Branch Warehouses:
200 King St. W., Toronto, Ont., Can.
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THE MASTER METAL ☐ THE MASTER METAL

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Power is Expensive—SAVE IT

But not by reducing production.

In fact, by the use of ball bearings, you can largely increase production and consume no more power than formerly, for in the average plant friction destroys at least 25 per cent. of all the power produced or bought.

High grade ball bearings, such as S K F and Hess-Bright are almost frictionless. Not only is less power required, but belting life is lengthened, wear is practically eliminated, bearing renewals are postponed almost indefinitely, frequent tying up of equipment is avoided, oil costs are lower, and hot boxes are unknown.

Ball bearings, by conserving the energy formerly wasted, benefit the whole power line from the machines back to the boilers.

Canadian SKF Company Limited

Montreal Toronto

SKF INDUSTRIES

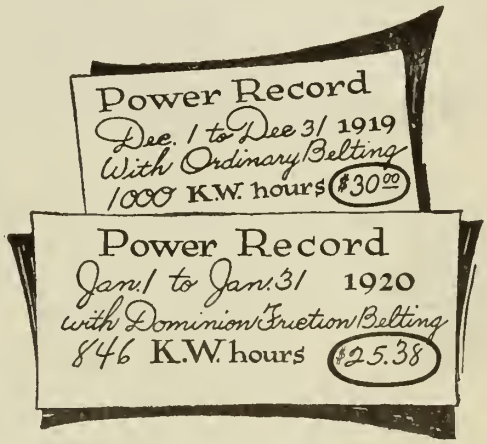
Hess-Bright Ball Bearings
S K F Ball Bearings
Atlas Steel Balls
Gronkvist Chucks
Transmission Hangers

A Service that contemplates more than the sale of a bearing.

Every S K F Industries service-salesman is a plant engineer equipped to consult on your bearing problems. S K F Service made available through these men is built on a laboratory-backed ideal that seeks to increase Canadian output by lifting the friction load from industrial machinery.

Manufacturers are invited to avail themselves of this freely offered co-operation.

The S K F Research Laboratories where friction problems are solved



Decrease Your Operating Cost

Efficient transmission equipment is an important factor in keeping down operating costs. Each repair you have to make to your belting equipment means delays and idle employees—the total cost of which is often greater than you would pay for better belting.

Dominion Friction Surface Belting

is built for "service first." Through its long life and continuous performance it practically eliminates the necessity for repairs and replacements. It eliminates delays and needless waste of time.

At your convenience, our belting experts will be glad to analyze your transmission equipment and prove to you that you can put in the profit column most of the losses created through transmission troubles.

All you need to do, is 'phone, wire or write our nearest service branch.

CANADIAN CONSOLIDATED RUBBER CO. LIMITED
DOMINION RUBBER SYSTEM AND ASSOCIATED COMPANIES

Our Dominion Hose. Packing and Industrial Rubber Goods are all the Same High Standard as Dominion Friction Surface Belting.

Dominion Rubber System Service Branches

Halifax	Toronto	Fort William	Edmonton
St. John	Hamilton	Winnipeg	Calgary
Quebec	London	Brandon	Lethbridge
Montreal	Kitchener	Regina	Vancouver
Ottawa	North Bay	Saskatoon	Victoria

BELTING

Transmission: "Dominion" "Keewatin," "Para."

Conveyor: "Rockproof," "Canadian," "Hiheat."

Elevator: "Dominion," "Rockproof."

Agricultural: "Lumber King," "Star."

Grain Elevator: "Metcalf Standard," "Grain King."

HOSE

Air: "Kushion Kover," "1810 Airtite."

Steam: "Indestructible," "Rockproof," "Para."

Water: "Indestructible," "Kushion Kover," "Para."

Suction: "Para," "Star," "Trade."

Garden: "Canadian," "Dominion," "Star."

PACKINGS

Sheet: "Join-Tite," "Star," "Importers."

Rod: "Cabestos," "Valve-Bestos," "Canadian."

Valves: "Montreal," "Commercial," "Canadian"

MISCELLANEOUS

Mats, Matting and Flooring, Plumbers' Specialties, Rubber Covered Rolls, Friction Tape, Splicing Compound, Dredging Sleeves, Hard Rubber Goods, Tubing, Rinex Soles, Catspaw Heels, Jar Rubbers, Moulded Goods.

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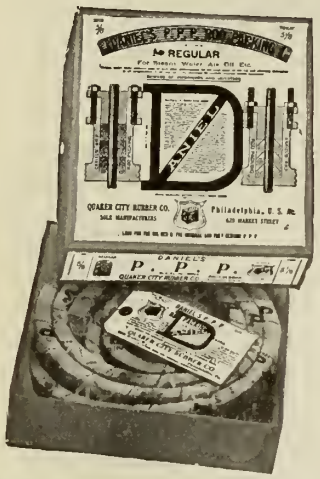
WILLIAM HAMILTON CO., LTD.

Hydraulic Turbines, Saw Mill and Pulp Mill Machinery, Iron Castings, Structural Steel and Steel Plate Work

PETERBORO ——— ONTARIO

PACKINGS



Take packings—rod and sheet—away from the Marine Field, and even the most inexperienced knows what would happen.

With the operation of practically all kinds of vessels so utterly dependent on rod and sheet packings to allow proper operation, why use any but thoroughly reliable and well-known products?

DANIEL'S P. P. P. ROD PACKING

Probably the best known rod packing on the market. Unequalled for the packing against steam, water, air, ammonia, and other fluids.

Many practical tests by experienced engineers under various conditions have clearly demonstrated that P.P.P. is the most economical rod packing to use. Its long life is remarkable, its ability to create a saving in the fuel bill is well known.

"The Story of Some Friction Test"

is a booklet that should be in the hands of every marine engineer and others who have anything to do with rod packing.

EBONITE SHEET PACKING

Used on many of the largest vessels plying the lake and ocean trade for high pressure, super-heated steam, hot water, ammonia, oils and all other kinds of joints requiring packing.

EBONITE will hold a vibrating joint absolutely tight, and where there is a varying expansion or contraction of the pipes EBONITE is especially desirable.

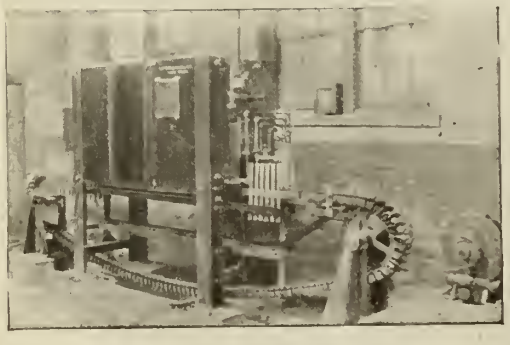
Sole Manufacturers:

QUAKER CITY RUBBER CO., PHILADELPHIA, PA., U.S.A.

General Canadian Agents:

INTERNATIONAL MACHINERY & SUPPLY CO., LIMITED

421 St. James Street, Montreal



Automatic Tube Annealing Furnace.
An example of "Quantity Production of Quality Product" made possible by use of Automatic Furnace.

AUTOMATIC FURNACES

will they help ME?

That depends on the kind and quantity of material you handle per day, the regularity of its flow, layout of plant and machinery, fuel available, etc.

Having designed and built hundreds of Automatic Furnaces for many industrial heating requirements, we can help you determine whether the automatic furnace and continuous method of heat-treating would improve your product and lower its cost.

Many interesting applications of the continuous method to the field of industrial heating are shown in Bulletin 217-T. This bulletin illustrates and describes both the furnaces and the heating and handling methods employed in a great variety of manufacturing operations.

Write for copy of bulletin to

Canadian Representative

R. J. McLEAN, 604 SOUTHAM BLDG., MONTREAL, P.Q.

We Make Industrial Heating Furnaces for Every Requirement.

"Furnace and Fuel to Suit the Work"

W. S. ROCKWELL CO. INDUSTRIAL ESTABLISHED 1888 FURNACES 50 CHURCH ST. NEW YORK

If what you need is not advertised, consult our Buyers' Directory and write advert isers listed under proper heading.

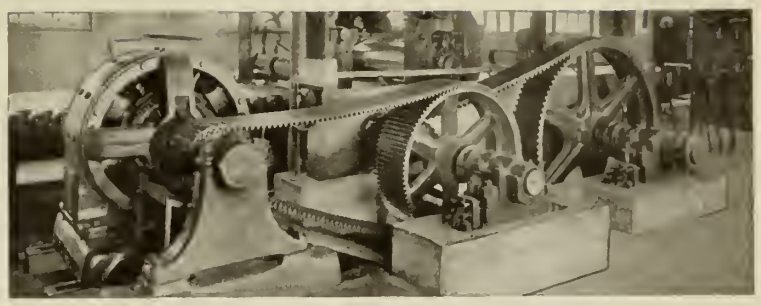
THE MORSE CHAIN CO.

are the
Largest Manufacturers in the world
of
High Speed Silent Chains

Why?

Morse Chain possesses the exclusive
Rocker Joint
Frictionless—Requires no Oilbath.

Jones & Glassco (Reg'd.)
Canadian Agents
Montreal - - Toronto



80 H.P. Morse Drive to Rolls, reverses direction every 45 seconds

Open a Bank Account in Canada

The present abnormal exchange situation between Canada and the United States is affecting trade relations between the two countries. Exporters in the United States can meet this by opening Bank Accounts in Canada.

This Bank has 700 Branches, of which 600 are located in Canada from the Atlantic to the Pacific Coast. Write for a complete list of Branches and for terms respecting a Canadian Account.

THE ROYAL BANK OF CANADA

Capital and Reserves $37,000,000 Total Resources $590,000,000

Head Offices: MONTREAL

ELECTRIC

ALLOY STEEL GRAY IRON

STEEL AND IRON

High grade steel castings of every description. Send us your drawings for estimates.

Our motto is quality and quick service.

CASTINGS

Canada Electric Castings Co., Limited, Orillia, Ontario

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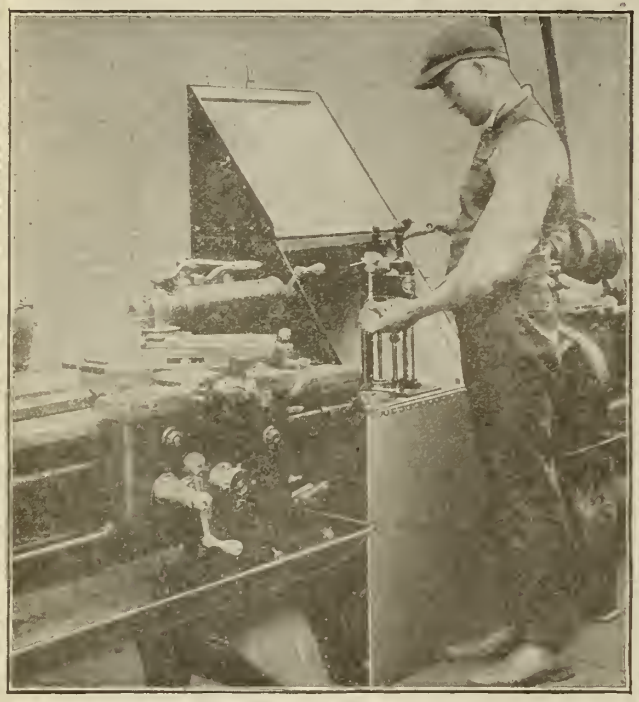
Prevent Idle Time
of Men and Machines



By placing Bowser Lubricating Oil Cabinets in departments where oil is used.

There is no going back and forth to the oil room, no spilling, no wasted oil, no fire risk from the oil storage.

Save the Oil

The oil supply can be stored and handled as systematically as raw materials or finished parts—income checked, distribution measured, charged and recorded.

Write for literature, explaining why and how Bowser Systems pay for themselves, many times over in saving of oils and labor.

S. F. BOWSER COMPANY, Ltd.

66-68 Fraser Ave., TORONTO, ONT.

Sales Offices In All Centers — Representatives Everywhere

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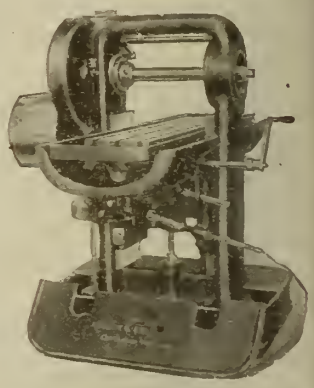
BRIGGS MILLERS
Production Tools

Machine tools to-day are judged by their ability to do efficient work, save time, labor and expense. These have ever been the measures by which Briggs Millers have been designed and constructed. That our engineers have succeeded in meeting these requirements is evidenced by the increasing popularity of Briggs Millers.

No matter what the nature of the work or how severe the service the Briggs Miller will stand up to it. Its unusual rigidity, great strength and ability to take wide deep cuts when running at a high rate of speed, has established a wide reputation that is unexcelled. We would like to show how "B r i g g s" adaptability and convenience can increase output and lower costs for you. A letter will bring full details by return mail.



Gooley & Edlund, Inc.
CORTLAND, N.Y.

Canadian Representative:
Garlock-Walker Machinery Company, Ltd., Toronto

We wanted something original—this is what we got

"BOTH of these operations and half another — I'll show you later—completed in the time our old taps took to do one; that, I guess, is why we continue to use your Victor Collapsible Taps."

It was the often-heard story of time saved, of costs lowered, of all threads clean and smooth. And it was pleasant to hear.

Victor Tool Company
Waynesboro, Pa.
U.S.A.

Send For Estimates

If interested tear out this page and place with letters to be answered.

—for a large variety of grinding

if your variety of grinding is large invest in a Manhattan Universal Grinder. It is capable of handling cylindrical or internal grinding with the utmost in speed and accuracy.

Write for details.

Manhattan Machine & Tool Works

Grand Rapids, Mich., U.S.A.

Manhattan All-Around UNIVERSAL TOOL GRINDER

Foreign Representatives The Oliver Machinery Co., Ltd., Manchester, Eng. Farmer & Co., Clerkenwell, London, E.C.

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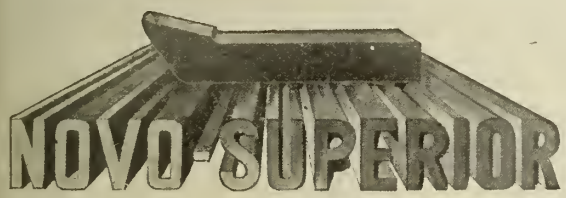

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HIGH SPEED STEEL

INTRA STEEL GIBRALTAR STEEL

Tool Steel for Every Purpose

Swedish Lancashire Iron

Twist Drills, Taps, Hack Saw Blades, Milling Cutter Files, Etc., Music Wire for Springs, Steel Balls. Cold Rolled Tool Steel in Strips and Sheets Circular Saws, Machine Knives.

PILOT STEEL & TOOL COMPANY, LIMITED

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Sole Agents for

JONAS & COLVER, LIMITED
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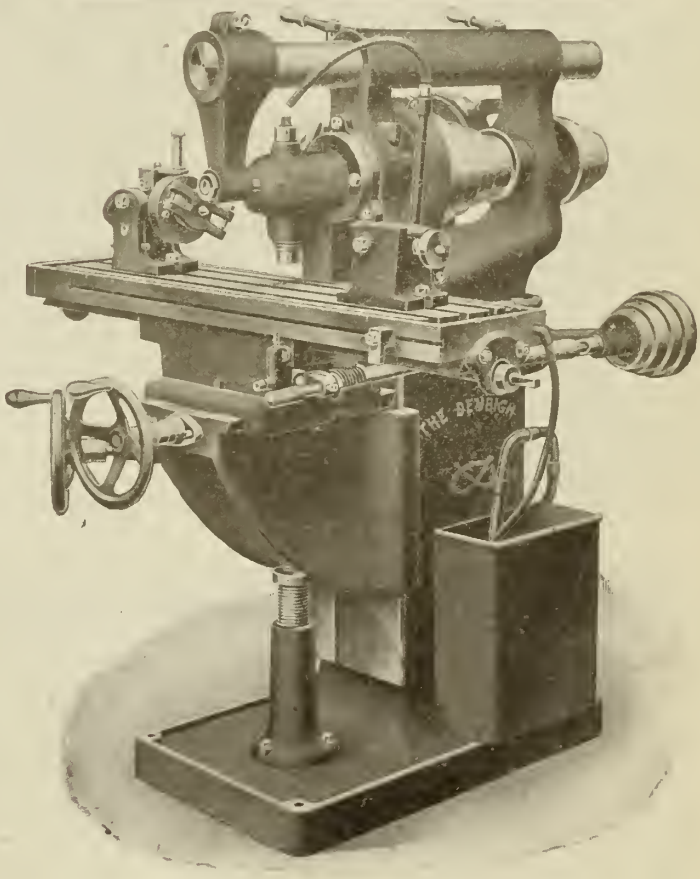
The DENBIGH Famous MANUFACTURING MILLERS



Enormous war demands enabled us to lay down a large and highly co-ordinated organization for the quantity production of Denbigh Manufacturing Millers.

This extensive experience has resulted in machines perfect in design and construction. We are now in a position to place them on the market at a very low price.

Nine types and sizes—to suit any miller requirement—**and the delivery is right.**

John M. Terry & Company

19-21 Queen Victoria Street

LONDON, ENGLAND

Cables: Athenian, Cannon, London.

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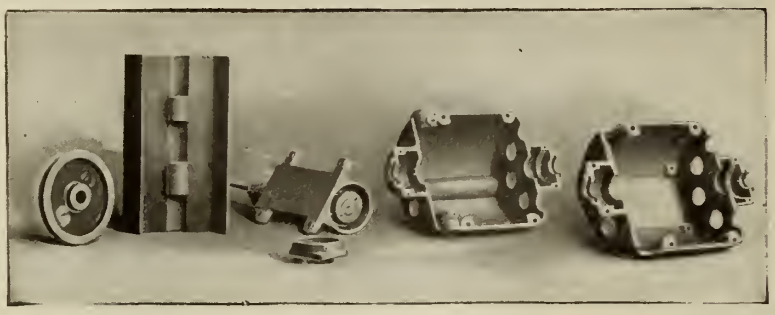

Die-Cast Parts Ready to Assemble

No Machining Required!

Very often a cheaper method of production means inferior work. Not so in the case of die-castings. Our die-cast parts represent **quality** in every respect. You can use them for the best class of machine parts, no matter how intricate, with absolute reliance. They meet all tests for accuracy and strength.

Die-Casting Chat No. 23.—Note the smooth appearance of the die-castings in the illustration. These parts are used in the manufacture of the famous Dumore Grinder. If die-castings are good enough for the manufacture of this well-built machine they should be good enough for many parts entering into your line of production. Die-Castings saved the Dumore Grinder manufacturers thousands of dollars. You can save money too.

Largest Makers of Die-Cast Parts in Canada

THE FISHER MOTOR CO., LIMITED
ORILLIA, ONTARIO

STEEL *for*
Every Commercial Purpose

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.

Steel Ingots *by the* HARMET Liquid Process

Nova Scotia Steel and Coal Co., Limited

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HIGH SPEED STEEL

The Highest Achievement of British Tool Steel Metallurgy

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Latest Improved

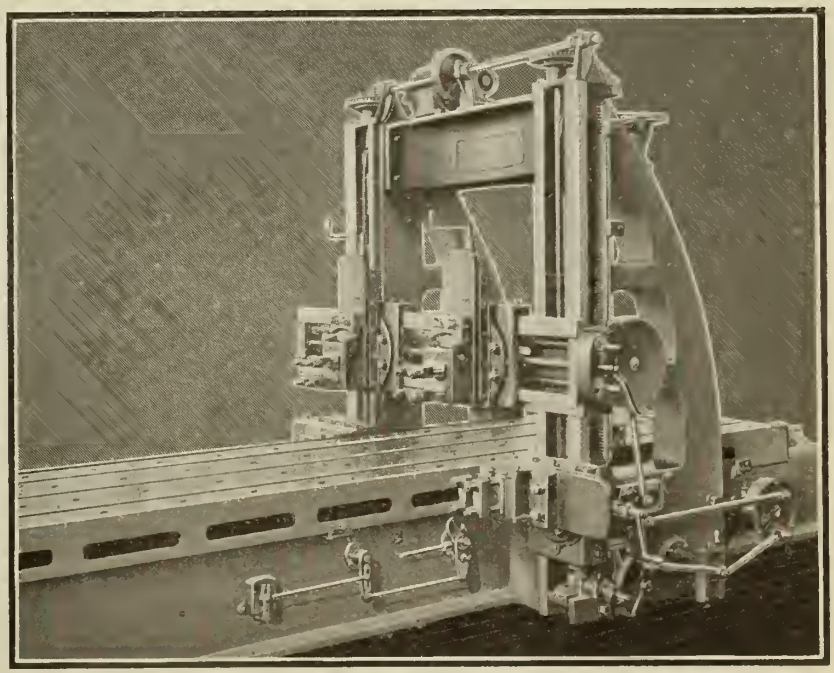
PLANERS

48" x 48" x 14' 0"

Either Two-Post or Openside Type

These are finely finished, heavy duty machine tools and are sturdy and accurate. All power feed! Belt or direct connected motor drive.

QUICK DELIVERY—We are prepared to ship direct from stock!



If You are Interested in Finely-Built Tools Investigate these Planers

L & P MANUFACTURING CO. LIMITED

Niagara Falls, Ontario

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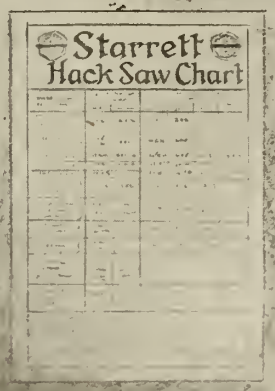
Use Starrett Hack Saws



Starrett Service goes with every box of Starrett Blades.

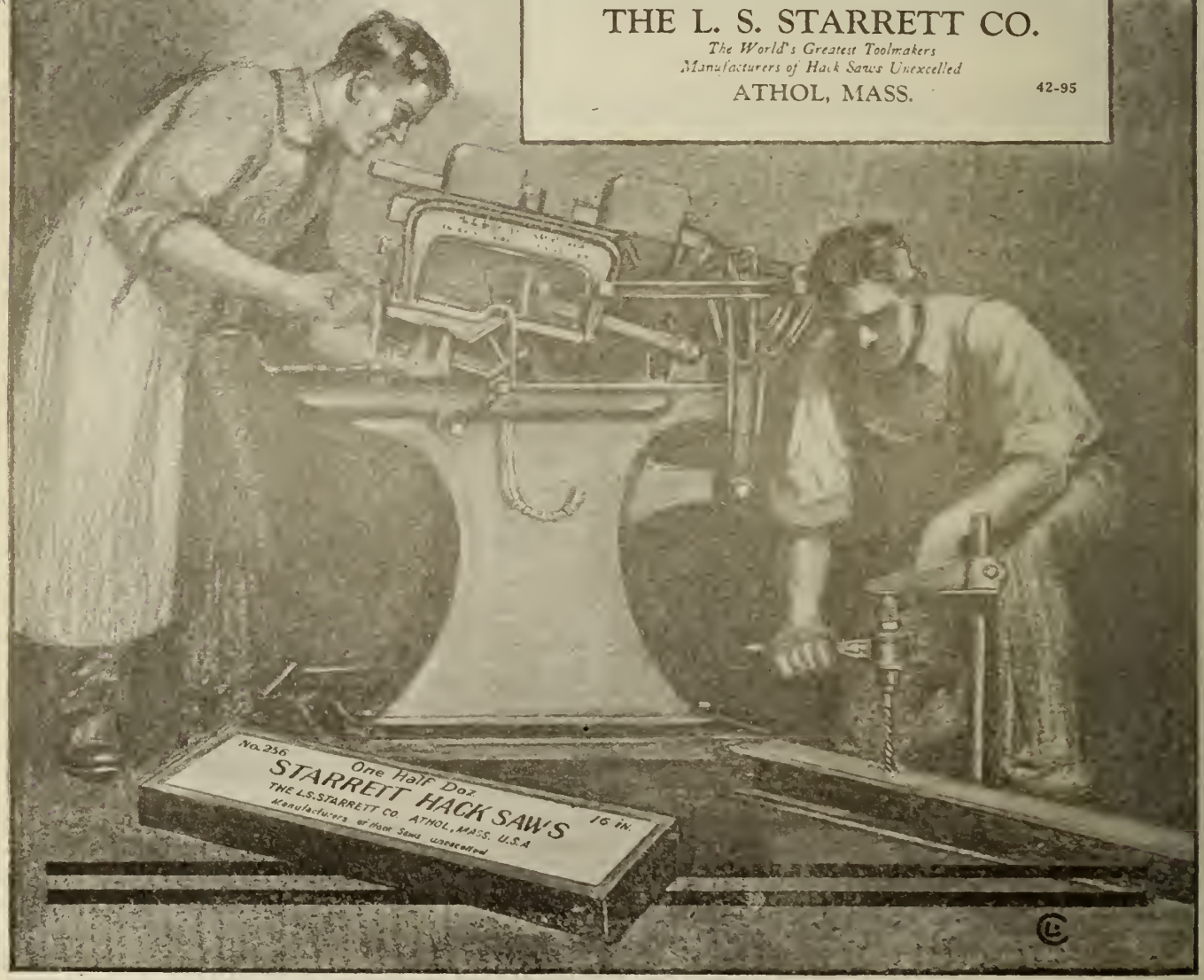
It begins with the fine quality of the saws themselves, and it's yours every minute of the day—any time you need it. Begin using Starrett Service *now*, and let Starrett Blades, backed by the Starrett Hack Saw Chart, show you why they're called "the blades that cut quicker and last longer."

Write for "Hack Saws and Their Use," the guide-book to more efficient cutting.

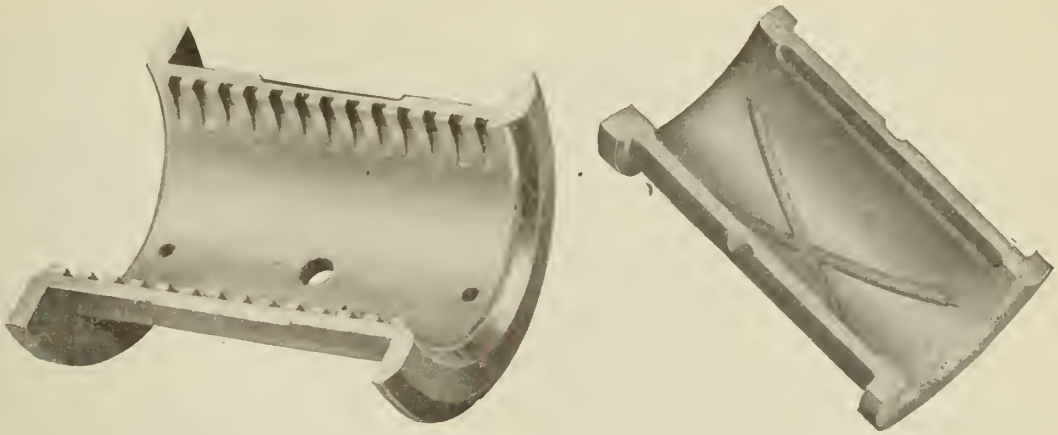
THE L. S. STARRETT CO.

The World's Greatest Toolmakers
Manufacturers of Hack Saws Unexcelled

ATHOL, MASS. 42-95



BABBITT LINED BRONZE BEARINGS FOR INTERNAL COMBUSTION MOTORS



DIE CASTINGS

DOEHLER PROCESS

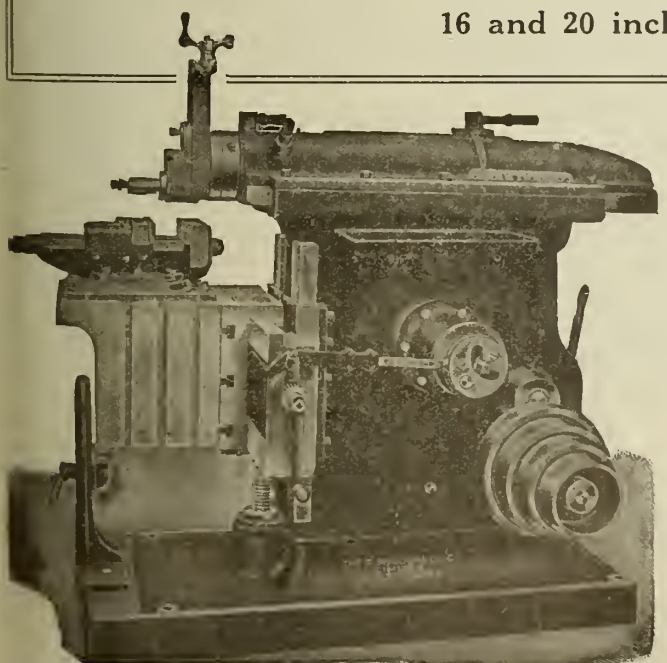
Manufactured by

Tallman Brass & Metal Limited
HAMILTON, ONT.

McDougall Crank Shapers

16 and 20 inch

ARE-MAC-DEE IS A GUARANTEE



A Bigger Day's Work—

is made possible with McDougall Crank Shapers than with any ordinary Shaper because the McDougall is built on lines especially for this purpose. It embodies the most approved features of the most practical shapers on the market and care has been taken to exclude all non-essential parts.

The column is massive in construction, well braced and reinforced internally. Exceptional strength is also seen in the ram, which is semi-circular in form and of box type. It can be set forward by crank conveniently arranged.

Slides are square, accurately fitted and with broad bearing surfaces.

Have us explain the other salient points of this finely constructed machine. Full details on request.

THE R. McDOUGALL COMPANY, LIMITED, Galt, Ont., Can.

The Canadian Fairbanks-Morse Company, Limited
Sales Agents

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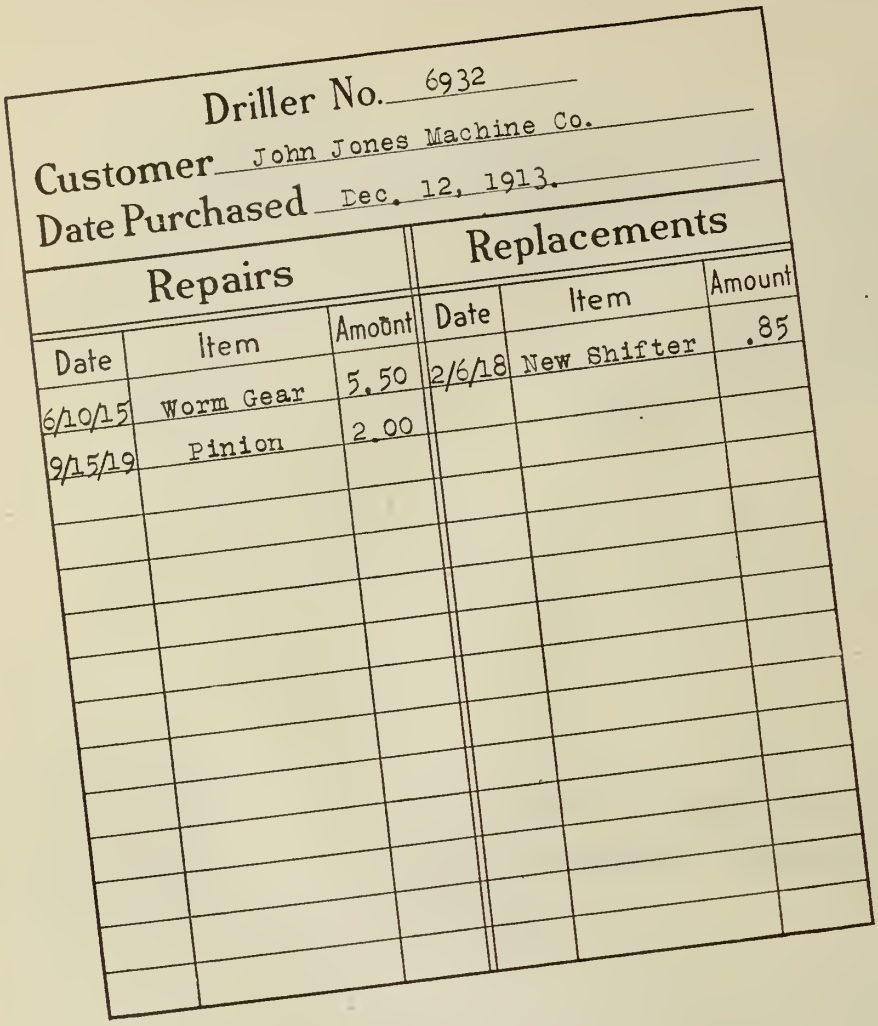


Driller No. 6932
Customer John Jones Machine Co.
Date Purchased Dec. 12, 1913.

Repairs			Replacements		
Date	Item	Amount	Date	Item	Amount
6/10/15	Worm Gear	5.50	2/6/18	New Shifter	.85
9/15/19	Pinion	2.00			

A Typical HOEFER Driller Repair Account

A dollar and a quarter a year maintenance expense;—and, what is equally important, no time lost. That's typical Hoefer Driller history and shows just one reason why Hoefer users are Hoefer boosters.

The average Hoefer Driller, like a happy nation, "has no history." It plugs along, day after day, year after year, without any ifs or buts. And when you've once tied up with Hoefer on drilling service, you'll appreciate another reason why Hoefer users are Hoefer boosters. It's because of the satisfactory feeling that comes from being **sure** you've got the right dope.

Hoefer drilling advice is just as dependable as Hoefer drilling equipment, because it's based on 25 years of experience in finding answers to the drilling questions that stumped the other fellow.

If you have a drilling problem for which you're not quite sure you have the right solution, let Hoefer tackle it. You'll get an answer you can depend on—and without the slightest obligation to you.

HOEFER M'F'G CO.
Freeport, Illinois

Sales Engineers for Hoefer Heads: Chicago, 621 Washington Blvd.; New York, 30 Church St.; Philadelphia, Bourse Bldg.; Buffalo, Ellicott Square Bldg.; Cleveland, Citizens' Bldg.; Pittsburgh, Empire Bldg.; Detroit, 602 Kerr Bldg.; Milwaukee, Majestic Bldg.; Dayton, John M. Howett, 12 W. Second St.; St. Louis, Colcord-Wright Machinery & Supply Co.; Minneapolis, F. E. Satterlee Co.; Montreal, Canadian Fairbanks-Morse Co. (head office).
Sales Offices for Hoefer Drillers: Boston, Factory & Mill Supply Co.; Providence, Brownell Machinery Co.; New York, F. H. Niles & Co., Woolworth Bldg.; Philadelphia, Luster Machinery Co., 917 Arch Street; Baltimore, Aumen Machinery Co., 107 E. Lombard Street; Syracuse, C. H. Wood Co.; Rochester and Buffalo, Ogden R. Adams; Pittsburgh, Motch & Merryweather Machinery Co.; Cleveland, Cleveland Tool & Supply Co.; Dayton, John M. Howett, 12 W. Second St.; Detroit, Cadillac Tool Co.; Chicago, Federal Machinery Sales Co., 12 N. Jefferson St.; Milwaukee, Badger-Packard Machinery Co.; Minneapolis, F. E. Satterlee Co.; St. Louis, Colcord-Wright Machinery & Supply Co.; Atlanta, Walraven Co.; Birmingham, Young & Vann Co.; New Orleans, Oliver H. Van Horn Co.; Seattle, Portland, Ore., San Francisco, Los Angeles, Eccles & Smith Co.; Montreal, Canadian Fairbanks-Morse Company (head office), for all Canada; Indianapolis, A. D. Heath Machinery Company, Merchants Bank Bldg.

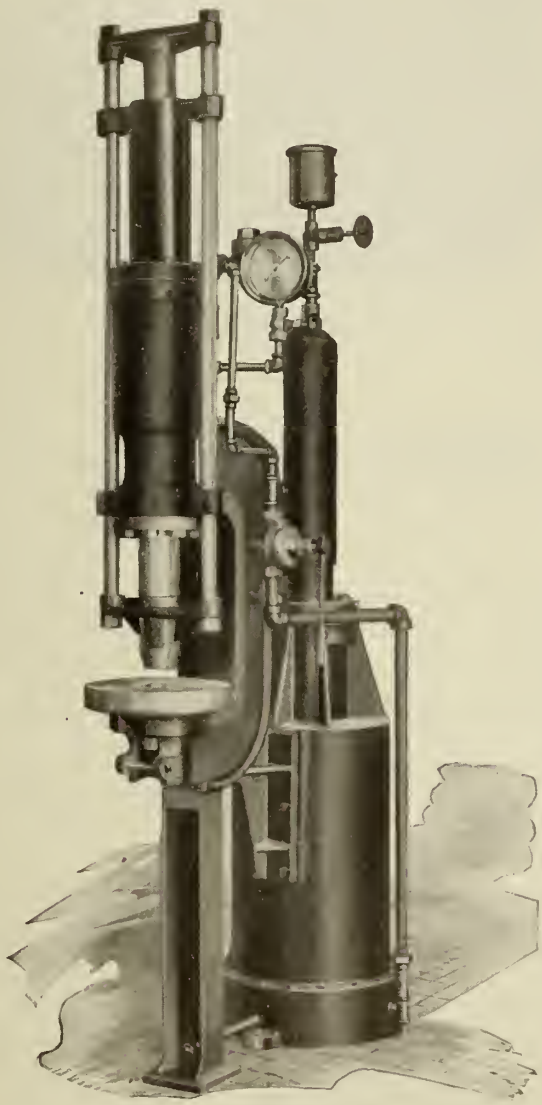
14a

ORIGINALITY

is Characteristic Always of

"METALWOOD"

DESIGNS and DEVELOPMENTS



The "Metalwood" line of these Quick Operating Hydro-Pneumatic Presses comprises a variety of styles, types and sizes.

By performance through a period of years, these presses have established themselves in a wide range of industries as standard tools for light straightening, broaching, forcing and assembly operations.

The "R-149" style press of 20-ton capacity shown here is described in our bulletin B-47.

METALWOOD MANUFACTURING CO.

High Speed Hydraulic and Hydro-Pneumatic Machinery

DETROIT, MICHIGAN

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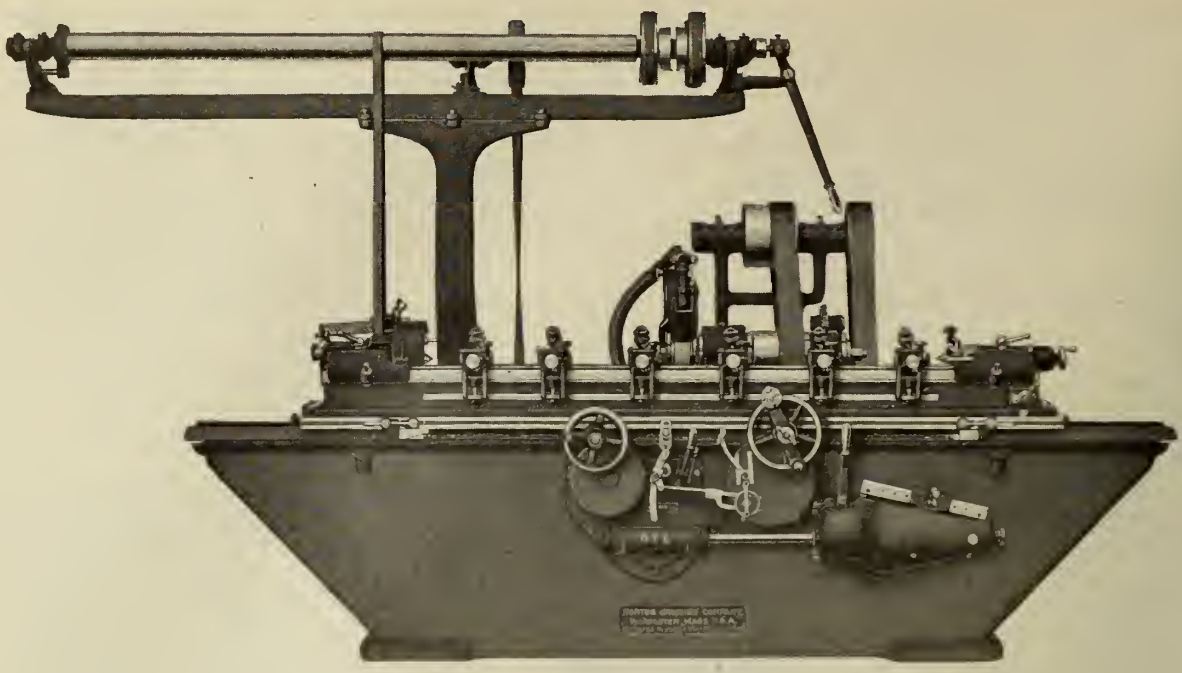


10 in. x 72 in. Machine--Electric Drive with Belt Driven Headstock

Machine Output—

The performance of a machine should be figured by the year, not merely by the hour. The expected output should properly be based on what the average good operator working with normal effort can produce in a day—not what an expert can do on a short time production "stunt."

This involves fundamentally correct design. In a grinding machine it means rigidity, power, sturdy wheel slide construction to take heavy cuts; well-proportioned bearings and careful heat treatment of vital parts to insure freedom from trouble and delay. It means simple and easy operating control, which assures continuous production without fatiguing the operator.

All these factors were amply provided for in the design of Norton Cylindrical Grinding Machines. The final result is a machine that has revolutionized grinding production—a consistent rapid producer of uniformly accurate work.

NORTON COMPANY OF CANADA, LIMITED

Hamilton, Ontario

Grinding Wheel Speeds For Cylindrical Grinding

A Brief Discussion

By Charles H. Norton

WE are often asked why we do not provide grinding machines with means for variable wheel-spindle speed. The answer is that variable speed for the work accomplishes all that variable wheel spindles can accomplish and much more, in a more simple way, at less expense.

With variable work speeds we are enabled to secure a wider range than variable wheel revolution could give. We secure uniform results from wheels having a variation of 2,000 feet per minute, and a variation from true grade within practical wheel-making limits. Thus the necessity for variable revolutions for the wheel, or close limits of speed and grade for the wheel, are unnecessary.

To obtain the same range of effect by variable wheel-spindle speed as we obtain with work revolutions from 20 to 138 r.p.m. we would require a spindle change from 169 r.p.m. to 1,233 r.p.m., or a wheel speed from 6,400 feet (the highest speed that is safe) to 890 feet per minute; this latter is so slow that the wheel would wear away rapidly and be useless, if the grade was soft enough to be effective at 6,400 feet per minute.

When we have adjusted the work speed to obtain the best results we should be careful to maintain a constant speed of revolution of the wheel with no slipping of belts or momentary slowing due to lack of power. With irregular wheel speed minute particles of material being ground adhere to the wheel face, which causes the wheel to cut less freely, with the result that production is delayed and more power is required.

The machine maker is constantly endeavoring to find the best relation of machine and wheel to produce the best results. Therefore he should be authority for the grade, grain, and speed of wheel.

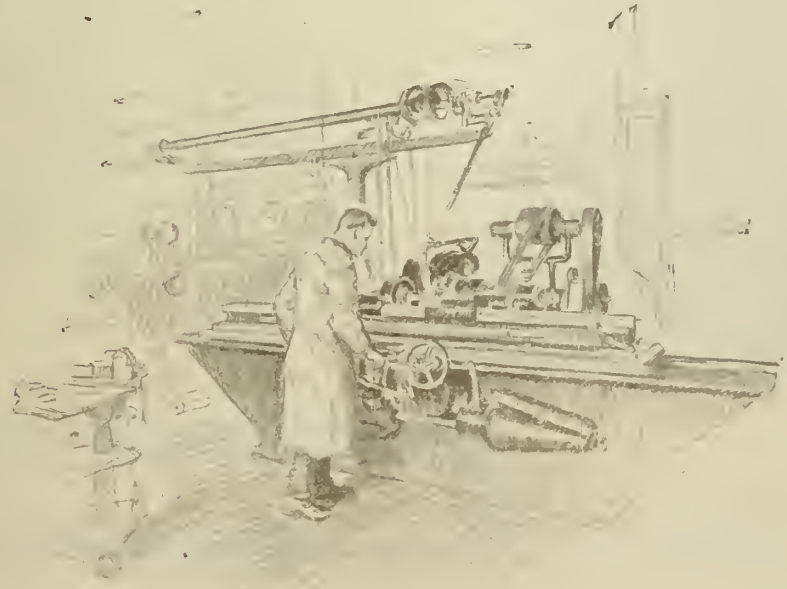
NORTON COMPANY OF CANADA, LIMITED

Hamilton, Ontario

Electric Furnace Plants

Niagara Falls, N.Y.

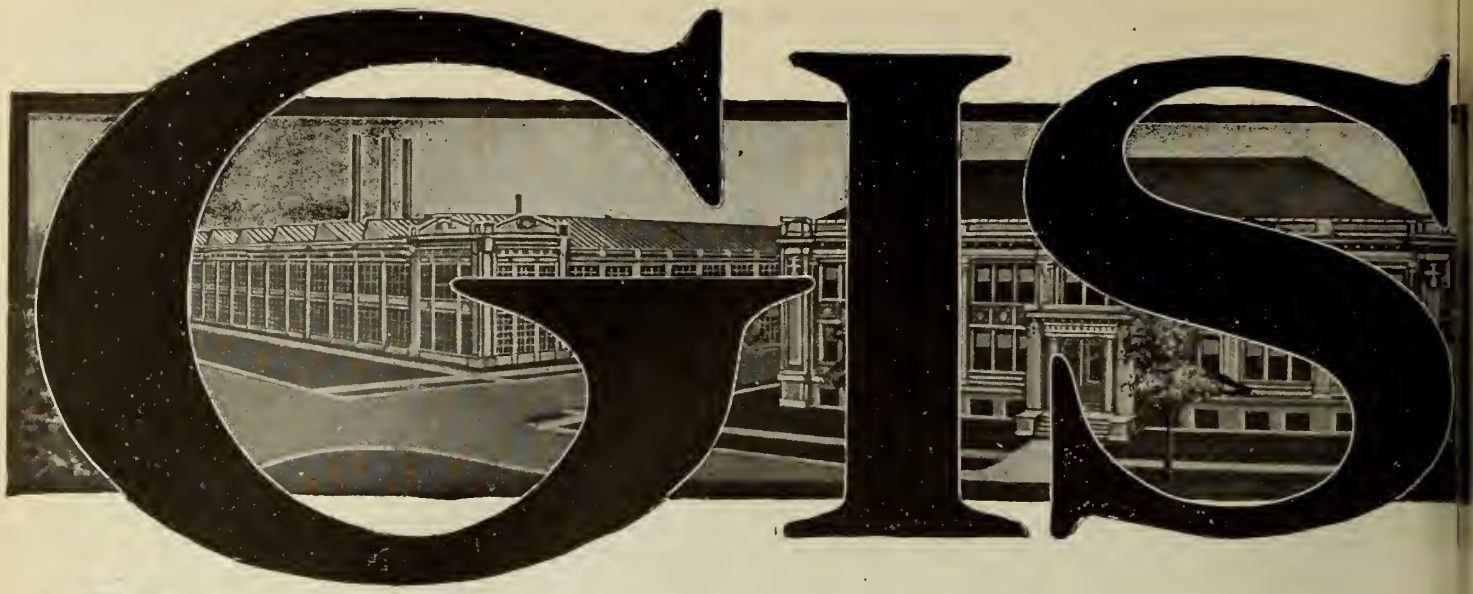
Chippawa, Ont., Canada



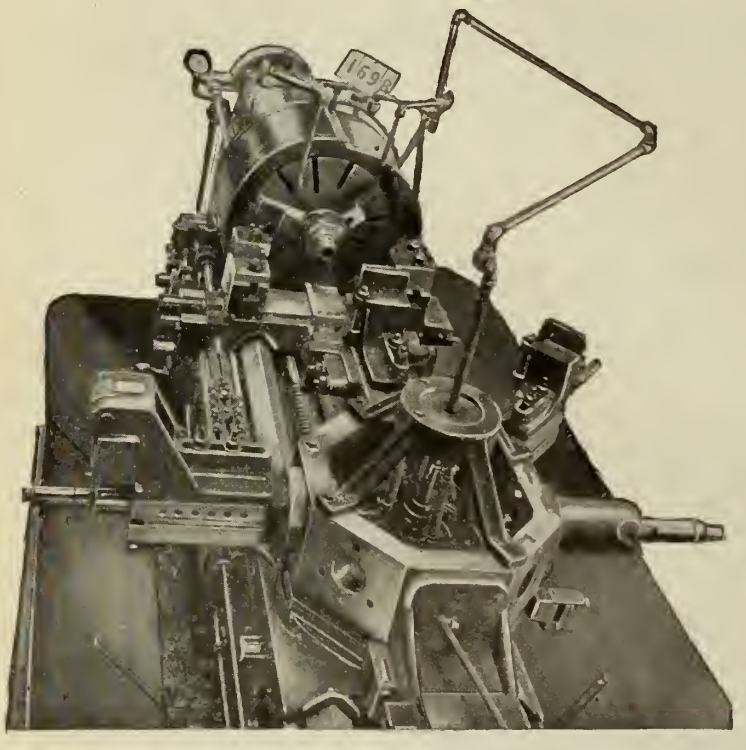
Canadian Agents:
The Canadian Fairbanks-Morse Co., Ltd Montreal, Toronto, Ottawa, St. John, N.B. Winnipeg, Calgary, Saskatoon, Vancouver, Victoria

F. H. Andrews & Son Quebec, Que.

Simonds Saw Co. Vancouver, B.C.



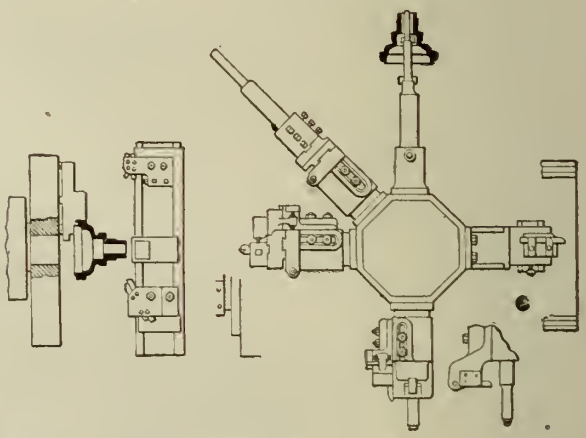
Sample of Gis



This picture shows first operation

From the Gisholt

These pages are worthy of study. They illustrate the way in which Gisholt engineers will help you solve your manufacturing problems.



Showing tooling set-up.

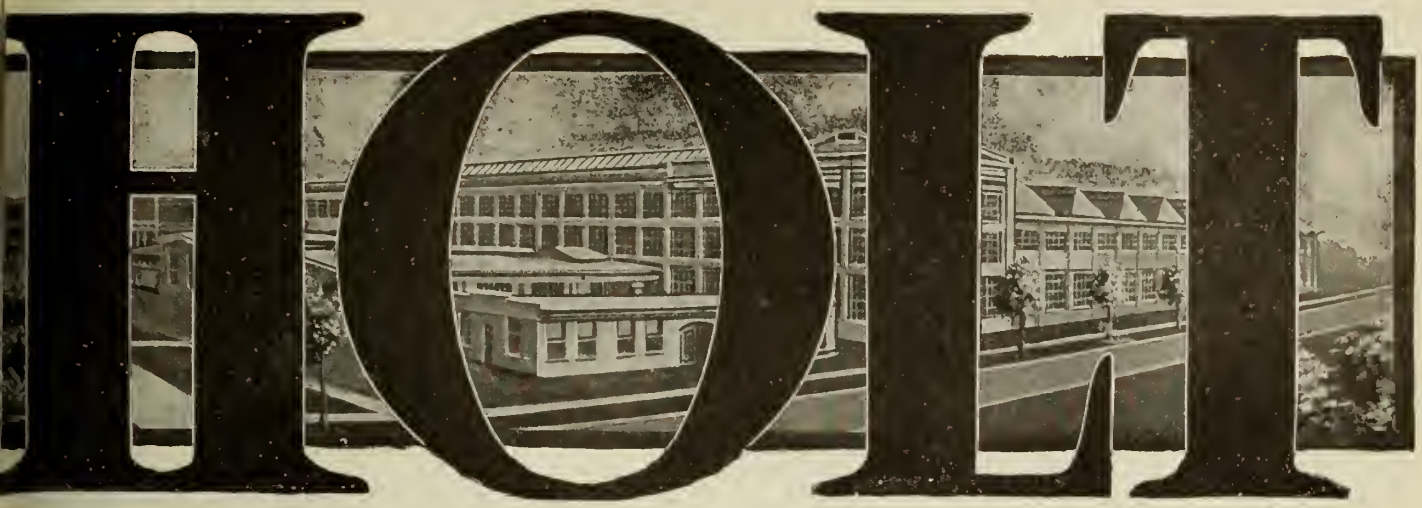
GISHOLT MACHINE COMPANY,

Builders of Standard and Automatic Boring Mills, Tool Grinders,

Eastern Sales Office: 30 Church St., New York.

Canadian Agents : The Canadian Fairbanks-Morse Co., Ltd., St. John, Quebec, Montreal Ottawa, Toronto, Hamilton, Windsor, Winnipeg, Saskatoon, Calgary, Vancouver, Victoria

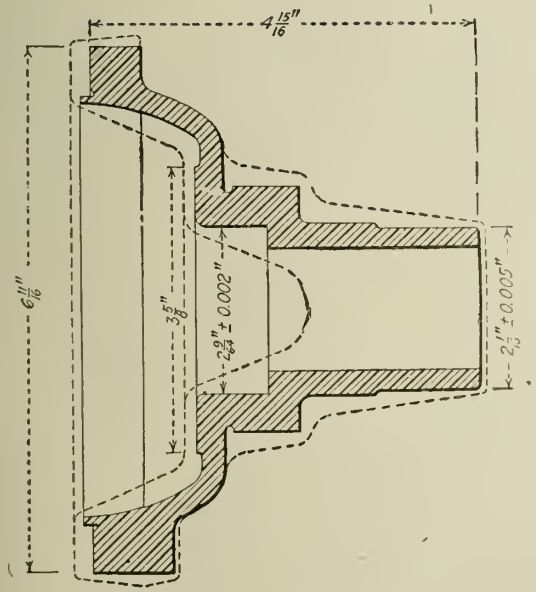
If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.



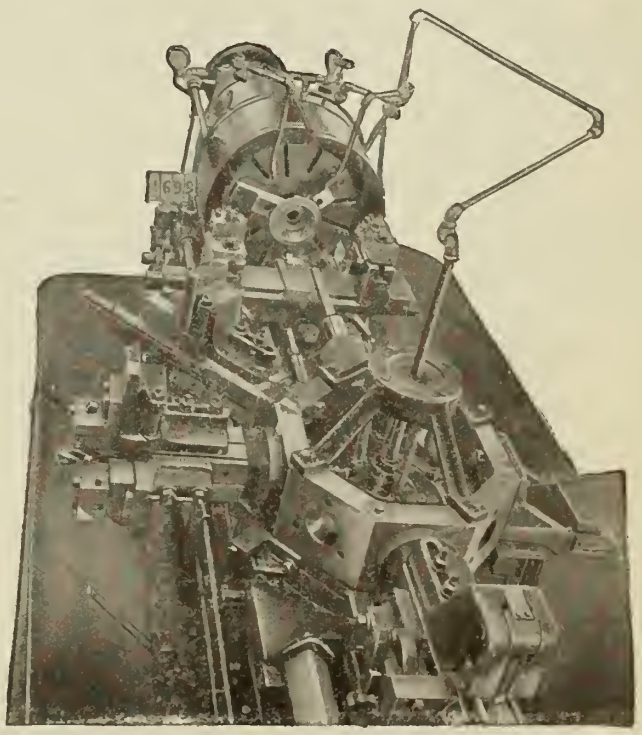
GisholtProduction

Automatic

Differential casing from drop forging. Floor to floor time for both operations 33 minutes.



Put your manufacturing problems up to Gisholt



This picture shows second operation. Both of these operations are performed on one machine during one revolution of the turret

WASHINGTON AVE., MADISON, WIS., U. S. A.

Turret Lathes, Vertical and Horizontal
Small Tools, Special Machinery, etc.

Works: Madison, Wis., Warren, Pa.

FOREIGN

ustralia, Benson Bros., Sydney, Melbourne; Belgium, Ateliers Demoor, Brussels; Great Britain, Burton, Griffiths & Co., London, Birmingham, anchester, and Glasgow, Scotland; France, Aux Forges de Vulcain, Paris; Italy, Emanuele Mascherpa, Milan; Japan, Andrews & George, okyo; Norway, Union Machine Co., Christiania; Sweden, Axel Ryden, Stockholm; Switzerland, J. Lambercier & Co., Geneva.

If interested tear out this page and place with letters to be answered.

15 Sales Offices Backed by the 100% Standard of Quality

THE Canadian Fairbanks-Morse Company Limited reaches out to you through its sales houses and offers the service and satisfaction that is assured by its 100% standard of quality and service.

To be able to turn to an institution that dominates its field in the industrial world is to safeguard the character of the merchandise you buy. To deal with an organizationthat is doing business at your very door puts upon the man you know that "responsibility which is the conscience of business."

Every one of these 15 offices has been established to bring to you the full advantages and benefit that have made The Canadian Fairbanks-Morse Co. Limited a national institution. Here in these offices is offered everything mechanical that your business requires — they centralize your purchasing—group your orders—bulk your shipments and send but one invoice. And when you buy from The Canadian Fairbanks-Morse Co. Limited you are guaranteed the 100% standard of quality and service in product and organization.

Make our nearest office your buying centre—our catalogue is your buying guide —our 100% quality seal your guarantee.

The Canadian Fairbanks-Morse Co., Limited

Canada's Departmental House for Mechanical Goods

Halifax St. John Quebec Montreal
Ottawa Toronto Hamilton
St. Catharines Windsor Winnipeg
Regina Saskatoon Calgary
Vancouver Victoria

2

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CANADIAN MACHINERY
AND
MANUFACTURING NEWS

Vol. XXIV. No. 10 September 2, 1920.

Do You Realize the Value of Your Scrap?

IF IT were good practice some years ago for firms to pay attention to the saving of scrap around the plant, the high prices of material make it ever so much more necessary to pay attention to this matter now.

When the war was at its height the War Industries Board of United States classified the various industries that were claiming attention, throwing out some that had been looked upon as quite essential, but holding that those engaged in such callings as scrap metal sorting and shipping were working at essential callings. On this ground exemption from military service was granted to those that applied for it.

There is just a danger that in a good many of our plants we are too much engaged in production, in turning out the material and in devising ways and means to cut down time on operations. This may be carried on to such an extent that a real waste takes place of odds and ends that could, with a reasonable amount of thought, be turned to good account.

There is an old saying that if a thing is kept around for seven years some use will be found for it. That is about as far removed from the modern idea of scrap reclamation as anything could well be imagined. The idea is not to keep material lying around in hope of finding some use for it later on, but rather to make use of it as soon as possible.

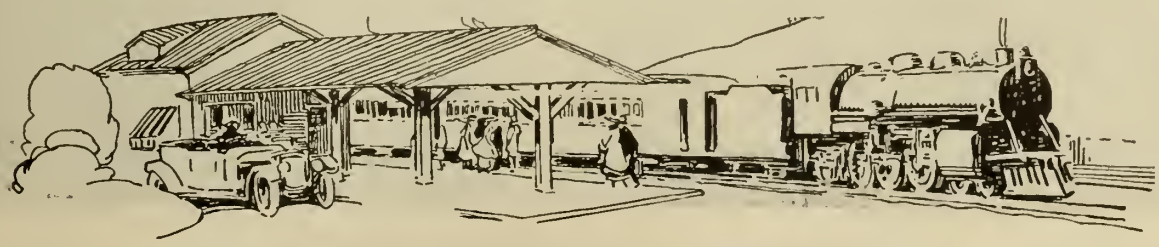
The big railway yards have made a keen study of this business. It is safe to say that the roads are saving hundreds of thousands of dollars every month by a strict attention to the scrap heap.

A certain well-known maker of pickles has his varieties numbering now up to 57, but the railway scrap record shows that the classification has gone to almost double that number, showing where some 99 bins are arranged to look after the various parts of engines and cars.

Station trucks and wheelbarrows are made out of old material. Old bars make the most of the truck, spot welding doing the holding together. The wheels and the frame for them are the only things made especially for the purpose. The wheelbarrows come to life from the old pieces of material, and the wheels for these are nothing more or less than the old hand brakes which the brakeman was wont in his strong and daring way to wind around to stop the train before air brakes became as common or as efficient as they are at present.

There is nothing whatever in the idea of reclaiming scrap to make it appear necessary for the shop to keep on indefinitely with the old material, even after it has lost its use, or to keep on patching up instead of buying new. On the contrary it works the other way. The wise shop wants to realize as soon as possible on its scrap —wants to get it out of the way and turn it into ready money.

The article on the following pages dealing with the system in vogue in the Angus shops of the C.P.R. at Montreal gives a good idea of what it really means to turn the scrap heap into an asset. Railway companies have gone a long distance in this work as the story will show.



Making an Asset Out of the Scrap Heap

by J.H.Rodgers

IT is only in recent years that any concentrated effort has been made, in industrial plants, to establish an organized department for the reclamation of scrap. The old material problem has, too frequently, been isolated from the regular routine of manufacturing plants, invariably considered as being outside the pale of constructive industial enterprise. Large organizations, however, are now recognizing this so-called scrap problem as one that has a vital bearing upon the economic operation of the company's business.

When the Canadian Pacific Railway Company constructed their Angus shops at Montreal, the reclamation of scrap received more than the ordinary amount of attention, as it was officially recognized as being a very essential factor of railroad operation, and one that would require to be placed under careful supervision in order to effect a saving.

In the operation of an extensive railway system the possibility of material loss, in the way of scrap and discarded materials, might easily run into many hundreds of thousands of dollars, unless some systematic effort is made to prevent, or at least, minimize the leakage. The multitudinous ways in which scrap may be created in ordinary railroad service makes it an imperative necessity to exercise the greatest care in preventing any of the discarded material in getting away from the company, before it has been determined that such equipment is beyond the stage of useful service. Not only is it necessary to collect these scrapped parts from every available source, but it is equally essential to transfer the material to some reclaim terminal and general stores department, so that serviceable parts and reclaimed equipment may be listed and stocked for further construction purposes, or distributed to different points on the system to effect needed repairs.

FIG. 1—PARTIAL VIEW OF THE SCRAP YARDS AT ANGUS C.P.R. SHOPS.

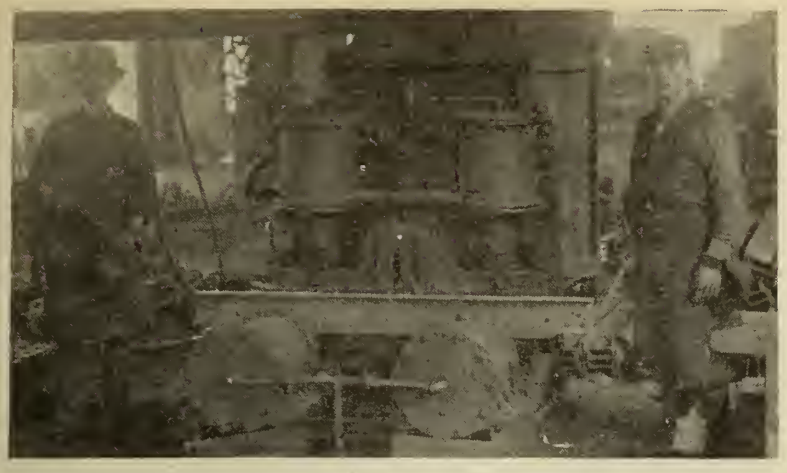


FIG. 3—PNEUMATIC PRESS FOR STRAIGHTENING BRAKE BEAMS.

Facilities are provided at every terminal on the C. P. R. system for the accumulation of old material, and this is loaded, periodically, on suitable cars and shipped to the main terminal at Montreal. The greater volume of the material is transported during the summer months when haulage is most favorable, the scrap accumulating at the different terminals throughout the winter. A part of the Western portion of the Angus property is utilized as a yard for scrap; approximately 10 acres are devoted to this purpose. A partial view of this section is shown in Fig. 1, the cars in the center being those in which the scrap is received. From these cars the material is taken and sorted, and placed in the various bins on the platform, according to their different classifications. Material that is to be reclaimed is kept separate from the rest, and subsequently goes through the necessary process of repairing or reconstruction for further service.

The line drawing Fig. 2 shows the general arrangement of the sorting dock and reclaim departments. The cars for loading the sorted scrap are located on the opposite side of the platform and parallel to the track on which the incoming cars are located. The arrangement of the several buildings and the mechanical equipment has been so planned as to facilitate the handling of the different materials from the time they are received until they are again in a repaired condition and placed in the stores.

In order to better acquaint the reader with the general layout, the summary below has ben given, the equipment and location being indicated in the sketch, Fig. 2.

1. Paper Baling Press.
2. Scale.
3. Machine for cutting rubber hose.
4. Workmen's time clock.
5. Reclaim dock office.
6. Storage bins for old wrenches.
7. Switch board.
8. Two dynamos.
9. Emery wheel.
10. 10, 13, 18. Benches.
11. Electric welding screens.
12. Six spindle tapping machine.
14. Small tapping drill.
15. Bins for keeping bolts.
16. Machines for punching washers.
17. Pipe threading machine.
19. Bolt threading machines.
20. Bolt shears.
21. Power hammer.
22. Heaters.
23. Small drill.
24. Furnace for couplers.
25. Hydraulic riveting machine for couplers.
26. Shears.
27, 28, 29. Furnaces.
30. Pneumatic riveting machine.
31. Pneumatic press.
32. Furnace.
33. Bench.
34. Forge for spring work.
35. Anvil.
36. Lead melting furnace.
37. Seal oil tanks.
38. Rolling mill furnace.
39. Re-roll mill for bar iron.
40. Straightening rack.

Owing to the numerous sources from which the material is collected it is quite obvious that the incoming cars will contain a jumbled mass of old material. Examination of the contents is made as it is unloaded, so that little difficulty is experienced in classifying the material and determining whether it has to pass through the reclaim process or to be transferred to the bins set apart for that particular class of scrap. When it is only a question of sorting the scrap for trans-shipment to the large rolling mills, foundries, and other manufacturing plants, the work entailed is simply un-

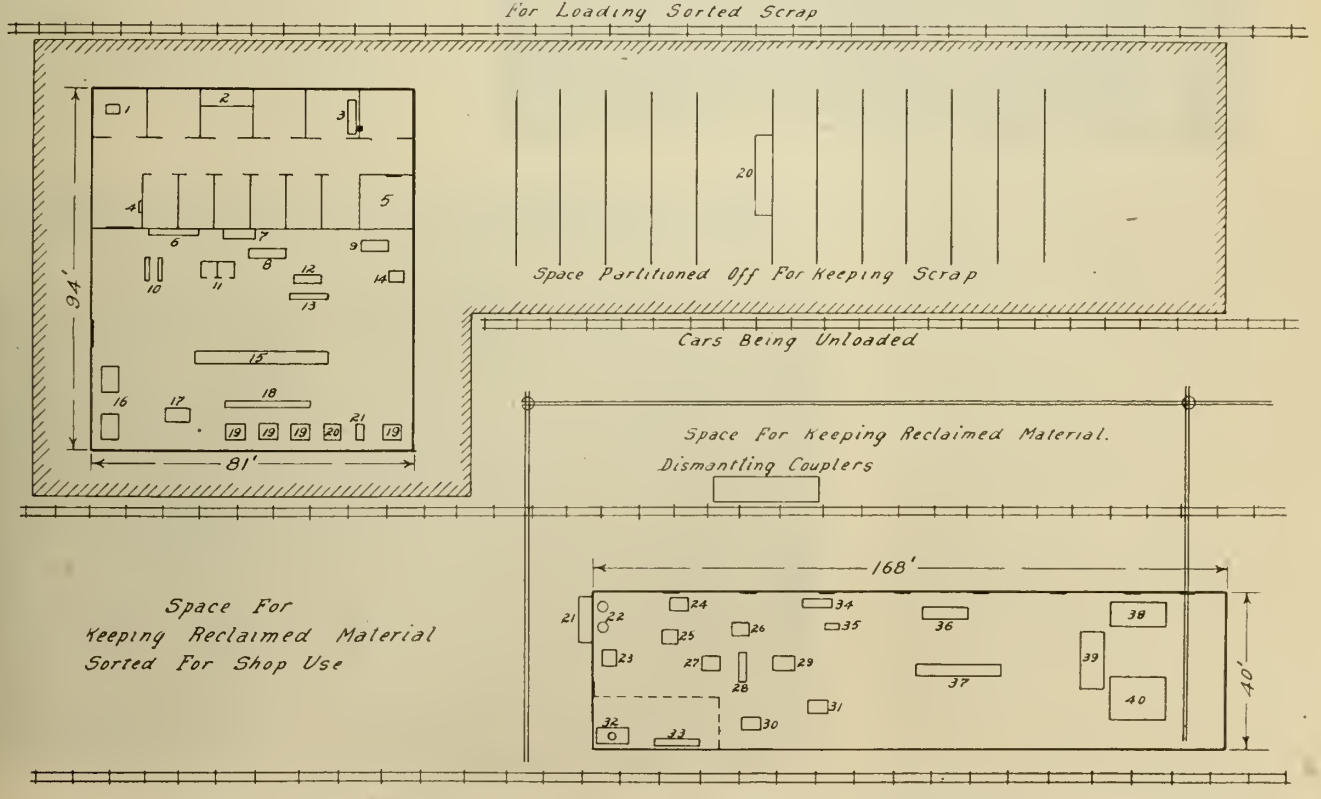


FIG. 2—GENERAL LAYOUT OF SCRAP DOCK AND RECLAIM DEPARTMENTS.

loading, sorting, and subsequent reloading. In many instances, however, the discarded equipment is a combination of two or more metals or materials, so that for profitable disposal of such parts it is necessary to separate them in order to place each in its proper scrap classification.

Some of the more important phases of railroad reclaim may be outlined briefly as follows:—

Brake Beams

Causes for the scrapping of brake beams are so numerous and varied that discarded equipment of this character will arrive at the scrap dock in every degree of twisted form. Many of those delivered to the yard at Angus are in good condition but have had to be replaced by heavier beams, to meet the latest M.C.B. specifications. These discarded beams are generally of the 5 in. type, this size being now obsolete for brake purposes. However, the various fittings are nearly always in good condition and can be used in a like capacity on the heavier beams. The rivet heads are severed by the use of oxyacetylene, the rivet knocked out, and the brackets and rod connections utilized for the reconstruction of serviceable equipment. The small 5-in. beams are seldom scrapped as various uses have been found for them in construction work in the shops and roundhouses.

FIG. 4—ASSEMBLING BRAKE BEAMS.

FIG. 5—ASSEMBLING DRAWBARS.

The majority of these obsolete brake beams are used for roof corlines for box cars, two of the 1-in. beams being welded together to obtain the desired length.

The greater number of the larger brake beams arriving for overhauling and repairing are usually bent out of the original form, and these must be straightened before they can be used. The beam is first dismantled, as stated above, and when entirely stripped, is placed in the furnace (29) and heated, after which it is taken to the home-made pneumatic press, shown in Fig. 3. This press is provided with four air-brake cylinders, two set for a vertical and two for a horizontal pressure, a thrust block of the desired shape being rigidly secured to the lower frame. Each pair of cylinders is controlled independently of the other. A beam that has just been straightened is shown resting on the cylinders.

For reassembling the brake beams a large pneumatic riveter is embedded in the ground; this is shown in operation in Fig. 4.

Drawbars and Couplers

A feature of the reclaim department is that of the handling of the couplers and drawbar equipment. The continual bumping and straining to which couplers are subjected provides an excellent opportunity of developing defects, and these must receive immediate attention to guarantee against mishap or accident. Dismantling is the first operation, and like the brake beams, the rivets holding the shanks to the drawbar are cut away with the oxyacetylene torch. If inspection shows that the coupler has been sprung it is placed in a furnace (24), and when heated sufficiently is placed in the hydraulic press (25) and straightened to its original shape. Slight cracks often develop in the couplers, due to internal stresses in the steel, or from some severe strain in service. These are carefully examined and chalk marked, and afterwards electric welded. Worn knuckles and corners are built up with new metal,

FIG. 6—REASSEMBLING TRUCK SPRING SETS.

FIG. 7—PUNCHING WASHERS OUT OF SCRAP PLATE.

so that the coupler, after repairing, is equally as serviceable, if not more so, than the new coupler, as initial strains have been largely eliminated. After welding the coupler is again assembled, interfering portions being ground off by means of a portable pneumatic grinder. New or repaired shank straps are provided, and these are riveted to the drawbar in the hydraulic press shown in Fig. 5, both rivets being inserted and headed at the one operation.

Truck Springs

In every car arriving at the scrap dock large numbers of coil springs are received. Aside from exhibiting exposure to the weather many of these springs are in perfect order, but require sorting out according to their different classifications. A truck unit generally consists of four heavy coil springs bound together with top and bottom plates, depressions being provided at each of the four corners so as to retain the springs in their proper position, the whole being firmly secured by a central bolt. The heavier type is made of eight springs, four small ones centered in the outer springs. Every spring is examined and tested with a gauge to determine if its original length has altered. When below size the springs are placed in the forge (34) and heated to a dull red, taken out and opened to the desired length, after which they are reheated and tempered in oil. The assembling operation is shown in Fig. 6. Leaf springs are generally turned over to the blacksmith shop, where they are overhauled and placed again into service.

Washers

The extensive use of washers for every branch of railway service makes the question of supply an ever-prominent one. Facilities are provided at the Angus shops for utilizing all the light scrap plate available for conversion into washers. The plates, when necessary, are cut into convenient size, but little attempt is made to flatten it, as this is accomplished at the time the washer is punched out. This operation is shown in Fig. 7. The Mason press in the background was especially made for washer work, and the die used is of the combination type, the central blank going through the die, while the washer is carried up on the upstroke and ejected on to a plate that swings below the punch automatically, this being done by means of a twisted rod operating in a nut secured to the upper portion of the frame, to the left of the operator.

The punch press in the foreground is especially interesting, for the reason that it, in itself, is a product of scrap reclaim. It is an old Bertram shear adapted for washer service. The die in the machine is of duplex design, where the outside and inside dies are distinctly separate but contained in the one holder, and both operations performed simultaneously and a completed washer obtained

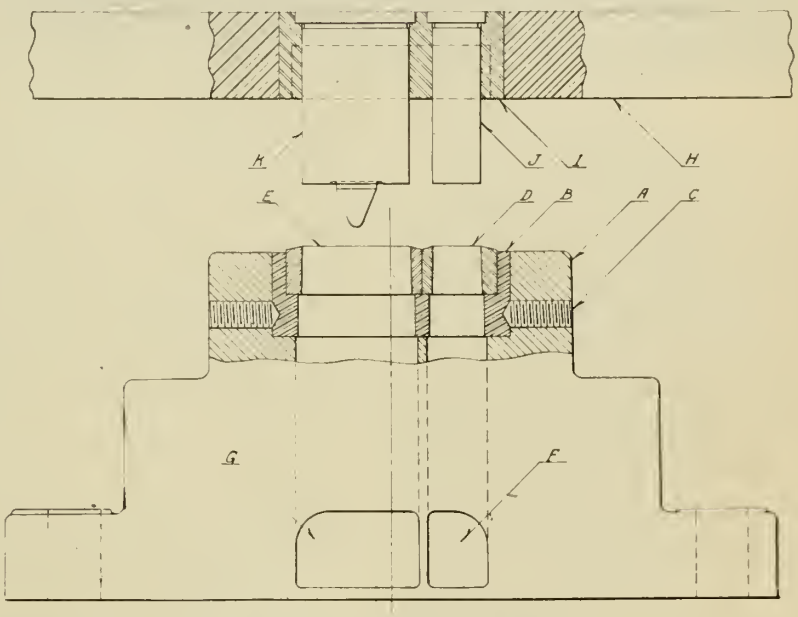


FIG. 8—DIE FOR MAKING WASHERS.

FIG. 9—RE-ROLLING MILL FOR SHORT LENGTH ROUND BARS.

FIG. 10—SLITTING REINFORCED RUBBER HOSE.

at each stroke of the press. A sectional sketch of the die construction is shown in Fig. 8. The die bed A is designed to give extreme rigidity and is counterbored at the top to receive the die holder B, which is bored and counterbored to retain the dies D and E, these being secured in position by headless screws (not shown); the die holder is held by screws C. The cored holes F and G are located in an inclined position, the lower opening being at the front of the die. The lower surface is filed smooth to aid the exit of the slug and the washer, each of which is guided into a separate receptacle. The punch plate H is bored part way and slotted to receive the punch holder I, which is shaped off on two sides to fit the plate, this providing an easy means of interchangeability and insuring accurate setting. The large punch K is provided with a pilot that enters the hole punched by J, so that the inside and the outside of the washer are concentric. Various sets of dies for the different sizes of washers may be fitted in the one die bed and punch plate.

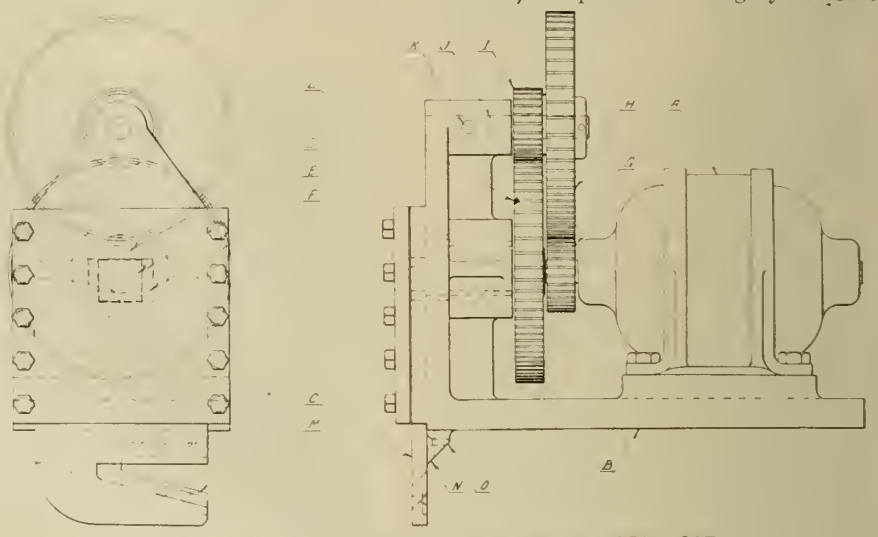


FIG. 11—MACHINE FOR SHEARING REINFORCED HOSE.

FIG. 12—OVERHAULING SCOOPS AND SHOVELS.

Re-Rolling Bar Iron

Probably no other factor is so essential to the economic solution of the scrap problem as the conservation and the reclaim of the bar material. In the short period of six months, during which the small re-rolling mill at Angus has been in operation, hundreds of tons of what would otherwise have been shipped to the mills as scrap has been re-rolled and used to good advantage for a great variety of purposes. This small mill, shown in Fig. 9, is not intended for the production of commercial iron, but has been installed for the sole purpose of utilizing the large quantities of odd sizes and lengths of old bolts and rods that are rapidly accumulating from every branch of the service. Without any particular attention being given to the scrap material, the pieces are roughly sorted and piled in readiness for being put in the furnace (39). After passing through the rolls a sufficient number of times to reduce the rod to the desired size, the finished bar is placed on the straightening rack (40). When cool the stock is weighed and then transferred to the stores warehouse. The great advantage of this local installation is that rush orders coming in from any part of the system for small quantities of certain sizes can be filled almost immediately, even though none is in stock at the time. All that is necessary is to charge the furnace with available scrap which will give the required size. The convenience of the re-rolling mill has been a boon to the system, when at different times it would have been difficult, if not impossible, to obtain quick delivery of the material from the market.

Reinforced Water Hose

To make the reclamation of reinforced water hose a profitable enterprise it is

FIG. 14—SORTING DEPARTMENT FOR FREIGHT CAR BOLTS AND NUTS.

necessary to separate the fabric from the coil of steel wire contained in the hose. To accomplish this the C. P. R. have designed a special motor driven shear for slitting the hose lengthwise. A view of the machine in operation is shown in Fig. 10. A line drawing of the device is shown in Fig. 11. The motor A, is secured to the base B, which is bolted by means of a suitable bracket to the bed of an old lathe. A slide in the front of the frame carries the shear plate C, which is operated by means of the crank shaft D. The crank of the shaft is fitted to the hole in the oscillating block E, operating in the slot F, cut in the shear plate C. The drive pinion G, secured to the motor shaft, meshes with the large gear H, keyed to the extension of the pinion I, which, in turn, drives the gear L, geared to the crank shaft D. The shear blade M, is fastened to the movable plate while the stationary shear blade N is secured to the small lug O, which is integral with the frame. The old hose is pushed over the horn of the movable shear plate and the end grabbed by the small claw clamp fitted to the carriage of the machine. This carriage is forced backwards, drawing the hose through the shear, which operates at a speed of about 100 strokes per minute. When co- p the hose is removed from the shear and the wire, now in rings, can easily be taken out.

Scoops and Shovels

An average of 500 scoops and shovels pass through the reclaim department every month. These are gathered from every conceivable source, from the Atlantic to the Pacific, and eventually find their way to Angus, where they are repaired and again placed in the stores ready for distribution to the service for which they are best suited. The bulk of these only require to have the ragged edge of the scoop trimmed off, while others may need the scoop or the handle replaced. The available supply is always ample to obtain the necessary repair parts without recourse to new material. Fig. 12 shows a section of the shop devoted to shovel repair. The pile of wheelbarrow bodies in the middle background has been made from light steel plate scrap.

Trucks and Barrows

The heading of this article is a typical example of what may be made from scrap material. To the left is shown an all-metal truck constructed without the use of rivets, the electric process being used to weld the various sections. The side frames, cross pieces and axle are all made of old piping, the feet and front made of plate and bar material. The handles are covered with pieces of air hose placed on the pipe when the latter is heated, so that the rubber will stick more firmly. The wheels are the only parts specially made for the truck. The wheel barrow is constructed entirely of scrap, the main frame and axle of pipe; the feet and axle brackets of light bar iron; the bodies of light plate and the wheels are made from old hand-operated brake wheels.

Freight Car Bolt Reclaim

A detail that might well be considered as coming under the general heading of scrap reclaim, although it is not included in the records of this department, is the gathering and sorting of the bolts out of the freight cars that are in for repairs. When the cars are brought into the shop the stripping operations are carried on without any attempt to keep track of the numerous bolts with which the different parts of the cars are held together. The stripping crew simply throw these on the floor and the bolts and nuts are collected afterwards and taken to the local sorting room shown in Fig. 14. Here the bolts are examined, and if in good condition are placed in the small wall compartments shown at the left. If threads are defective, the thread is cut off and the bolt re-threaded and stored according to its new length. A bolt threading machine and a double-ended guillotine shear are located at the opposite end of the room. The shear has been specially designed for this particular duty, and was constructed in the Angus shop. An elevation sketch of the shear is shown in Fig. 15. The bed A carried the two housings B,B, and a spacing brace C is used to tie the upper ends together. The eccentric shaft E carries the gear F, that is driven by a pinion on the main drive shaft, which is provided with a fly-wheel K. The ram G carries the upper half of the guillotine shear H, while the lower portion I is secured to the bed of the machine.

Monkey Wrenches

The ordinary monkey wrench is a small item when considered individually, but on a system like the C. P. R. the aggregate consumption of this indispensable piece of mechanical equipment runs into tens of thousands, and the usual depreciation of this small tool is generally quite rapid. To maintain an efficient supply a section of the reclaim department is devoted to the reconstruction of monkey wrenches. Discarded wrenches, no matter for what cause, are gathered at local scrap terminals and finally find their destination at the Angus scrap dock, where they are separated from the other material and the different parts sorted according to their size and make. As hundreds of these are received every month it is seldom a difficult problem to obtain sufficient good parts to reconstruct a large number of highly-

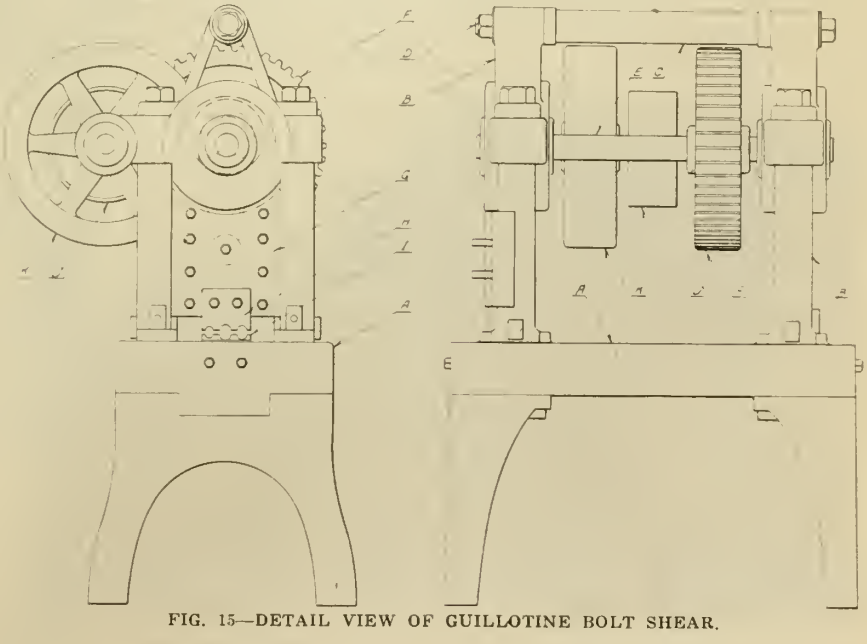


FIG. 15—DETAIL VIEW OF GUILLOTINE BOLT SHEAR.

serviceable wrenches that may be placed in the stores for further distribution.

No small part of the duties performed by the scrap reclaim division is the conservation of bolts and nuts. In the majority of cases bolts are discarded because the nut has frozen on the thread, or the thread has been stripped. Seldom will it be found that the thread in the nut is seriously affected, and nuts can usually be reclaimed by simply re-tapping them. The sequence of bolt reclaim is to sort out to the different lengths and sizes, remove the nuts, straighten the bolt, cut off the defective portion, and re-thread, finally placing them in bins for specific uses.

Reclaiming of Tinsmith Shop Material

It would doubtless be a very difficult undertaking to dispose of manufactured products made from scrap sheet metal, but where the distribution of the finished articles is made to various branches of the one service, the question is not one of competition but rather of an economic character. The C. P. R. through the reclaim department are able to use enormous quantities of discarded sheet metal for many lines of shop and train equipment. All steel, copper, brass and tin sheeting, that comes to the scrap dock, is inspected, and if found satisfactory, is handed over to the sheet metal shop, where it is made into various articles.

Amongst the articles that are made from scrap material in the tinsmith shop are the following:

Window deflectors, hopper deflectors, smoke jacks, tee pipes, stove pipes, hopper chute pipes, ventilators (all classes), garbage cans, ash pans, funnels, drip covers, soiled cup holders, switch lamp discs, van lamp (casings), card cases, engineers' tool boxes, flat boxes, valve caps, hopper pans, water runs.

Fire guards, pyrene extinguisher holders, pipe guards, foot rests, filler block covers, drip shields.

Brine tank ventilators, soiled towel holder covers, sanitary cup holders, vestibule curtain boxes, false tops, cab lamp shades, conduit covers.

Washers, van lamp brackets, pipe clips, vestibule diaphragm shields, electric lamp shades, valve boxes.

Coal chutes, coal boxes, gear guards, rag holders, broom holders, heater reducers, ventilator extensions.

All the above articles are regular products of the department that are made in large quantities. A great many other uses are found for the reclaimed material which it is, of course, impossible to emmerate.

Miscellaneous Items

In railroad service the range for the adaption of the old piping is almost unlimited. Large quantities are constantly being used for the construction of wheelbarrows, warehouse trucks, guard rails, farm gates, ladders, etc. Old boiler tubes are utilized for making engine pilots, and other new uses are being discovered for this class of material. Car and locomotive axles are turned into various forgings for locomotive and car service. Old chains are likewise utilized for a great variety of purposes.

Worn out tires are usually sold to the large rolling mills, but many of them are taken to the forge shop where they are made into suitable tool holders for the larger machines. It might be mentioned here that all heavy machine cutting tools have the high-speed tip welded on to the shank. All castings that arrive in the scrap laden cars are examined and if found in good condition are recorded and placed in stock. Many parts not seriously damaged are repaired by means of welding and then turned in to the stores. All broken scrap is arranged according to its classification and subsequently sold. The bulk of the machinery cast iron scrap is absorbed in the local foundry. All old material having solder in its makeup is specially treated in a furnace, where the solder is melted off and cast into ingots. This also applies to lead and babbit. These metals in the shape of ingots are turned over to the stores department. Every conceivable form of scrap is given attention and careful study is made to profitably dispose of it. Wire rope, netting, lead dross, zinc, glass, waste, etc., are sorted and packed ready for shipment, and in this way the best possible market is always available.

An interesting detail in connection with the handling of reclaimed equipment is the method of transferring the finished work to the various departments or stores. A large Maple Leaf motor truck is used for this purpose and it never leaves the boundaries of the company's property, being devoted exclusively to inter-department transfer of material to and from the reclaim section. This unit is shown in Fig. 16 being loaded with rebuilt couplers in readiness for taking to the freight car stores. A jib crane, fitted with an air-operated lift, is provided for handling the finished couplers.

FIG. 16—MAPLE LEAF TRUCK USED FOR HANDLING THE RECLAIMED SCRAP MATERIAL.

NEW USES FOR COMPRESSED AIR

It is not generally known that compressed air is used in various ways in the tobacco industry, yet such is the case, and the following description, which appeared in "Compressed Air Magazine" should be of special interest. The author is chief engineer of the R. J. Reynolds Tobacco Co., Winston-Salem, N.C., and he comments as follows:

"The regular tools such as the rock drills for concrete work, and the machine shop equipment for drilling and driving rivets, chippings, etc., and also a few hoists using compressed air are in use but do not require any further mention as they are of standard design. Compressed air is used for blowing motors and machinery in general, to remove the dust, and in places in automatic machines where the fine tobacco droppings have a tendency to gum and clog the machine in a few hours; a fine jet of air was placed to remove this dust, the trouble was removed, and the machine could run along its full time.

"The same principle is used in another process where it assists in drying and also blows away any dust, while a quick-drying paste is setting. This has very extensive application in plants and has made the installation of several large compressors necessary.

"In making the 'Prince Albert' can tops they are blown clear off the die by air pressure, and just to show that it's an ill wind that won't work both ways, sheets of tin used in making the cans are picked up by means of un-compressed air, or a vacuum.

"A battery of boilers is so placed that they are below any drainage or storm sewer line. When these boilers are blown down a few inches under pressure, no complications result, but when they are cooled down naturally, as they should be, and so have no steam pressure on them to blow out their water up to the sewer, a compressed air connection empties them very successfully.

"The air is of great use and assistance in spraying liquids for conditioning dry tobaccos. The sprayer acts on the principle of the ejector and will pick up the liquid by suction for several feet rise.

"With a pressure-reducing valve in series, there is much use made of the compressed air, for the purpose of low pressure control of heating valves, humidity apparatus and similar equipment."

Cutting of Steel Plates, Castings and Billets

Rapid Cutting of Metals by Radiagraph and Oxy-Acetylene Torch Are Described—This Matter Should Interest Steel Mills, Boiler Shops, Shipyards, Locomotive Shops, and Machine Plants.

By J. H. MOORE

TO the uninitiated, the accompanying illustrations will cause considerable surprise, and believing an article dealing with the details and uses of such a machine would interest our readers, we have prepared the following:

The machine to be discussed is known as a radiograph and is manufactured by the Davis-Bournonville Co., Jersey City, N. J. It is used for varied purposes as the photos will clearly show. To convey an adequate idea of the power adaptability of such a tool is impossible by illustrations alone. Seeing the machine in actual operation is a very different matter. Were one to go through some of the large shipbuilding plants and watch these machines cutting plates, angles, billets, heavy forgings, etc., etc., they could then realize its wonderful power.

Briefly the machine is of portable nature, weighing about 50 pounds and designed for cutting all thicknesses of steel from ¼ inch to 20 inches, or more. The speed of cutting varies with the thicknesses, but not directly. For instance, the cutting of billets 10 inches thick is accomplished at a rate of about five inches per minute and approximately the same rate is employed on thicker sections up to 12 or 15 inches. A billet 18 inches square was cut off at the League Island Navy Yard in 6½ minutes, and about the same rate would be used for cutting billets 20 inches thick. The reason for this is that higher oxygen pressures are employed and the combustion rate is maintained throughout the kerf of a heavy section at nearly, if not quite, the same rate for all thicknesses from 16 to 24 inches.

We do not know what the ultimate limit of thick cutting with this machine really is. It might be placed at 24 inches, but development now in progress will probably make it feasible to cut 30 inches, if not 36 inches. A reason for this indefinite limitation is an indefinite demand. The construction of large battleships and fast cruisers now in progress requires the use of forgings much heavier than ever used before, and this method of cutting is widely employed for such class of work.

The machine is used to cut either straight or curved lines, using a grooved track to guide for straight cutting, and a

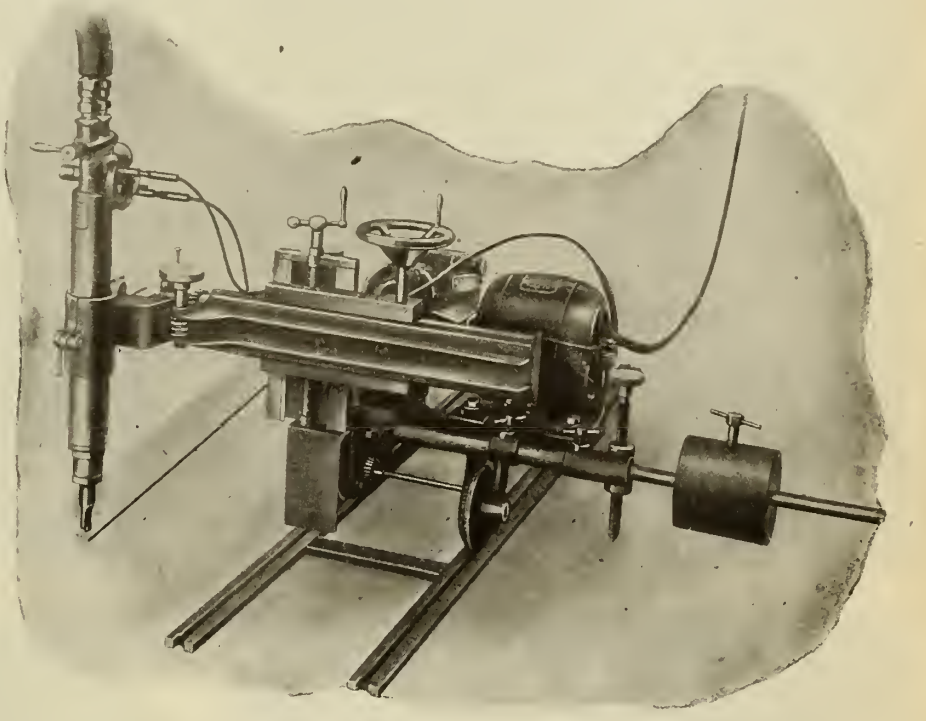


FIG. 1—FRONT VIEW OF MACHINE SET UP TO CUT TO STRAIGHT LINES.

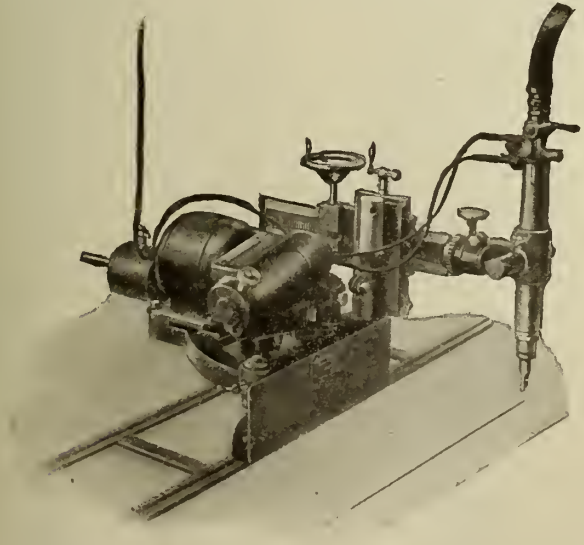


FIG. 2—REAR VIEW OF THE MACHINE SET UP TO CUT TO STRAIGHT LINES.

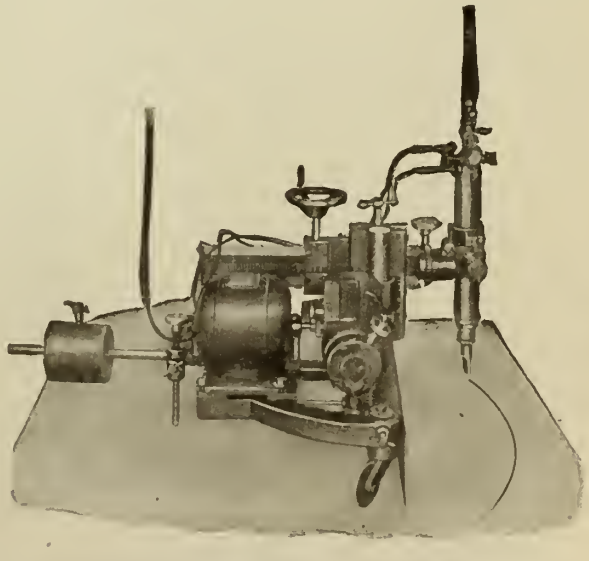
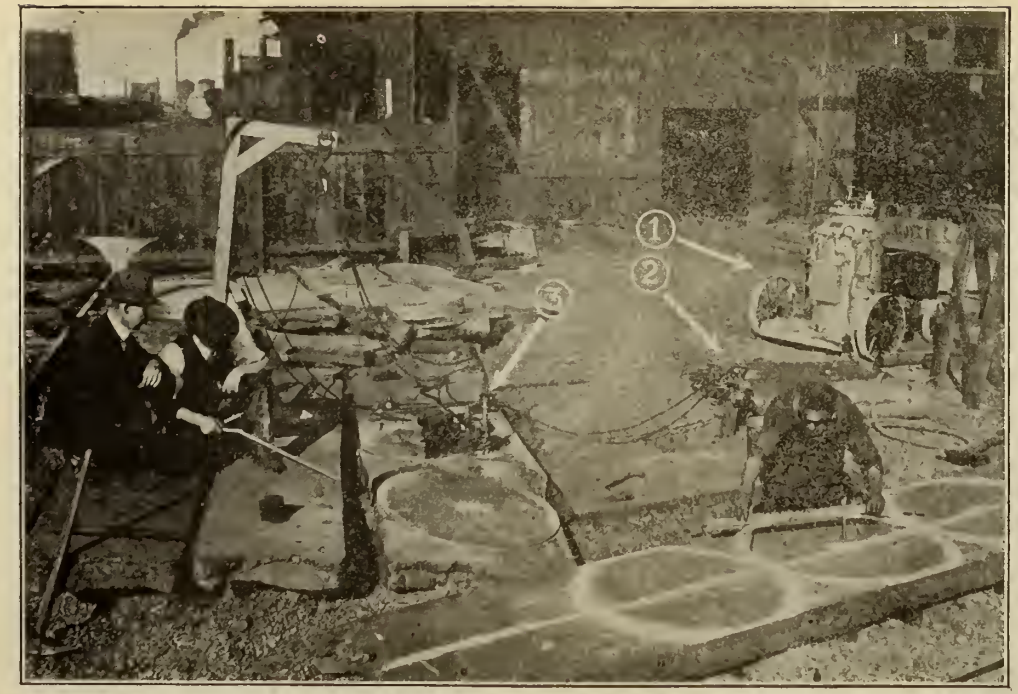


FIG. 3—THE MACHINE SET UP TO CUT CIRCULAR PATHS, USING SCREW POINT AS A POINT.



CUTTING DISCS 31 INCHES DIAMETER AND 9 INCHES THICK.

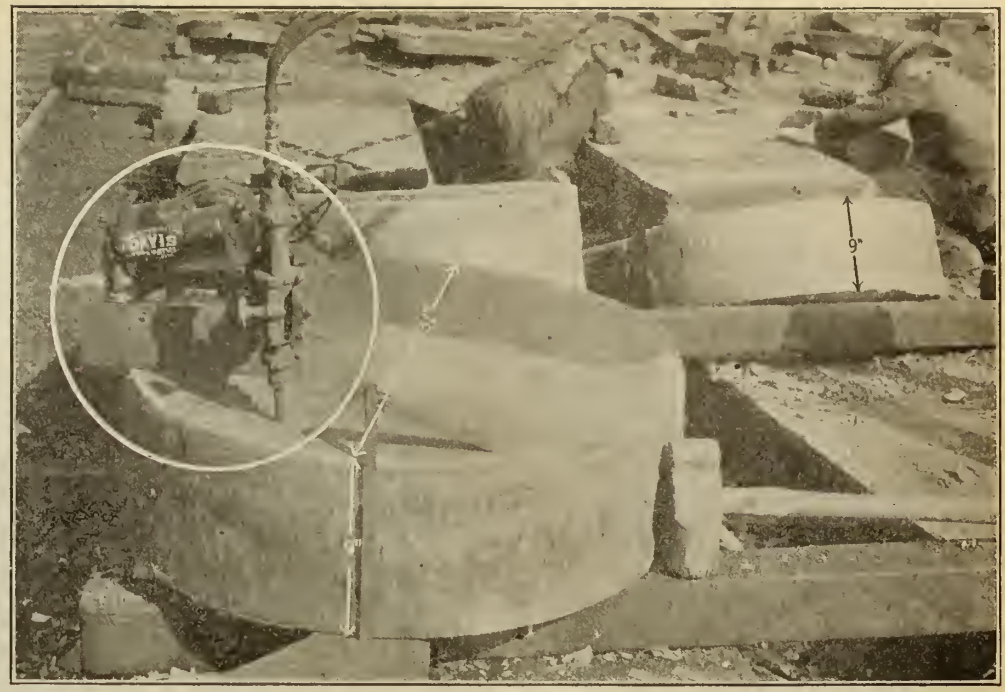


FIG. 5—A CLOSE UP VIEW OF DISCS SHOWN AT FIG. 4.

FIG. 6—CUTTING [illegible] PLATE IN [illegible] YORK SHIPBUILDING YARD

FIG. [illegible] TRIMMING HEAVY [illegible] I BEAMS, USING THE MACHINE FOR THAT PURPOSE [illegible]

radius bar and center point for circular cutting. It is supported on three wheels, two of which are tractor wheels and the third a caster wheel. It carries a machine cutting torch and is fed along at a uniform rate by an electric motor working through a train of gears and driving the tractor wheels. A change gear feed box provides for various rates of speed suitable for cutting ¼-inch up to 20 inches thickness or more.

It might be well to add that the machine is fully covered by patents, both as to design and basic principle. Referring to Figs. 1, 2 and 3, we see the outfit set up for cutting to both straight and curved lines.

Cutting Straight Lines

Should readers ever use one of these machines, they should keep the following in mind. When a steel plate is to cut, it should be supported on blocks or horses a few inches from the floor. The supports should be so placed that the torch flame will not strike them in its path and the machine will not fall when the cut is finished. In some cases, it may be advisable to mark the line to be cut with chalk, and prick punch it at intervals of a few inches, but generally this is unnecessary for straight cutting. The track supporting the machine should be laid on the plate parallel to the line to be cut and set six to eight inches away. When the position of the rack has been determined, a chalk line may be drawn along the side so that in case of being shifted accidentally it can be replaced to the original position.

The machine is now placed on the grooved track and connected to the motor with a flexible electric cord to the nearest lamp socket or source of 110 or 220-volt current, according to the winding of the motor.

The machine operates in either direction, depending on the setting of the reverse gear knob. The torch should be adjusted horizontally and vertically on the cross arm so that the tip is directly over the line to be cut and with the end about ¼ inch above the surface of the plate. The vertical adjustment depends on the style of tip and thickness of cutting. The acetylene and oxygen cylinders are placed alongside in convenient positions where the pressure gauges can be seen. The cylinder valves are next cracked and attached to the regulators. Connect the hose to the torch, red hose to acetylene and black hose to oxygen, taking care to blow out first to free the hose of dust.

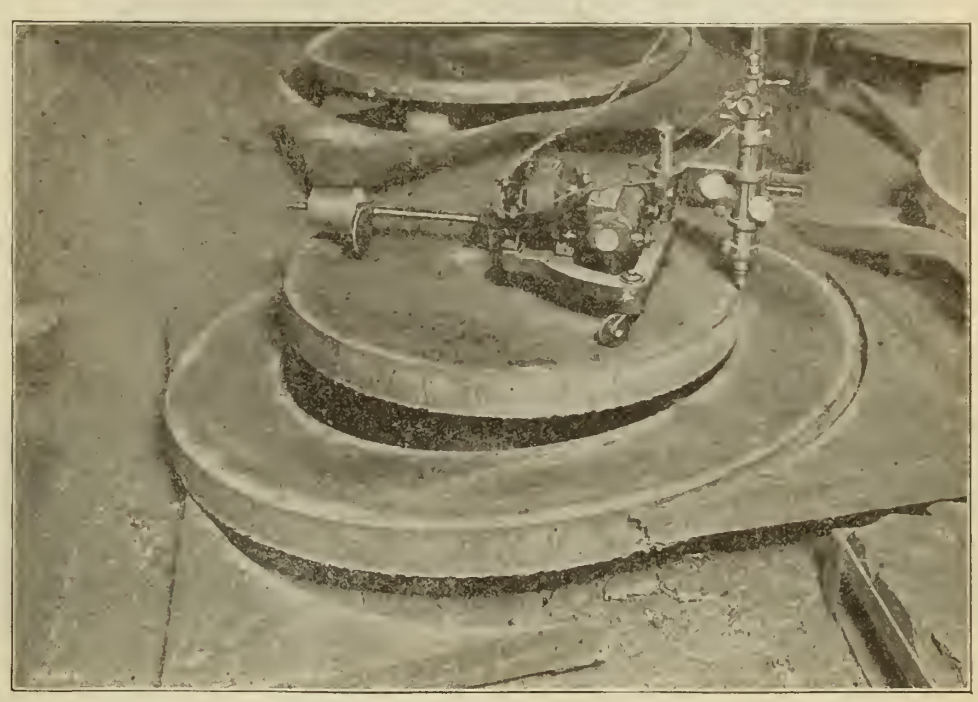


FIG. 9—AN EXAMPLE OF CIRCULAR CUTTING. THE PLATE IS 2½" THICK AND WAS CUT AT A SPEED OF 6" PER MINUTE.

Open the gas cylinder valves carefully, turning on the oxygen valve first. The regulator adjusting screw should be in the "off" position. Open the valve in the torch, adjust the acetylene working pressure with the regulator screw, and light the torch with the sparklighter. Then open the oxygen valve, and adjust the oxygen working pressure.

Next, adjust the preheating flame with the oxygen needle valve, making it neutral, or slightly oxidizing. Open the cutting oxygen valve when making this adjustment. Cutting should begin at the edge of the plate wherever feasible but if the pattern to be cut is some distance from the edge, the plate may be perforated with the flame. Preheat the plate to a high red or white hot temperature and then turn the cutting oxygen valve handle. Opening the cutting oxygen valve operates the switch turning the current on to the motor. The motor starts to feed the machine along at a rate that will depend on the setting of the gears in the feed box. The feed rate varies with the metal thickness, size and style of tip and oxygen pressure, and it should be determined before starting to cut the material.

Should the flame cease to cut, it may indicate that the travel rate

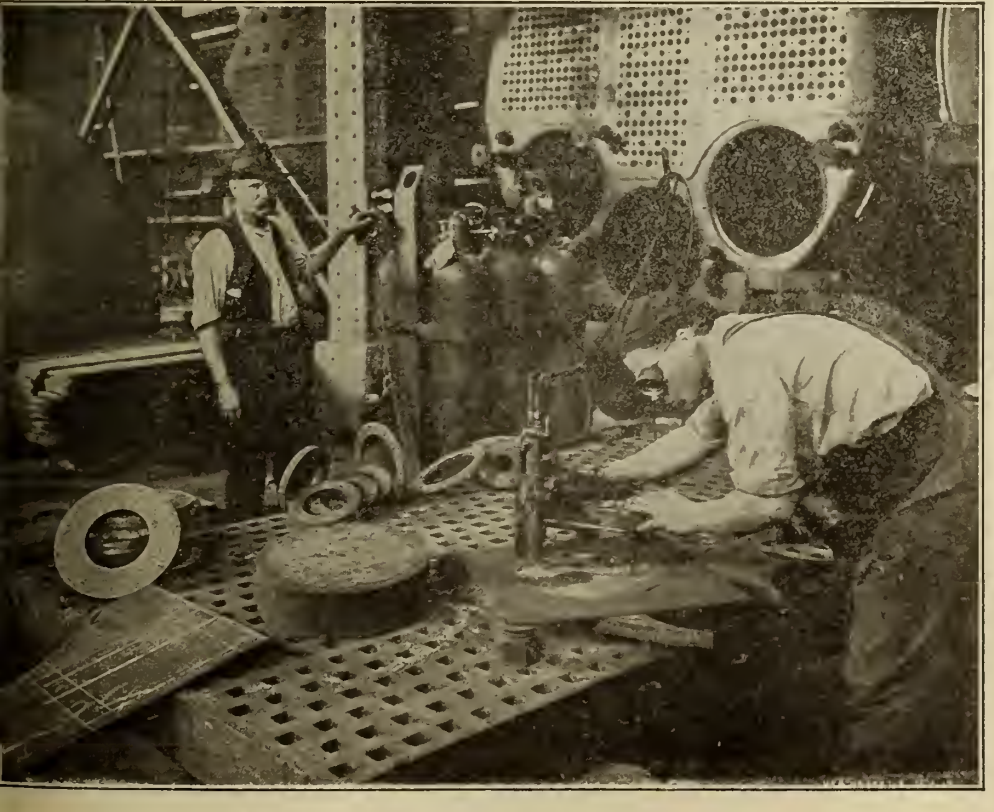


FIG. 7—CIRCULAR CUTTING. (Note the true shape and thickness of finished pieces.)

FIG. 10—AN 108,000-POUND STEEL CASTING. (Note the 36" main riser, also four smaller 8" ones.)

is too fast, in which case move the machine back to the termination of the cut, and start cutting again at a slower speed. On the other hand, too slow a speed may cause the cut to stop, and then the remedy is to increase the feed rate. The act of turning on the cutting oxygen starts the motor into operation, therefore do not turn on the cutting oxygen until the preheating flame has raised the metal to the burning temperature.

If the length of cut requires more than one section of grooved track, two may be used, which will serve for any length of cut, the first section being taken up when the machine has passed over it, and laid down in front of the one in use. In case of cutting that requires the machine to travel off the plate, it will be necessary to provide support for the track by laying another support alongside at the same level. To bevel a plate when cutting, adjust the torch sideways by loosening the swivel and clamping the torch at the desired angle. Notched, stepped or offset cuts can be made by stopping the feed motion by disconnecting one of the motor feed wires and feeding the torch sideways by hand the required distance, and then starting the feed again for straight-away cutting. Any combination of right-angle cuts can be made in this manner.

When starting a cut at the edge of a billet having a sloping side, the torch should be inclined parallel to the slope. When the cut has been started, the torch should be gradually brought to an upright position for straight-away cutting.

To Cut Curved Lines

Curved line cutting is done without using the grooved track, the machine being guided by a radius rod set in a punch mark at the center of the desired circle or arc. Lay off the required arc with dividers or a trammel bar, and prick punch the center of the arc to be cut. Set up the machine with the center point in the punch-marked centre, then adjust for the required radius.

The third wheel of the radiagraph (not shown in the illustration) is a caster that is locked with a set-screw for straight cutting. The set-screw should be loosened for circular cutting so that the caster will be free to swivel. Set the counterweight on the radius rod beyond the centre point and clamp it. The purpose of the counterweight is to hold the centre point down in the punched centre. If trouble is caused by the centre point slipping out of the centre, move the counterweight further out on the radius rod, and thus bring more pressure to bear.

Turn on the gases as directed for straight cutting and start the same as for straight lines. The radiagraph will automatically follow the curved line, swinging about the centre point. The machine is traversed by the outer tractor wheel. The rate of torch travel will vary with the setting of the cross arm and the position of the adjustable leg on the radius rod. It may be necessary to do some experimenting before the proper setting of the feed box gears can be determined. Remember that the torch, when outside of the tractor wheel, will move at a faster rate than on straight cutting, and it will generally be necessary to provide for slower feed rate, or to increase the oxygen pressure.

A circle having a radius greater than about 51 inches requires special radius rods made to order. Circles of very short radius are cut by setting the center point close to the frame and

FIG. 11—THE RESULT OF A LITTLE OVER AN HOUR'S WORK. (Note the machine on top of larger riser to right.)

swinging the cross arm around the vertical post until the tip is on the inside of the radiagraph frame with the center point. This is done by unclamping the cross arm, litfing it up off the post, turning around over the frame and then slipping the socket down on the post and clamping. If the center point cannot be moved in to the desired position because of interference with the tractor wheel, remove it by loosening the clamp, holding it to the radius rod. The center point clamp can then be set close to the frame. This will usually give the short radius of action required.

It is possible to place the torch within about two inches of the center point but it is rarely feasible to cut circles of much less than six inches radius or twelve inches diameter. A faster feed rate must be set on the feed box than for straight cutting as the torch is traveling at a slower rate.

Cutting Combination Straight and Curved Lines

The path to be cut should be laid out and marked with the prick punch. The centers of the arcs should be punched and circled with chalk so that they can be readily located as the work proceeds. Lay out the work to make the straight cut first. Clamp the bracket on the radius bar at the correct position for cutting the arc of required radius, and screw the center point up so that it runs about 1-16 inch above the plate. The grooved track is not used when cutting to straight and curved lines on steel plate. The straight line cut is first made and as the center point reaches the punch mark it is quickly screwed down, catching the point in the plate. The machine then swings around the center, cutting to an arc without stopping and interrupting the cut. To cut to a straight line from the termination of an arc, unscrew the center point when the end of the arc is reached, which will permit the tractor wheel to rest on the plate, and then the machine will carry the torch forward in a straight line.

Having commented on the machine and how it should be used, let us discuss the illustrations shown. At Fig. 4, we see the machine cutting steel discs, 31 inches diameter, 9 inches thick, at the rate of five lineal inches per minute. This means that a cut is completed in 20 minutes. Some of the discs shown were 9 inches thick, others 5 inches, and from 25 to 36 inches diameter. At 1 is illustrated a D-B portable acetylene generator. At 2, some manifold oxygen tanks, and the radiagraph itself is shown at 3. A close-up of some of these discs is shown at Fig. 5.

Cutting steel plate with the oxy-acetylene flame in a New York shipbuilding yard is shown at Fig. 6. The machine can be clearly noted, and these plates were cut at speeds varying from 18 inches to 2 inches per minute on plate from ¼ inch to 20 inches thick.

Fig. 7 illustrates some circular cutting in the New York shipbuilding yards. The true and finished cut is self-apparent in this view, and the thickness is also considerable.

At Fig. 8 is illustrated the work of trimming heavy 24 inch. I beams, while Fig. 9 shows a good example of a circular cut in steel plate. Fig. 10 depicts a 108,000 pound steel casting with a riser 36 inches in diameter, weighing about 30,000 pounds. Two of the four smaller 8-inch risers can be noted clearly.

The result of cutting by the method we are discussing is shown at Fig. 11. The main riser was cut off in a little over an hour with one of these machines, and an oxy-hydrogen torch. The complete outfit weighed less than 50 pounds. The four smaller risers were cut off with a D-B hand-cutting torch. This casting was for the steel cylinder of a 7,500-ton forging press and represented a pouring of 140,000 pounds of metal. It is amusing to note the size of the machine in comparison with the work accomplished. Note the machine on the top of the riser.

From the foregoing information, and the illustrations accompanying the same, one cannot help but admit that we are progressing in the art of overcoming the bugbear of cutting heavy material.

CUTTING OUT CIRCULAR PLATES. A CLOSE UP OF ONE OF THESE PLATES IS SHOWN AT FIG. 9.

NEW CATALOGUE

The Wilt Twist Drill Company of Canada, Limited, Walkerville, Ont., have just recently published a very elaborate catalogue of drills, reamers, and cutters, which not only lists the various types of tools, but gives a description of the different styles and types and various suggestions on their proper uses. This catalogue is now ready for distribution and can be had by writing to the jobber or direct.

Ship Plates Overseas.—The Dominion Steel Corporations are shipping about 1,000 tons of steel ship plates to Australia and New Zealand by the steamer "Otira."

INTERESTING FACTS TO BE FOUND IN THIS WEEK'S ADVERTISING SECTION

A material that has saved Canada and the United States $200,000,000.

An economical feature on a well-known machine.

How to eliminate 50% of motor trouble.

A material that is free of all foreign matter.

How to decrease your operating costs.

A machine that has a herring-bone gear drive to spindle.

How to make a single spindle machine do double or even multiple duty.

An interesting repair account.

A product that is of uniform quality, no matter where or when it is purchased.

How to save power, yet never reduce production.

An interesting announcement.

How to figure the performance of a machine.

A brief talk on grinding wheel speeds.

How to prevent idle time.

That men and steels are different.

How to put efficiency into your shop.

How to secure parts ready for assembling.

Something of importance to riveters.

Grinding Wheels and Their Uses in Industry

Abrasives Used, the Process of Manufacture, and Other Important Points Are Spoken of in This Article, Which Was Presented Before the Engineers' Society of Western Pennsylvania.

By W. T. MONTAGUE

GRINDING is one of the most ancient of arts. Prehistoric man shaped instruments of stone, and later of metal, by rubbing them on rocks which possessed abrasive qualities. It is not a matter of record when the idea of cutting out a circular block of stone, mounting it on a spindle, and revolving it by hand was first thought of.

Sandstones were originally used in the industries where grinding operations were performed. although the applicability of emery was generally recognized by the Greeks of the early ages, who found it on the island of Naxos. The extensive use of emery in competition with the sandstone was limited until around the year 1870, when a method was invented for binding the grains together with a suitable medium and forming the wheels into necessary shapes for use in grinding.

Improvements in the methods of manufacture of grinding wheels naturally included a betterment of the abrasive material, with the result that the artificial abrasive was developed to overcome the imperfections of the natural emery, and to make available an abrasive in sufficient quantity to meet the ever-increasing needs of industry.

Abrasives

In general there are two types of abrasive—aluminous, and silicon carbide, the former consisting essentially of aluminium oxide, and the latter of a chemical union of the elements carbon and silicon.

Aluminous abrasives occur in nature as minerals in the form of emery and corundum. Aluminous abrasives are also manufactured by electric-furnace methods, and sold under the trade names, "alundum," "aloxite," "borolon," etc.

Silicon carbide abrasives do not occur in nature but are manufactured in the electric furnace and sold under such trade names as "crystolon," "carborundum," "carbolon."

The Norton brand of aluminous abrasive—alundum—is made from the natural mineral, bauxite, containing as high a percentage of aluminium oxide as it is possible to obtain. The ore is carefully analyzed and a mixture so made that the product of the furnace operation is fully controlled. The mixture is fused in an electric furnace of the arc type, aud during fusion the material is purified and changed from soft bauxite into hard crystals of aluminium oxide.

The Norton brand of silicon carbide abrasive—crystolon — is manufactured by heating pure silica-sand and coke together in a special resistance type of electric furnace. The material is not fused, but a chemical reaction results from the high temperature employed, with resulting crystals of abrasive.

Sizing the Abrasive

The alundum and crystolon abrasives are received at the Norton grinding-wheel plant in irregular pieces about six inches in diameter. This material is passed through a series of jaw crushers, rolls, washers, etc., and is finally sized by being passed through standard-mesh screens. The standard-grain sizes begin at 8-mesh and continue through 200. The flour which is left is designated as 200F, and is further refined and classified by hydraulic means into such sizes as F, 2F, 3F, XF, etc. The number giving the size of the grain indicates approx- screen having 30 holes to the linear inch in the screen through which the grain will just pass. For instance, a 30-grain will just pass through a screen having 30 holes to the linear inch, or 900 holes to the square inch.

After passing over the sizing screen, the abrasive grain is stored in tanks, ready to be sent out as a polishing material or to be used in the manufacture of grinding wheels.

Manufacturing Processes

Grinding wheels are manufactured by four processes—vitrified, silicate, elastic and rubber.

By far the larger proportion of grinding wheels is manufactured by the vitrified process. In this process, the abrasive grain is mixed with the proper amounts of clay and water until the mixture has the consistency of a mud, which can be easily poured into moulds. After pouring into moulds, the wheels are taken to drying-rooms and left until thoroughly dry. They are then shaved on special shaving machines to the approximate shapes and dimensions required, and placed in dry storage, ready to go into the kilns for vitrification. Vitrification in the kilns takes takes place at about the melting point of steel and the length of time required for heating, the length of time held at high heat, and the cooling period are very important. Kilns are of the type used in the pottery industry, and are fired by a series of hard-coal fires uniformly spaced around the base of the kilns. In the larger types of kilns, it is approximately three weeks from the time the kiln is charged until it is drawn. This time is absolutely necessary, and regardless of the emergency nature of any order, every wheel burned in the large kilns must remain there for the full time. After the wheels have been burned, they are sent to machines where they are shaped to exact size by means of hard metal cutters.

Silicate wheels, as the name implies, are made by using a bonding material composed of silicate of soda. These wheels are made by tamping into iron moulds, and they are baked at a comparatively low temperature. By this process all wheels thirty or more inches are manufactured, 60-in. in diameter being the maximum size that can be made.

Elastic wheels are made by using a bond having quite a degree of elasticity. The bond is of an organic nature and is composed mostly of shellac. These wheels are also tamped into iron moulds and are baked at a comparatively low temperature.

Rubber wheels are made by mixing abrasive with rubber, and later vulcanising the resultant product.

Silicate wheels are used largely in the cutlery industry in general to replace sandstone; and for all wheels over 30 inches in diameter, which cannot be manufactured commercially by the vitrified process. Elastic wheels are used where very thin wheels are required for cutting off stock; also for finishing grinding of chilled iron rolls, and for other work where a fine finish is desired. Rubber wheels are used on the same class of work as elastic wheels, except that they have a somewhat harder action, and are, therefore, used only where grades harder than those made by the electric process are required.

Abrasive Action

The abrasive action of an aluminous abrasive is dependent upon the amount of crystalline aluminous oxide present and also upon the temper or brittleness of the abrasive.

The best grade of emery comes from Turkey. It contains up to about 65 per cent. of corundum, which is the form in which the cutting element occurs in emery. Emery mined in America has as low as 10 per cent. corundum. The chief impurity of emery is magnetic iron oxide. Alundum abrasives contain more than 92 per cent. of this cutting element and a special alundum known as No. 38 contains more than 98 per cent. aluminium oxide. Practically no magnetic iron oxide is present in these abrasives.

Artificial aluminous abrasives are more efficient than emery, because (1) they contain a much higher percentage of

cutting element; (2) being free from impurities, they are capable of variations in toughness to suit the work to be done; (3) they are made to a definite standard of composition and temper.

The grinding wheel to meet present day requirements must be a scientifically developed cutting tool. Its action when at work is similar to that of the steel milling-cutter. On the face of the wheel are millions of cutting teeth at work every minute, and although these teeth are not as long or as strong as the teeth of the steel cutter, and cannot cut as deep, they are capable of working at a much greater speed. Each little cutting-tool, which in substance is a grain of abrasive material, cuts off a chip at each revolution. The chips resemble, in shape and character, the chips cut off by the milling-cutter.

Uses in Industry

The uses of grinding wheels in industry to-day are many and varied. The great refinement attained in the case of the gasoline motor used for automobiles could not have been reached without the use of the grinding wheel and artificial abrasives. Likewise, the grinding wheel plays an important part in the manufacture of tractors, motor-trucks, gas engines used for farm purposes, etc.

The ball and roller-bearing industry, which has grown up alongside the automobile industry, is likewise absolutely dependent upon artificial abrasives for the refinement and accuracy of its product. Being composed of hardened alloy steels, the only way that these could be brought within the required limits of accuracy and finish was by means of such aluminous abrasives as alundum. Likewise, the requirements of this industry are so great that existing supplies of natural abrasives, even though they were of proper standards of purity, would not begin to meet the demand.

The phonograph, the typewriter, the adding machine, the cash register and other apparatus of similar nature, could not be made as economically to-day if it were not for the grinding wheel industry and artificial abrasives. The agricultural implement industry uses grinding wheels and abrasive grain in large quantities for the manufacture of harvesting and threshing machinery, ploughs, planters, etc. Even such activities as the textile industry require grinding wheels for sharpening cards, snagging castings, and maintaining tools, cutters, and dies used extensively in keeping up its equipment.

The leather and shoe industry uses grinding wheels for the buffing of hides and for the sharpening of leather cutting and shaving knives.

The steel mills use alundum grinding wheels for grinding out seams of high-speed steel billets preparatory to rolling into bar stock. The steel foundries use alundum wheels for snagging steel castings. Crystolon grinding wheels are used in foundries for snagging cast-iron castings, and for cleaning castings of brass, bronze, and aluminium.

The railroad industry has extensive use for wheels composed of artificial abrasives. Such parts as locomotive piston-rods and valves must be ground on cylindrical grinding machines; guide-bars must be surface ground with alundum grinding wheels; steel car-wheel treads and flanges sometimes are ground with alundum wheels, and manganese-steel frogs and switches have to be surfaced and fitted with grinding wheels composed of aluminous abrasive.

The optical industry uses aluminous abrasive wheels for lens-grinding, and aluminous abrasive grain for roughing-out lens blanks prior to polishing.

The cut-glass industry employs the artificial grinding wheel to a very large extent in cutting the intricate designs that go to make up the beauty of this ware.

The marble industry employs silicon-carbide abrasives in thin wheels for sawing marble into slabs, and in thick wheels for surfacing or moulding the marble into various shapes and designs.

The final polish on marble slabs used in interior building operations is obtained by means of abrasive blocks composed of very fine grit silicon-carbide or alundum abrasive, followed by putty powder.

Selection of Wheels

The main points to consider in the selection of grinding wheels are as follows:

Material.
- High tensile strength. (Aluminous abrasive.)
- Low tensile strength. (Carbide of Silicon abrasive.)

Operation.
- Cylindrical
- Surfacing
- Internal
- Sharpening
- Off-hand grinding
  - Bench stands
  - Floor stands
  - Swing frames
  - Portable
    - Electric
    - Pneumatic
    - Flexible shaft

Wheel speed
Work speed
Contact
Condition and type of grinding machine.
Personal factor

Whenever a grinding job is presented to you, the first thing to think of is the nature of the material to be ground—whether it is hard or soft, etc. If it falls under the general head of a high tensile-strength material—such as all steels and down as far as the hard grades of bronzes—then an alundum wheel of some kind should be used. If, on the other hand, the material falls in the class of low-tensile-strength materials—such as cast iron, chilled iron, brass, soft bronzes, aluminium, and copper—then you should use crystolon wheels.

Operation

The next thing to consider is the nature of the operation to be performed by grinding—that is, whether cylindrical, surface internal, sharpening, or off-hand grinding is demanded. There are so many small points to be considered in connection with each operation that it is impossible to go into this in detail.

Wheel Speed

This should be considered, but with any given class of grinding it is more or less fixed. We recommend the following speeds for different classes of grinding:

Application	Speed in Feet per Minute
Cylindrical grinding	5500 to 6500
Snagging and general off-hand grinding on bench and floor stands	5000 to 6000
Surface grinding	4000 to 5000
Knife grinding	3500 to 4000
Hemming cylinders	2100 to 2400
Wet tool grinders	4000 to 5000
Vertical surface grinding machines	4000 to 4500
Elastic and rubber cut-off wheels	9000 to 12000

If the speeds deviate very much from these, and it is impossible to change them to suit our recommendations, then this must be taken into account in your recommendations. Speeds higher than those recommended call for slightly softer grades to offset the harder cutting action; and speeds lower than those recommended call for slightly harder grades than would be ordinarily supplied.

It is impossible to tell a customer the exact speed at which his work should be done on any given grinding job. It is largely a matter of experiment. The work speed should be suited to the wheel in use and the nature of the material to be ground. On the Norton cylindrical grinder a speed of from 60 to 80 surface feet per minute is often used for roughing and from 30 to 40 surface feet per minute for finishing. On most types of precision grinding machines it is customary to rough-grind at a higher surface speed of work than on finish grinding.

Contact affects grade selection. Broad contact calls for softer grades, and narrow contact for harder grades, as the case may be. This is especially true in snagging and off-hand grinding. Where wheels are used for grinding the burr left by welding, or for grinding sharp fins from castings, extremely hard grades, such as S, T, and U, are called for. In cylindrical grinding the contact varies with the diameter of the wheel and the work, increasing with larger work or with a larger wheel, and thus making a softer grade of wheel desirable.

Condition of Grinding Machine

This is something which you would really have to observe personally in order to understand how it would affect grinding-wheel selection. If the spindle is loose and cannot be put in good condition, it means an irregular motion and in this case harder wheels must be used than would ordinarily be recommended. This is in order to overcome the tendency to pound the wheel face to pieces. Light, flimsy machines, and machines improperly secured to the foundation, also call for harder grades than would ordinarily be used. Machines are frequently placed in the middle of

Continued on Page 233.

John Conley Secures Some Further Advice

On This Occasion His Dad Takes a Hand in the Matter, Telling John Where He Made His Mistakes—Drilling Out a Cap Screw, Drilling Holes Through Thin Sheet Steel and Other Jobs

By J. DAVIES

"DAD, I think the boss picked the most miserable jobs he could for me to-day. The first one was putting an inch hole through a piece of sheet steel about 1-32 of an inch thick. I placed the sheet steel on a piece of wood. The drill wasn't exactly running true, and when it broke through the plate into the wood it wobbled somewhat, with the result that the hole wasn't quite round. Mr. Smith had the nerve to ask me if I had put the hole in with a dumdum bullet.

"As if that wasn't enough, he gave me a bracket with a broken half inch cap screw in it and told me to drill out and replace it with another screw. Of course I drilled it out with a 13-32 drill, the standard tapping size for half inch, then I put the tap in and managed to twist out the remainder of the broken screw. To my surprise I found I had drilled all the thread out on one side, so I next had to drill a 17-32 hole and tap that out ⅝ in.

"Next, I had to put a number of holes in a piece of cast steel and ream these out with a No. 6 Morse taper reamer. The foreman told me to be careful not to break the reamer. I didn't know how it was but the boys seemed to be awfully interested in that job. They asked me if it was the same one, was I coming or going, where was I piling them, hadn't I better put some salt on it, and so on. I had an awful job drilling the holes, but when it came to reaming I made no headway at all, and for once I was glad to see the foreman coming down the shop. I asked him what the trouble was, and after critically examining the reamer he said 'The reamer is worn on the cutting edge. It looks as if the steel you are reaming has not been properly annealed. I will have it softened again.'

"Surely my troubles are over for to-day, I decided, and I proceeded to centre my next job, a cast iron piece. At my first blow I broke a piece out of it, and Dad, I don't mind saying, I'm feeling pretty blue to-night and don't care if I never see the machine shop again."

Some Real Advice

Robert Conley carefully adjusted his spectacles and then said: "John, here is a little rhyme I learnt some time ago"—"It's easy to be pleasant when life flows along like a song, but the man worth while is the man with a smile, when everything goes dead wrong."

"I consider you have spent a very profitable day if you will remember not to make the same mistakes twice. You know, nothing happens without a cause. Now let's look for the cause.

"The irregular-shaped hole in the sheet steel was caused by the point of the drill having no support when it broke through the sheet. The remedy is to secure a piece of scrap iron, bolt your sheet down to it solidly, and drill through into the scrap iron until your drill has gone through the sheet steel, when you will have a true round hole.

"Drilling the cap screw the full tapping size was just lack of thought. It is practically impossible to drill a broken screw in a casting the full tapping size without drilling away part of the threads in the casting. You should drill a thirty-second or a sixteenth less. You can then drive in a square drift, and in most cases you can twist out the remainder of the broken screw.

"Learn to use your head as well as your hands, my boy. By the way, do you know the tapping sizes of standard nuts and bolts?"

"No, father, I do not."

"You ought to learn them off by heart up to an inch anyway, also tapping sizes for pipe taps; it will save you a lot of trouble. Just dot them down and learn them at your leisure."

SIZES OF TAPPING DRILLS—U.S. STANDARD.

Dia. of Tap	No. of Thds.	Tapping Size
1/4	20	13/64
5/16	18	1/4
3/8	16	5/16
7/16	14	23/64
1/2	13	13/32
5/8	11	17/32
3/4	10	41/64
7/8	9	3/4
1	8	7/8

PIPE TAPS AND DRILLS

Pipe	No. Threads	Drill
1/8	27	11 32
1/4	18	15 32
3/8	18	19/32
1/2	14	23/32
3/4	14	15/16
1	11½	1 3/16

"Did you get those sizes from a text book, dad?" "I did get a list of sizes from a text book, but I found I had to revise them to suit the circumstances. The list I have just given you is not to be followed exactly in all cases. You have to use your own judgment according to the depth of the tapped hole, the material, and purpose of the job. The most fruitful source of broken taps is making the tapping hole too small.

"Regarding the taper holes you tried to ream, if your reamer refuses to cut at first, don't try to force it, but stop your machine and look for the trouble at once. Your reamer may be soft, or the cutting edge worn away, or it may not have proper clearance. Cast steel is pretty tough stuff to ream, and in a deep hole there is great danger of breaking the reamer. In cutting hard steel, turpentine is often used as a cutting compound, and it helps considerably. A standard Morse taper is 1 in 20, so that if a 1-32 larger drill is put in for every ¾ in. depth it will make it much easier for the reamer and leave a safety margin for the reamer to take out."

"How about speeds and feeds?"

"The speed of the drill and the amount of feed per revolution can only be determined by the man on the job, depending as it does on so many conditions, i.e., the hardness of the material to be drilled, the nature of the job, the quality of the drill, the depth of hole, etc. It is impossible to state a rule to cover all cases, therefore, the correct cutting speed must be determined by good judgment. It is safe to start drilling with carbon drills at 30 ft. per minute for machinery steel, using a feed of about .004 inch per revolution for small drills up to about ⅝ in. and a higher feed up to about .010 for larger drills. These are only trial speeds from which the correct speed can be obtained to suit the job."

"There was one other job that gave me a lot of trouble, Dad. It was drilling a hole square to the base in a block of iron that had an inclined surface. I was rather afraid I would not be able to draw it back to the right place."

"A pilot drill would have been useful in that case."

"What in the world is a pilot drill?"

"A pilot drill is a very useful tool. It is made in various forms, the chief characteristic being that of its having a round pilot turned on the end to suit the standard sized drills. Some pilot drills are made with four cutting edges, and some with only two. They are employed for counter-sinking counter-boring, and for enlarging small holes where accuracy is desired. Perhaps their most useful feature is the drilling of a hole on an inclined plane, the pilot preventing the drill from running to one side. A small hole is first drilled the size of the pilot."

He Wants to Know More

"Now, Dad, I want to know something about boring bars, how, when, and where to use them."

"All right, John, it is a pleasure to tell you anything I know. When a hole is too large to be finished with a drill, it is either drilled first or the hole is cored out in the foundry. It is then finished with a boring bar so that boring may be said to be the finishing of a hole that has been previously made. This is done by a bar carrying one or more cutters, but the practical method of operation is much the same in all cases.

"Use a boring bar as large in diameter as the cored or drilled hole will permit and as short as is consistent with the depth of hole to be bored, leaving a good length of bearing in the guiding or supporting bush when the cutter commences to cut. See that the tang at the end of the boring bar fits the drill spindle, and

in large bars it is well to have a small hole right through the end of the drill spindle and the taper shank of the boring bar, so that a pin driven in this hole supports the weight of the bar.

"A boring bar is much more likely to come loose in the drill spindle than a drill, so that some such device is necessary. Some people use a set-screw, but this is unsatisfactory and dangerous unless a safety set-screw is used. Be sure that the bar is a good fit in the table bushing, an easy, free fit, yet not too loose. This is very important as it is impossible to do a good job if the end of the bar is allowed to wobble. In setting up the job, see that the bar will enter the table bushing without being deflected to one side. Set your table first, that is, if the job will permit you doing so, with the bar free to move round and up and down in the bush. It might not be possible to set up some jobs in this way because the bar could not be raised high enough to pass over the job underneath. In these circumstances place the job into the table bushing and swing the whole arrangement under the drill spindle together. All the holes to be bored ought to be marked off carefully. The centre of the bar must be in the centre of the finished hole, independent of the centre of the original or cored hole. In setting up the job with the hermaphrodites, or jenny-legs, or odd legs, as they are variously called, put the pointed leg in the punch, mark on the circumference of the circle to be finished, and let the other leg just touch the bar. Move the job around until each punch mark is an equal distance from the bar. After taking one cut through and the hole cleaned up, which means that the cutter is cutting all around, test with the hermaphrodites again, only this time measure from the punch marks so that measurements from all the punch marks in the finished circle to the edge of the hole will be equal.

"It is not good practice to finish-bore a cored hole with one cut, as the cutter is nearly always sure to cut more to one side than the other. This causes the bar to spring and chatter, and the hole will not be round. When the hole is uneven to begin with, always finish with a light cut.

"In some jobs the centre of the table cannot be used as a support for the bar. In such cases improvise a bearing by bolting a piece of cast iron bored out to suit the bar, to the bedplate or baseplate of the drill, or perhaps to an angle plate. Again, the job may not permit of any guide or support, such as boring a blind hole. Finish with a reamer if possible; if you haven't one, the only thing you can do is to finish with light cuts. When boring to a standard size the finishing cutter should be notched out to fit the bar and turned up in the lathe. Having very little clearance in the finishing cutter makes a smooth hole, too much clearance develops chattering. But enough just now."

GRINDING WHEELS AND THEIR USES

(Continued from page 231)

a wooden floor which vibrates badly, and in this case harder wheels must be used for a machine on a firm, solid foundation.

This is extremely important in the operation of grinding wheels, frequently influencing the results obtained as much at 100 per cent. We mean by this that different men working on the same kind of machines and on the same work in the same shop will get one result (say, 15 hours' life), whereas other men under exactly the same conditions might get 30 hours. This is based on records obtained, and not on impressions, and explains why the same wheels will work differently in different shops.

MISSOURI SYSTEM OF CLASSIFYING MACHINISTS

By John Homewood

THAT the all round machinist and the employers of such should be protected from the influx of make believes produced by the late war is very evident. Half made mechanics are a cancer in the body of the industrial world and some means should be adopted whereby they would be put in the proper place. Some method must be adopted that will handle this new class. When a man applies for a job and claims this and that, some way should be arranged whereby his claims should be put to the test before he enters into employ. To have a man fill out an application blank with his family history included in the other information is not sufficient to protect the employers of all round machinists.

It is a moral detriment to the good mechanic to have one of these bluffers working alongside him that claims that he is an all round mechanic when in fact he is an all round prevaricator. There is a class of men that get their experience chain fashion; they get it link by link until they have enough to pass along as all round men. During this period they adopt fradulent methods in order to get by. I do not believe in taking the bread from any one's mouth but I like to see him get it by honest means. It is not an uncommon thing for a man that has never been in a shop before to get a job as a machine operator and after working for a short period start welding his chain. He craftily obtains enough information to get him into another shop; with the assistance of a inexhaustive amount of nerve, and a few tools in his pocket, he furthers his efforts until the foreman catches on to him. The damage he does to tools and machinery is very great and the loss he causes is shouldered by the trained man as well as the employer.

Some will say it is the foreman's duty to detect these critters. The foremen have their hands full in attending to other duties besides attending to the details of detecting a poor workman. A man does not have to go very far in detecting a bluffer in some classes of work. It is a feeling among good men that these should be reported to the foremen. Who is going to do it unless he is particularly assigned to that task? There is no mechanic that is not in sympathy with a movement to suppress the present evil, if some method was adopted to handle it. A man may be well worth two dollars an hour, but does he get it? No, he has to support the loss caused by the offending one. When we purchase an article we naturally expect to get something near what the clerk claimed it was. When a firm hires a man who terms himself an all round mechanic, it isn't in a position to see what he is until the damage is done. He has robbed the firm of some "experience" that he should have obtained by other methods at a lower rate of pay.

The essential thing in a machine shop is co-operation. Can a worker be censured for failing to assist a bluffer in a small detail? A certain chap claiming to be a first-class toolmaker was given some hollow mills to make out of high speed steel. He got along all right although very slowly. The time came for him to harden the mills and the fact that he never looked into a hardening furnace before resulted in something that resembled slag drops. He carried his nerve along with him right up to the last minute by taking them up to the foreman, and, laying them on his desk, asked, "What next?" The boss picked them up and told him that he didn't order fried oysters but hollow mills.

The above experience and loss was shouldered by the firm. Another chap worked with a pattern maker's shrink rule for several days before he was detected. His reply to a query was "Oh, I just allow a little."

The writer was the guilty one that hired this latter bird, and was too busy on other matters to detect him. I had another chap apply for a position and decided from his talk that he was worth taking a chance on. He told me that his tools were on the way and he was assisted by the loan of a few. I took particular interest in this chap and took notice as to how he "carried" himself around the lathe. He carried himself around it all right; I thought he would get dizzy; he finally landed in front of the carriage and I honestly believe he thought the thing was charged with electricity as he seemed afraid to touch it. I began to get conservative after that and spent a little more time with a new comer. Can you blame one for yelling for the Missouri system of hiring labor, where they will be put to a practical test under a man that thoroughly understands his business.

I am sure that any foreman would welcome the idea of having a man put through the grill and be tested and classified before being thrust upon him. There is another phase in this matter that will not be out of place to mention and that is that a very good man can come into a shop and be improperly classified owing to the fault of the machinery that has been permitted to get into a very bad state.

All Roads Lead to Machinery Hall at Exhibition

At Least They Do for the Man with a Mechanical Turn of Mind—Exhibits of Interest Are Shown, and a Visit to This Hall Should Be Considered a Duty.

By J. H. M.

THE exhibition authorities picked on a real motto when they used the slogan "Work and Prosper." There is good reasoning to the cry and if one is interested in the mechanical field, a visit to the machinery hall will show the latest developments in the machine tool and other kindred lines. Space is once more at a premium in spite of the new space charges, and as usual one hears on all sides the comments relative to the inadequate provision made for the machinery industry. One exhibitor tells of the floor breaking twice while he brought in a rather heavy press and he mentioned that he would have to take it out by another exit where he knew the floor to be stronger.

As the machine tool industry is a well established one in Canada, there is no reason why an up-to-date building could not be erected, and we feel sure that if this were done and on a larger scale than the present edifice, the response by the various manufacturers would repay the outlay. Here's hoping that when another year rolls around we will be able to talk in glowing terms of the new machinery hall, with all its latest improvements. Many concerns who have the machinery in place, but not under the belt, would have them in actual operation were the facilities up to date.

Let us take a tour through the building and see what we discover. Suppose we decide to start at the east entrance and go down the right hand side, clean around the outside, then take the middle section last, but not least. No attempt is made to give the exhibits in their order of importance, but rather as we viewed them when we passed by.

Exhibits

The Acme Steel Goods Co., Chicago, is the first to greet the eye. This concern is showing a complete line of box straps and corrugated fasteners. Acme shook fasteners are the proper name, and these with wire are said to tie up any bundle in record time, and present a very neat appearance. It is claimed that such fasteners are easily tied, quickly applied and cannot come loose. Wire pullers, wire cutters and hammer combined are also shown.

The Wilkens Automatic Regulator Co., Ltd., Toronto, are next in order. All types of fuel and draft regulators, steam pump regulators and reducing valves are shown. A system of automatic control of boiler feed water and a thermostat regulator are included in this exhibit.

The Climax Baler Co., of Hamilton, are showing a complete line of their balers; that is the hand power machines. These machines are used wherever waste paper or other materials require being made up into small bales.

The Canadian Hauck Burner Co., Ltd., Port Hope, Ont., have a very complete showing of thawing outfits, preheating outfits, blow torches, portable oil burners, torches and furnaces. There are also some portable heating outfits, furnace burners of both low and high pressure and lead melting outfits. The latter is said to melt 200 lbs. of lead in less than 15 minutes. Rivet forges, brazing forges and crucible melting furnaces are also shown. The crucible furnace is said to melt 120 lbs. of brass in 45 minutes. We also noted in this exhibit plumbers' furnaces, kerosene furnaces and oil burners used for welding and preheating. A concrete heater next claimed our attention. This heater is used on concrete mixers in the colder weather and heats the sand, etc., in the mixer, in this way eliminating the necessity of thawing out lumps in the frozen sand. A smoothing iron as used on asphalt work is also shown heated by the Hauck burner principle. This latter idea is of course particularly for road making. The representatives in charge are W. W. Yates, R. W. Ware and A. M. Thomson.

The Elliott Machine Co., Ltd., Belleville, Ont., have a line of portable woodworking machinery, including scroll

Just a sample of the crowd at the Exhibition.

saws, floor and drum sanders, band saws, planers, etc.

The Dominion Steel Products Co., Ltd., Brantford, Ont., come next, with both a very neat and interesting exhibit. First, and perhaps most important of all, comes their showing of a 75 K. W. 425 R.P.M. high compression oil engine. This engine is of the Diesel type and is claimed to be the first Diesel engine completely designed and built in Canada. Mr. W. W. Brown, the designer, gave the writer a complete description of the engine and while one cannot go into a full talk on the matter in this small space, we can say that the exhibit is well worth a visit. Each cylinder is identical in assembly, and interchangeability is an accomplished fact. The writer saw the arrangements made and if desired one can disassemble any unit without disturbing its neighbor. Even the governor and other smaller parts are arranged on the same principle. The engine is very compact and is completely self-contained. They are said to be fully efficient under both steady and variable loads, this being of considerable importance to any heavy duty engine. The electric generator is, as stated before, part of the complete outfit, and the crane can pick up the complete self-contained unit and place it into position wherever desired. Full details are given in the literature, which is given to those interested. W. W. Brown, H. J. Jordon and E. Hopkins are representatives.

In addition to the engine, the concern are showing a complete line of cast iron and steel chucks of the design which has already been explained in our columns. These chucks are very neat and their strength is already well known. Various tire moulds are also exhibited, one in particular being engraved, or profiled at the outside diameter for the tread. This work is very neat indeed.

A tire applying press is also shown, this press being used for the applying of tires on trucks, etc.; 200 tons is the capacity of the press in question.

This concern has also an outside exhibit of their Dominion light plant. The unit is self-automatic and privides both electric light and power to the farm. In connection with this latter exhibit we might mention the showing of the Ivey storage batteries. These batteries are used in connection with the lighting outfits and to show how small a space they occupy in relation to those of other makes the demonstrator has placed a set of similar strength, but of another make, directly alongside. The latter set takes approximately four times as much space as the former.

Another feature is said to be that the Ivey batteries come packed ready for setting up, that is, after the boxes are opened the batteries are lifted out on a specially made tray, the box set upside down and the tray placed on top of the box. Other features are that this style of battery has three regulator bulbs, which show when the same is 25, 50 and 75 per cent. discharged. The cases are transparent and made from pyrolin, this material being both non-inflammable and indestructible. The set shown are of 160 ampere hours and 32 volts. G. R. Archdeacon is in charge and mentioned he would be pleased to give all information possible.

The Henry Engineering Co., Toronto, come next. This concern is showing a full line of Pierce renewable fuses, an economy tiering machine, a full line of Jewel electrical instruments and the American steam jet ash conveyor. They also are exhibiting the diamond soot blowers for boilers. The ash conveyor is especially interesting and briefly here is the idea. The fireman shovels his ashes down a hole convenient to the ash pit. The ashes drop into a pipe, are sucked up into a hopper and from there can be unloaded at will. Several installations have been put in recently, the Robert Simpson Co. being one of the concerns to use this method. Jas. A. Rumzay is the gentleman in charge of this exhibit.

The Pratt & Whitney Co., of Canada, Ltd., have a very interesting exhibit at booth 69A in the industrial building. Mr. Ferguson is in charge and will be pleased to receive anyone interested. A full line of dies, taps, reamers, milling cutters, etc., are shown and as the Pratt & Whitney line is already well known we need only add, see this exhibit before you leave the grounds.

L'Air Liquide Society have various representatives, these being F. Staddon, manager; L. Sykes, Mr. Burns, Mr. Davis, Mr. Cohen, Mr. Richards, and Mr. Hougten. They show a complete line of oxy-acetylene apparatus, consisting of gas cylinders of various sizes, torches of various kinds and complete outfits ready for work. A cylinder has been cut in half and those not familiar with the interior construction and filling of such a tank should view this sectional cut tank. A thermos of the real honest to goodness liquid air is shown in its liquid state. It might be well to add that liquid air in its liquid state must be at least 300 degrees below zero. A drop of this on the hand would freeze, yet seem to actually burn, so low is the temperature. This concern is also showing a new form of tank for acetylene.

A general view of the Manufacturers' and Liberal Arts Building.

The Clemens Electrical Corporation, Ltd., Hamilton, Ont., have an interesting and varied exhibit, consisting of refillable fuses, soldering irons and a new type of toaster. As the soldering iron is of most interest to machinery readers we will discuss that feature. These irons are of different models and heat in from 30 seconds up depending on their size. The copper point is brought in contact with two carbons by releasing a spring. When the contact is made the iron immediately starts to heat. They are designed especially for tinning, running of seams and general soldering work. They are shown in various sizes from the 150 to 800 watt sizes. A two handle portable soldering outfit is also shown and this works on the same principle. Mr. R. C. Guest is representative at this booth.

The Carter Welding Co., of Toronto, Ltd., are next in order and they are exhibiting a very complete line of Rego welding and cutting apparatus. These torches and other parts are well displayed, and as the Carter Co. are al-

ready well known we need not suggest a visit, for you will no doubt go anyway. It will be worth while, as Mr. Carter or Mr. Sorely will be pleased to have you call.

The Dunlop Rubber Co., Toronto, have a very interesting display of rubber belting, fire hose, separate, and on the fire waggon. They also show an installation under power of a Gibraltar conveyor. This is a large rubber belt to which cast iron buckets are fastened. Fire extinguishers and fire hose in general are shown, also a few examples of garden and industrial hose. Mr. Richards is the gentleman in charge.

The Canadian Calcium Carbide Co. are showing the different sizes of their product as used for various purposes and by the different countries. Quite a display is given and it is well worth while. Mr. A. McMillan and H. E. Mussett are in charge.

The Independent Pneumatic Tool Co., Chicago, have a very complete exhibit of their Thor air and electrically driven tools. These, of course, include their chipping, caulking, and flue beading hammers, riveting hammers, air drills, wood borers, air grinders, staybolt drills and electric drills and grinders of all kinds. This concern is featuring its new electric screw driver, which with certain attachments will not only place screws in by electricity, but will also remove nuts by the same means. Mr. McCrae, and Mr. W. H. Rosevear, the latter the Canadian manager, are in charge and will be pleased to see all comers. As the exhibit is of considerable importance, no doubt the crowd will gather there for at least a look.

The Goldie & McCullough Co., Galt, have a very complete exhibit, including examples of their well known lines and they have even got a splendid example of one of their safes on exhibition. We could not get in touch with their representative in time for this matter going to press, but their showing is certainly well worth a visit.

Peckover, Ltd., are displaying a complete line of steel, including metal lath, plates, triangular mesh, and reinforcing sheets, bars, structural sheets, boiler tubes and tool sheets are also included. They are showing the Feralum and Vulcanum slip proof tread, these treads being made of iron with a heavy layer of alundum grit embedded in the surface at the time of casting. R. C. Peckover, J. G. Near, R. C. Rice, G. Jolly, A. Jacks, H. Raine, and W. B. Rubidge are all on hand at this exhibit. Incidentally the twelve tons of steel which they have on exhibit were sold 24 hours after being in place.

The Dominion Machine & Tool Co., Ltd., are makers of jigs, dies and special machines and have a goodly assortment of these displayed. They are also featuring their sherardizing process, this being a rust proof process for all kinds of materials.

The Cleveland Pneumatic Tool Co., of Canada, Ltd., are displaying a very complete line of pneumatic tools. These include chipping hammers and riveters, grinders, sand rammers, caulking and beading hammers, breast drills, rock drills, manifolds and all types of air hose couplings. Four piston air drills, ball bearing type, are shown, also compound geared air drills. Corner drills are included and the new Cleveland pocket in head rotator is also displayed and in fact everything necessary in this line is shown, even to the plain and armored hose. A very neat display of valves are in a case, some 30 kinds being shown, these including the 1, 2, 3, and 4 way valves, Y's, etc., etc. C. D. Garner, Canadian manager, A. W. Hughes, Toronto office, A. M. Whittle, Montreal office, and G. H. Hall from Cleveland, are in attendance to seekers after knowledge.

The Canadian Ice Machine Co. have an excellent exhibit of refrigerating supplies and materials; fittings, ammonia, calcium chloride and other supplies being featured. This firm are the manufacturers of the York refrigerating systems and compressors, installations being made from ¼ ton up in the direct expansions, absorption or CO_2 systems, the latter being popular and considerable adaptability for hospit and marine work. Mr. Haine, C. Le nox, and P. G. Hender are in charge this booth.

The Goodyear Rubber Co. have a ve full display of all transmission belti for mechanical purposes. Packing all kinds is shown, this including stea water, etc., etc. Corrugated mattin hose for air, steam, water, gasoline, et are included in this very complete e hibit. F. Fox, Mr. Dodge, Mr. Cros and Mr. Woods are looking after th display.

Prest-O-Lite of Canada, Ltd., with M A. M. Gimble, A. V. Tuthille, and F. Northwood in charge, are showing a fu line of welding torches and general wel ing apparatus, including preheate They are also displaying the differe types of filler rods used in welding. fact anything relating to acetylene c be found at this exhibit.

The Davis-Bournonville Co., of Toro to, have a very fine exhibit of portab welding and cutting plants. They ha a generator of 300 pounds capacity, al a portable one, mounted on a neat tru of 50 pounds capacity. They have full line of welding torches and a featuring their new improved non fla back torch. The writer had this tor explained in detail and it is well wor looking into. They have also an ox graph in operation cutting metals of a thicknesses up to 18 in. and the writ received a demonstration which show this machine up to good advantage. cuts on the patograph principle, bein ratioed at 2 to 1. 18 in. thick materi can be cut at a speed of 3 in. per mi ute, while ¼ in. material can be cut 18 in. per minute. The writer foun M. W. Gibbs an interesting speaker an he mentioned he would be only t pleased to meet readers of Canadia Machinery who were interested in an of his lines. J. F. Crowley and H Willson are also at this exhibit.

D. K. McLaren, Ltd., have a very in teresting display of single and doubl beltings and supplies for the textil trade in general. The belts includ waterproof leather and balata beltin and a very interesting demonstration i given in this connection, namely th running of two belts which pass throug a pan of water while turning over pul leys. Other lines shown are split pul leys, belt dressing, belt fasteners an other accessories. W. S. Hamilton i in charge, with Craig Hamilton assist ing, and they state they will be only too pleased to welcome visitors.

Jones & Moore Electric Co., Ltd. Toronto, are showing a neat line o motors from 1-6 h.p. to 25 h.p. A sho r pair shop outfit in actual demonstra tion is also shown.

Dominion Belting Co. are showing a full line of conveyor and transmissio belting. This is the well known Mapl

A busy scene around the grand stand.

Leaf cotton stitch belting. Belt dressing, fasteners, etc., are included in this exhibit, and E. Kinrade is representative.

E. Pullman Wipers & Waste Co., Ltd., Toronto, are displaying a full line of their wiper cloths, klenser kloths and mop cloths. They are especially featuring on the latter, because as it comes to the customer in very large pieces, it leaves them to cut it up at their own discretion. They are also very soft and absorbent, two essential features. Mr. F. Kribs and G. A. Hardie are in charge.

The W. R. Sexton Boiler Setting Co. are showing their line of Elco special fire brick, their style of nonpareil dumping grate bars, also boiler settings.

The Wayne Forge & Mach. Co., Toronto, who are agents for the Laclede Christy Clay Products Co., are showing a good varied line of heat treating furnaces for manufactured and natural gas. They are also showing different style fire brick for the same.

The Geo. W. Cole Co., Ltd., Toronto, are showing a very complete exhibit of their well known lines. A boiler feeder, condenser trap, return trap, receiver, various swing check valves, angle check valves and pressure reducing valves are shown. This is a very neat and complete exhibit and deserves attention from anyone interested in such a line. G. E. Cole, vice-president, W. H. Hughes, J. E. Farrell and D. Johnston are at this booth and will be pleased to see all callers.

Baines & David, Ltd., Toronto, are showing all kinds of iron and steels, sheets, bars, steelcrete, etc., etc. They are also displaying the universal stair tread, which is said to be absolutely non-slipping.

The Centre Portion

Coming down the centre portion we have the **P. B. Yates Machine Co., Hamilton, Canada.** This concern has a very complete exhibit including a C_3 moulder. This is a new machine on the market and has several features, among which is the entire open side and top and bottom heads. These heads are of the slip-on principle. The machines speed up to 100 feet per minute.

A type G2 chain feed straight edge jointing and ripping saw is also displayed and this machine has various commendable features of interest. They show a No. 431 endless bed sander, which is especially adapted to the sanding of narrow and short stock. A type S2 edge sander with tilting table is also displayed and this machine is so arranged that two men can work at it at one time. A very interesting display of cutter heads is shown, these including the square and round types, also special matching heads, jointer and ship lap heads. One has to see this exhibit to appreciate it, and literature covering all the Yates lines can be had for the asking. Mr. C. H. Dankert and J. T. Donnolly are in charge. By all means stop and meet these men.

The Canadian Milk Products, Ltd., Toronto, are showing the Elyria glass enamelled equipment. This is used in dairies, ice cream plants, and in all chemical plants where a vessel of acid-resisting qualities is desired.

The United Shoe Machine Co. have a full line of machines used in the shoe repair industry. They have a 22 ft. outfit, including stitcher, a 8½ ft. outfit, and a smaller 6 ft. outfit. All these are self-contained. Other accessories used in this business are shown. F. Webster and Mr. Hanson are in charge.

Brown and Boggs, Ltd., Hamilton, with W. J. Graham in charge, have a very fine exhibit of presses and other tools. They show three inclinable bed presses, from 1½ in. to 4 in. strokes, also another solid bed punch press of 1½ in. stroke. These presses are of the improved model, the connection being made of steel instead of cast iron as formerly. They have also a foot squaring shear, a steel brake for bending metals up to 10 gauge, and a full line of tinsmiths' groovers, rolls, etc. The presses are all under power.

Bond Engineering Works, Toronto.—This concern has a very full line of double sure power transmitting appliances, including shaft hangers, Spiro compression couplings, universal adjustment friction clutches, Grundy flexible insulated couplings, all loose ball bearing countershafts, and loose ball bearing pulleys. The majority of these lines are covered by patent. Pulleys, and in fact all transmission equipment, are included in this exhibit, which is very complete. W. G. Grant, the exhibit manager, is very anxious to meet anyone interested in such lines and issues a warm invitation. Joseph Walton is also at this stall.

The Dodge Co., Toronto.—The Dodge pulleys, both wood and steel, are shown in practically all sizes, and their line of bearing boxes, solid and split pulleys, couplings, friction clutches, friction couplings, etc., are shown. We could not get the name of the exhibit manager, but all are welcome, we feel sure.

Williams Tool Corporation of Canada, Ltd., Brantford, Ont.—This company, formerly the J. H. Hall Co., have a very complete line of pipe threading machinery. They show five machines from the ¼ in. to 2 in. size up to the 2½ in. to 8 in. size. Of course they make larger machines, in fact they have made what is claimed to be the largest pipe machine in Canada. This was of 18 in. capacity, which went to Crane, Ltd. Photographs of the machine are shown, also views of the recent patented die head, which has 16 streams of lubricant flowing on the die during the work. Copies of their service bulletins are also shown, and the exhibit is certainly well worth a visit. E. L. Williams and L. S. Hall are waiting to welcome you.

The Canadian Fairbanks-Morse Co., Ltd., have a very complete exhibit, and we had better enumerate it bit by bit. There is a 21 in. Gisholt turret lathe, a No. 2 Brown and Sharpe surface grinder, a 14 in. Star screw-cutting lathe, and a 14 in. Walcott lathe of quick change engine design. There is also a No. 1A Brown and Sharpe Universal miller, a Francis Reed 7 in. sensitive drill, and a No. 1 Norton universal tool and cutter.

They have a complete line of valves and steam goods, also SKF ball-bearing hangers, Hyatt roller-bearing hangers, ring oil bearings, some C. F. M. gasoline motors, and Gould pumps, also quite an assortment of Norton wheels and grain. They have some Yale and Towne blocks of various sizes and a complete line of Brown and Sharpe small tools. R. E. Turner, P. F. Cleal, and C. R. Gall are in charge.

In addition to this exhibit they have an outside display of their type Z farm engines, one of these being suspended from a spring to show the small amount of vibration. Taken in all, you cannot afford to miss these two exhibits.

Jones and Shipman Ltd. have a very complete exhibit of their line of J. and S. small tools. These include their tool holders, centre drills, small chucks, vises, etc. They are also showing a 10 in. ball bearing sensitive drill with a gravity feed. This drill is going to be used to demonstrate actual tests on their centre drills. A 14 in. drill is also displayed.

A very cleverly designed machine is that of a 24 in. by 12 in. universal grinding machine. This machine has a specially arranged head that allows both external and internal work to be done. The change is accomplished by swinging the work head 180 degrees. Another feature of importance is the provision made on the driving spindle for added speed if desired for small work. A 5 in. pulley is on the drive spindle but this is so arranged that it can be taken apart, and another pulley half its size put on in its place. Sectional construction allows the following out of this idea, but its advantages are easily understood.

The grinder spindle can run at 60,000 r.p.m. if necessary, being equipped with ball bearings, and they intend running it to the fastest speed possible with the facilities at their command, which will be approximately 50,000 r.p.m. This type of machine is used for all classes of cylindrical, parallel, external, internal and taper grinding. The workhead has eight speeds, and there are many other features which we cannot go into in detail in this small space. An 18 in. x 8 in. universal grinder, a 20 in. and 22 in. power feed drill are also shown. T. E. Hewitt is in charge of this display.

The A. R. Williams Machine Tool Co., Ltd. This concern have a very complete exhibit as follows. The Normack Tool Co. have a Mr. Lovell as their representative, and he is demonstrating a very clever die and templet-making machine. They also show a 12 inch Hendey lathe, a 12 inch shaper made by the Rhode Mfg. Co., Hartford, Conn., a Le Blonde heavy duty miller, a Dalton 6 in. lathe, a No. 19 Le Blonde heavy duty lathe, a No. 2 Cochrane Bly filing machine, a ¾ in. Geometric Tool Co. thread machine, a Barnes 20 in. drill, a Beach combination saw, planer, drill and countersink combined, a Preston ball-bearing shaper and a No. 1 Lapointe broaching machine.

They also show two Williams double-end emery grinders, a Williams 14 in. sensitive drill, a New Way engine, some electric pumping outfits, some marine engines of both two and four cylinder types, a gasoline driven pump, an Evinrude bilge pump, an Evinrude boat motor, a splendid display of Starrett tools, and a full line of steel pulleys, belting, portable benches, stools and jacks. Mr. Cronk, from A. R. Williams, is in charge.

The Twentieth Century grade bars and a patented pick are also shown at this exhibit, Mr. Andrews being in charge of the former, and Mr. Harrington in charge of the latter.

Owing to our not being able to get in touch with Mr. Garlock Jr., we left the exhibit to be spoken of next to the last, for we wished to do it justice.

The Garlock-Walker Machinery Co., Ltd., have spread themselves to provide material of interest. They have various machines in operation, and the best plan would be to go over, item by item, the machines being shown. They have a Millholland turret lathe, a Cataract precision tool-room lathe complete with a unique and compact self-contained electrical drive, a Steptoe 24 in. single pulley drive shaper, a Briggs manufacturing miller, a Grant Manufacturing Co. noiseless riveter, an American No. 25 edging and ripping machine, and an American No. 3 double cut-off saw, which has a very neat and efficient adjustment for spacing of saw to table.

In addition to the above they show an American No. 9 knife grinder for both thick and thin knives, and they have a full line of Cataract precision lathes, grinders, drills, millers, both horizontal and vertical as manufactured by the Hardinge Bros., Inc. These are all fixed up on an attractive stand.

They have also the McClean hole-drilling tool in actual demonstration. This tool drills practically any shaped hole, square, hexagon, etc. You should see it for yourself. A Globe universal tool-room grinder is also shown, and a Racine No. 10 hack saw equipped with swivel vise. Some motor-driven disc and spindle sanders as used in pattern shops are displayed.

This exhibit is very well arranged, and they have various men in charge. A list follows: Wm. Garlock Jr., A. B. Walker, J. Albert Brown, W. F. Parsons, W. A. Marshall and L. McCormack, of Hardinge Bros., Inc. Either of these gentlemen will be pleased to see visitors, and a welcome is assured. Visits to these booths should be made if readers wish to keep in touch with the latest things in machine-tool developments.

In a report of the Department of Overseas Trade it is stated with regard to the iron ore deposits in Brazil that it is doubtful whether any country possesses a greater quantity of deposits of this mineral. Minas Geraes alone is said to contain more than 3,000,000 tons of mineral, and the metal in the ore is stated to average 50 per cent. A great future is also claimed for the petroleum deposits in Brazil. It is claimed that Brazilian petroleum is purely of animal derivation, and contains therefore more calories and a much less quantity of sulphur than other petroleum. The oil "area" has been estimated at 200,000 kiloms., and the deposits are said to be all close to the sea coast.

Some research work on high chromium steel, which has recently been carried out by the United States Bureau of Standards to determine the influence of various kinds of heat treatment, indicates that the maximum hardness is obtained by quenching at about 1066 deg. Cent., but that quenching from 955 deg. Cent. gives the best combination of strength and ductility. Steel quenched at temperatures above 1010 deg. Cent. shows a very low elongation and reduction of area. Such brittleness can be decreased by short-time tempering up to about 427 deg. Cent., while tempering above this heat rapidly decreases the strength and hardness. All quenching was done in oil. The material studied had the composition: C, 0.29 per cent.; Mn, 0.38 per cent.; Si, 0.70 per cent.; Cr, 13.2 per cent.

Yellow brass castings can be colored golden bronze by cleaning and spraying or brushing with a very weak muriatic acid pickle. They are next sprayed or brushed with a solution made by using 4 ounces of sulphide of potash, 2 ounces of thialdine crystals, and 4 ounces of chloride of ammonium per gallon. By heating the castings any shade of color, from golden yellow to a dark brown, can be produced.

Another view of the Exhibition grounds near the main entrance.

DEVELOPMENTS IN SHOP EQUIPMENT

ELECTRIC RIVETING MACHINE

Many cases arise in practice in which it would be desirable to employ power riveting, but in which either the amount of work to be done, or the isolated situation of the work, is such that it becomes very questionable if the installation of an hydraulic or pneumatic plant is justifiable. Most large works have now either one, or both, of these forms of power available, but many small ones have neither, and in the large works it is unusual to find the distributing mains, for either pressure water or air, carried over the whole ground. These and other circumstances make the possibility of riveting by means of electric power a matter of considerable importance in many cases and add interest to the electric riveting machine which we illustrate herewith. There are but few shops nowadays in which a supply of electric power is not available, and the ease with which mains can be run to a new position should, in many cases, make an electric riveter an attractive proposition. Even where alternative forms of power are available, the supply mains cannot, as a rule, be extended with the facility with which a cable can be run. In exposed situations the cable also, of course, has advantage over an hydraulic main in eliminating the possibility of trouble owing to freezing.

The machine which we illustrate has been patented by Mr. Edward Adamson and is manufactured by the Mada Engineering Co., Ltd., of 12 Bevington Hill, Liverpool. The machine is known as the "Remca." Its general appearance is well shown in Figs. 1 to 3, from which it will be seen that it consists of a bow-frame with the operating mechanism carried on one arm. The machine may be used either vertically or horizontally, and may be suspended, as shown in Figs. 1 and 2, or fixed to a stand as shown in Fig. 3. The operating mechanism consists of a long-stroke solenoid designed so that full advantage is taken of the fact that increasing power is developed as the core approaches the end of its stroke. This gives a type of action particularly suitable for riveting, the final pressure being the maximum pressure. As will be seen from the figures, the whole arrangement buids up into a neat and compact tool, which, for portable work in particular, should be very convenient owing to the power being carried by quite a flexible connection.

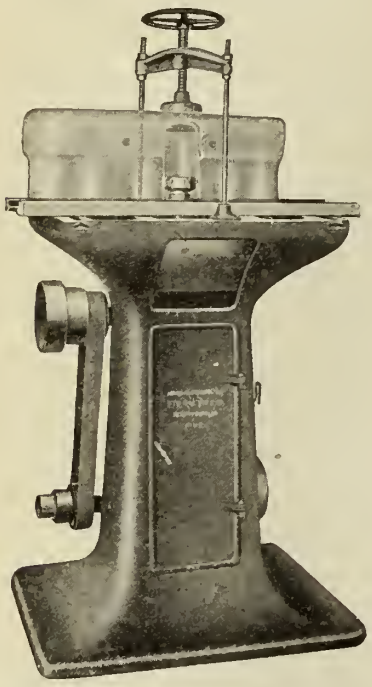
The electrical connections of the riveter are of a simple nature. An earth wire is incorporated in the cable so that the frame of the machine may be earthed. The tool is, of course, operated by alternately closing and opening the switch and, if necessary, more than one operating point may be arranged for by fitting more than one switch. When a rivet is closed the pressure may, of course, be maintained while the rivet is partially cooling, simply by leaving the switch closed. Trials have shown that a ⅝-in. iron rivet may be closed by one of these machines with 16 amperes at 230 volts, the time from closing the switch to opening it being 3 secs. The riveters are made to deal with rivets from ¼ in. to 1¼ in. diam. and with various depths of gap.

NEW BORING MILL

The Storm Mfg. Co., 6th Ave. and 4th St., S., Minneapolis, Minn., have placed a new boring mill, as shown in accompanying illustration, upon the machinery market.

THESE THREE VIEWS GIVE A GOOD IDEA OF THE GENERAL APPEARANCE OF THE RIVETER.

This machine is especially adapted for the boring or reboring of motor cylinders and other parts such as large gears, heavy bushings, tractor wheels, and large holes in castings which are of unusual shape, size, or outside dimensions. Referring to the illustration, it will be seen that the machine consists essentially of the following parts: A main frame or casting of the heavy pedestal type which is provided with flat table on which the cylinders or other work can be mounted; a boring head which is mounted on a vertical boring-bar supported within the base casting; a device for clamping work to the table, consisting of two upright adjustable bars 40 inches long, a heavy arch, and a handwheel and clamping screw.



GENERAL VIEW OF THE BORING MILL.

The boring-bar is hollow, and is 48 inches long by 2 9-16 inches in diameter. The heat-treatment to which this bar is subjected gives it great strength and stiffness, and it is claimed that it will withstand a thirty-ton load applied at the centre of a twenty-inch length of the bar without springing. Four cutter-heads of the regular Storm multiple-cutter adjustable type are furnished as regular equipment, giving a range for boring holes from 2⅝ to 7⅞ inches in diameter by 20 inches deep. However, special equipment can be furnished for reboring cylinders up to 12 inches in diameter. The cutter-heads are so designed that they can be quickly adjusted by simply turning the adjuster until the desired diameter as measured with a micrometer caliper is obtained. A centreing cone is furnished for each head so that the work can be quickly centred. When centreing a cylinder, it is placed on a table directly above the boring-bar with the head and centreing cone in position. The bar is then raised by means of a handwheel, until the cone fits into the bore of the cylinder and raises it slightly from the table or bars. This action draws the bar directly over the cutter-head. The work is then clamped in place, and the boring-bar lowered to remove the cone.

A variable boring-bar speed is obtained through a countershaft and three-step cone pulleys, and positive feed is obtained through cut gears and heavy central steel screws. An automatic return and stop is a feature incorporated in the design of this machine, which is a means of saving considerable time, as the operator can leave the machine after the operation has been started without danger of spoiling the work. This machine, which occupies a floor space of 30 by 36 inches, is 44 inches high, has a table or upper face of 24 by 30 inches, and a shipping weight of approximately 10,000 pounds.

NEW THINGS IN MACHINE TOOLS

STRAIGHTENING MACHINE

The W. J. Pine Machine Co., of Kenosha, Wis., have placed on the market a machine which they believe to be a new departure in the machine tool line. Every user of cold-rolled steel knows the difficulties they have to contend with in its use. It is full of kinks and twists, and the usual method employed is to hammer the convex side of a kink to drive it in, but this only draws the grain on the long side longer, and if the kink is reduced at all there must be additional kinks of lesser degree. It is impracticable under present methods to use cold-rolled flat or square stock, where one edge or side is to be broken the full length owing to tension of all surfaces which, when broken, causes the stock to bow. Cold-rolled flat stock could be used to advantage for a great number of purposes where it is now impractical, if a practical means for straightening were at hand.

With this machine devices are at hand for doing this work in the only way practical, that is by pressure on the long side of a kink which contracts the long grain and expands the short grain.

The upper bar is a testing table on which stock is laid to find the kinks; it is then placed under the pressure screw, which is convenient for the purpose. When used to take the twist out of stock, one end is clamped on the parallel under yoke vise, and the other end in the twisting head vise.

The machine provides a convenient means for doing innumerable operations that come up in machine shops in general, such as offsetting connection rods and bars, bending irregular shapes in forms or dies, where pressure is used. Four sizes are being built which apply mainly to the length of the testing table.

GAS BURNER

The Berg Burner Company of Brooklyn, N. Y., are now manufacturing a new design of burner for the burning of oxy-hydrogen gas, automatically produced from oil and water. Superheated steam is generated by the burner and combined with the oil flow as it leaves the nozzle. The hydrogen of the steam unites with the hydrogen and the carbon of the oil while the oxygen set free in a superheated state is said to create perfect combustion when the torch is ignited. The burner will operate in any position and is designed to consume the cheapest distillates or refined oils but not gasoline or similar products.

GRINDING MACHINE

The Bryant Chucking Grinder Company of Springfield, Vt., have recently developed a machine for the grinding of holes and exterior surface. The machines are made in two types, one with a single spindle for the operation on holes and the other with a double spindle for the grinding of both holes and outer surfaces. The work spindles run in adjustable bronze bearings. Two speeds are provided for both work spindle and the traverse slide. A taper attachment provided for the grinding of work up to an angle of 30 degrees. The wheel spindle is mounted on ball bearings of the inclosed type. The machine may be belt or motor driven

FRICTION CLUTCH

The Link-Belt Company, of Chicago, are now making a new design of "Twy-cone" friction clutch that embodies the following features:—One-point adjustment, perfect balance, and complete inclosure of all moving parts. The friction cones are lined with thermoid, and the clutch may be operated when running at full speed.

INVERTED DRILLING MACHINE

A driling machine for advantageous driling of deep holes in cast iron, has been produced by the National Automatic Tool Company of Richmond, Ind. The work is held in a special fixture that is fitted to the under side of the table that feeds downwards. The work is securely locked in position by means of two large handwheels. The drill spindles are amply protected from the falling chips.

POWER BENCH PRESS

The La Salle Machine Works of Chicago, are placing on the market a line of bench press designed for economic rapid and accurate production of such parts manufactured by jewellers, typewriter and adding machine plants, novelty work, etc. The press is provided with a hardened tool steel clutch and an automatic safety device which disengages the clutch at each revolution of the press. The machine is of the open back type and may be used on the bench or fitted with legs if desired.

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Keeping Up High Wages

ONE hears many yarns now about firms that have laid off a large number of their men, and taken them on at a date a short time after at a reduced rate of wages. There have been cases where this has been done, but in many of these there are peculiar circumstances, and the trouble is that the bald statement gets circulated without including any of the extenuating circumstances.

There is no desire on the part of Canadian manufacturers to batter down the rate of wages, irrespective of the cost of living.

One thing that is going to sustain the present wage schedule longer than anything else is a fair and reasonable performance on the part of the men on the payroll.

A high wage is a good investment if it is being earned. The theory of being successful with a lot of poorly paid people was exploded a long time ago.

Employees generally have a lot to do with determining whether the present high rates of wages shall continue or be reduced to make operations possible on a plane of reduced value.

The Pessimist Is Here

DID you ever meet the man who knows for certain that the bottom has dropped out of business? He gets you in a corner and pulls a paper out of his pocket, showing where some thousands of men have been laid off by a tire-making plant, where some other concern has laid off the night shift, and he has well pencil-marked all references to money being tight. There is always a danger of his not properly understanding what tight money means, failing entirely to realize that such a turn is a good business tonic for those houses that, if left to themselves, would never get their accounts in proper shape.

As a matter of fact it requires no ability to circulate pessimistic news; it is the easiest thing imaginable to pass it along, and any blatherskite can appear apparently well informed if he has rolled together a half dozen instances of this kind.

Take all the unfavorable circumstances, and add them together. Alongside them put the favorable ones, including the large orders still on the books of many of the industries, the splendid crops, the increasing efficiency of labor in many places, then weigh your results and see what you have.

It is much better, as far as possible, to do your own industrial survey work, rather than depend on others who have not had your point of view, and whose interests may sag while yours would prosper.

The Steel Corporation Prices

THE Steel Corporation continues to adhere to its selling schedule as far as United States orders are concerned. For some time past there has been a spread of at least $20 per ton on an average between Corporation prices and the figures obtained by the premium mills. Some of the independents have secured as high as $90 for sheet bars, while the Corporation price was $42; galvanized sheets have been delivered by the Corporation at 5.70, against 9.50 charged by the independents. In 1914 the average price at the mills for galvanized sheets, No. 28 gauge, was 2.87.

The Steel Corporation, it is figured, in the last year, has delivered to the domestic trade in United States some ten million tons, and although price tendencies have been toward the sky, the Corporation has consistently stayed with the old schedule of March 21, 1919, as far as domestic trade is concerned.

Figuring, for sake of comparison, that their price was $15 a ton lower than the figures secured by premium operators, this selling of ten million tons at the lower figure has meant $150,000,000 that they could have collected had they joined the procession of those that are out for every last dollar.

Watching the Scrap Heap

IN another section of this week's edition of Canadian Machinery is an article showing in considerable detail the system used by the Canadian Pacific in their Angus shops for the utilizing of all forms of scrap material.

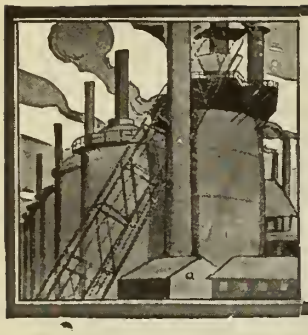
There has been great progress in this work in recent years, and the railroads all over the country have worked out various ideas that have resulted in the saving of hundreds of thousands of dollars.

Scrap material is valuable. The metal itself is not impaired, and it has a much larger value than might be indicated by a glance at prices some firms are willing to pay for this class of material.

The old idea of a scrap heap at the back door, with a periodical visit from some of the dealers with their wagons, is a thing of the past with the big shops. Material is of use only when it is employed, and nothing is worse than having a lot of trash that has outlived its usefulness.

The experience of the C.P.R. at Angus ought to contain ideas that will be valuable to Canadian shop executives in many lines.

PROSPERITY!
—Alley in the Memphis "Commercial Appeal."



MARKET DEVELOPMENTS

May Be Upward Revision in Steel Prices

Added Freight Charges Bring $2 to $3 Per Ton—Has Pig Iron Been Boosted to the Point Where the Trade Will Not Buy It?—New York Machine Tool Market is Dull.

INCREASED freight rates, and the fact that freight charges from points of origin in the steel and iron trade are paid all the way in New York funds, are some of the causes that seem likely to bring in their wake an upward revision in prices of steel and iron stocks, having special reference to the warehousing trade. This will probably amount to between $2 and $3 per ton all around.

There is no let-up in the price tension applied by the premium mills. They know they can get the price for their material if they can make delivery, and prevailing prices show that the ability to make delivery is being turned into cash at a generous rate. There is no limit to the demand for certain lines in the steel trade, such as sheets and boiler tubes. Some carlot sales of the former have been made during the week, the buyer not even asking for a figure, being concerned entirely about having the material landed at his plant.

Machine tool dealers report that in some cases they have an improvement in the inquiries that are coming in. No large business is in the tool market, but a number of additions to existing plants are being made in the way of new tools. With reports of better returns from labor in the plants, dealers believe that several projects that have been hung up for some time may be gone on with. The New York machine tool market is dull, and rumors from there have it that if this condition lasts much longer some of the makers may be in a position where they will have more thought to revising prices, which are still double and more what they were in pre-war days.

The Canadian steel mills are making better deliveries now in several lines, but they are still having trouble in getting anything like the capacity production of their plants.

The scrap metal trade remains where it has been for some months, stagnant. The big buyers are not in the market, and yards are not particularly keen to take on anything for speculation, unless they can do so "at a price."

LOOK FOR UPWARD REVISION IN MONTREAL TO TAKE UP FREIGHT COSTS

Special to CANADIAN MACHINERY

MONTREAL, Sept. 2.—The upward revision in freight rates will be the basis for readjustment of steel prices and other commodities, and it is expected that quotations on many lines will be advanced proportionately to the increased costs of additional freight charges. The new rates now applying on iron and steel lines from Pittsburgh to Montreal are 55½ cents per hundred on car lots, and 69½ cents per hundred on less than car lots. The rates to other principal cities are given in the selected market quotations.

Steel Prices Firmer

Inadequate railroad facilities continue to influence the volume of business that steel industries are able to engage in. The congested condition that features some of the American producing mills is a controlling factor of the output, and of late it has been impossible to maintain capacity operations owing to the lack of space to store the finished material. It is often the case that a department of a mill will require to close down until some space is cleared by shipments from the yard. The vital factor is the need of more cars and the ability of the railroads to take care of the shipments, both coming in and going out. For the next few weeks transportation companies will be busy in handling the crops and little relief is looked for in steel shipments until the early fall. There is a decided falling off in the sheet demand and it appears that the automobile industry is preparing for a quieter period. Dealers here were anticipating and preparing for an easier market, but latest reports are to the effect that conditions are firming and prices strengthening. It is believed that the changes in freight rates will mean advances in other directions and this tendency is already showing itself in some lines. Light gauge sheets are hard to obtain and likewise blue annealed stock. Canada plates, dull, are now quoted at $13, and bright at $14, but the latter is virtually impossible to get. Queen's Head, 28 gage, is quoted at $13.50 and a price of $13.00 prevails for Fleur-de-Lis.

Quiet Business in Ingots

The seasonable quiet spell is increasingly emphasized by the additional decrease in the general demand for ingot metals and finished sheets. The consuming requirements at the present time are below normal and it is quite evident that the call for sheets is less marked than has been the case for many months. Dealers here are inclined to think that automobile factories are curtailing production, and this condition may be still more evident as time passes. The movement of ingot metals has fallen off slightly, but the demand for sheets of all kinds is well in keeping with the available supply, the latter being controlled by the producing mills which are considerably handicapped owing to the difficulty experienced in getting raw materials to the mills or in shipping the product after it is rolled. With the exception of aluminum, which is up 2 cents to 36 cents per pound, all ingot metals are slightly easier. Electro copper is quoted at 24 cents, castings at 23½ cents, tin at 56 cents, spelter at 10¾ cents, lead at 9¼ cents, and antimony

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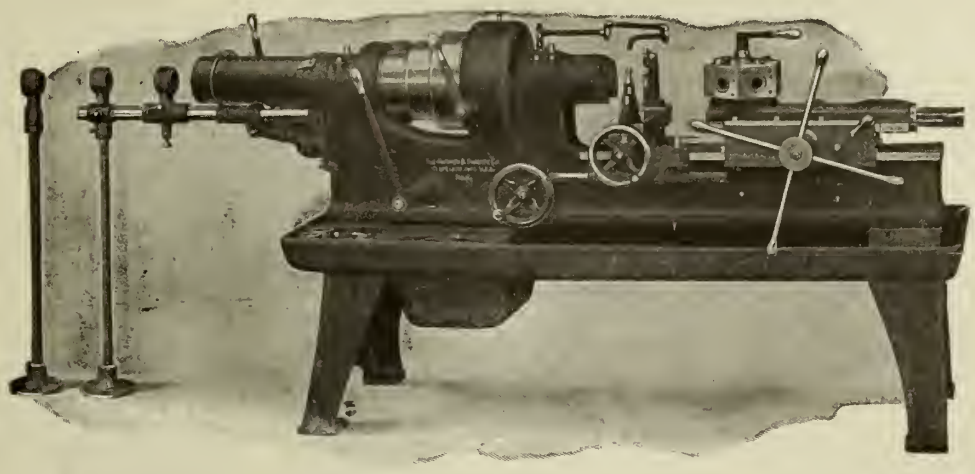

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INGERSOLL

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at 9 cents. Copper sheets show an advance on that previously quoted, these advances ranging from $3 per hundred on 14 ounce plain sheets, to $10 on 16 ounce planished sheets, the current quotation being $49 for plain sheets, 14 ounce 14 x 60, and $56 for 16 ounce planished.

Dullness in Scrap

The lack of activity in the scrap market is largely due to the prevailing conditions on the railways, especially in the States, where the scarcity of cars makes it difficult to get adequate supplies through for the normal operation of the mills and other metal industries. Local business is quiet but sufficient is passing to maintain a market interest. Of the business now passing through the hands of the dealers the volume seems to favor the steel lines. Large individual transactions are seldom recorded. Price changes this week are confined to heavy melting steel, which is up $2 to $20 per ton. Wrought iron axles have advanced $5, the quotation being $30 per ton. It is anticipated that further revisions will become effective when the freight rate is increased.

HE BOUGHT THE WHOLE EXHIBIT

Steel Prices May Be Revised Upward as Far as the Warehouses are Concerned

TORONTO.—Some of the dealers in the machine tool market, while quite willing to admit that there has been a falling off in the volume of business passing in recent weeks, claim that they find a better inquiry now than for some weeks. "I am certain," stated one dealer to Machinery this morning, "that as soon as employers feel they have the backing of labor to a greater extent than they have experienced during the past months, they will be going ahead with extensions. In our business there has been a good demand in the last ten days, and sales are resulting. There are no very large orders, but they are coming from places that are buying because they need the equipment, and in many cases they want to get delivery right away." This same dealer also is of the opinion that right now we are in the reconstruction period about which so much was heard after the war.

The Small Tools

Small tools are being sold to many concerns that are not large buyers. Several of the dealers seem to be paying more attention to the smaller buyer now than they did heretofore, claiming that their business is apt to fluctuate less if they have the accounts of a number of small buyers. Some of the large users of small tools are operating at a very small proportion of their capacity at present, although in some cases there are signs of a betterment, and shops are taking on a few men, whereas they have previously been laying them off.

Reports come from a number of jobbers that they are having more difficulty in keeping their books free of held-over debts than for some time. As soon as money starts to get tight it is felt in the whole business circle. For this reason dealers in general, and they seem to be well-advised in the course, are paying more attention than usual to cleaning up odds and ends that have been hanging fire on their books for some time.

Premium Material Arriving

Most of the sheets that are reaching the city now seem to be from the premium mills. The fact that Pittsburgh is quoting a slightly lower figure on sheet bars does not mean that there is any reduction in the finished material. One yard brought in about a dozen cars of black sheets and blue mixed at the first of the week. On the first day of the week there arrived orders for over 100 tons of sheets, so there is no difficulty in getting rid of the stuff even at the high price needed to cover premium material.

Sold the Exhibit

Here is an instance that shows the way material is grabbed up in certain corners of the steel market. One Toronto concern wanted to make a showing at Toronto fair this year, so they decided to truck out a good sized pile of sheets and make a real showing. So they took some seven tons and piled them. That was on the opening day of the fair, and the exhibit had not been arranged when a buyer loomed up.

"What's that?" he inquired.

"Sheets," was the answer.

"Sell me that pile when the fair is over?"

"Sure. That's our business."

"And another car lot as well?"

"Yes, another car on quick delivery."

The promise was made of a confirming order the next day, which arrived in due order. Price was never mentioned in the whole conversation, nor in the closing of the deal.

There is a nice tonnage of boiler tubes on the way to some of the Toronto yards, and they are of the much wanted sizes, viz., 3½-inch by 16 feet. One shipment that we heard of had about 1,000 of these in it. Orders have not been accepted in many of the yards for tubes for some time past, and there will be no trouble in placing all the tubes that come into this country for some time.

A Higher Steel Market

That there is likely to be an adjustment of prices in the iron and steel warehouses is the word being passed around in the trade this week. When asked about it, one of the warehouses put the case this way: "We look to see an advance that will average about $2 or $3 per ton. There is a 40 per cent. increase in the freight rates on goods coming from the States, and these charges have to be paid all the way in New York funds. It should be remembered also that the great bulk of our business is brought in from U. S. points, where the freight rates have increased. The change has not gone into effect yet, but the chances are that the revision will be made around the first of the month."

Canadian mills are beginning to give much better service in the matter of bar mill material, and a fair tonnage is coming from this source.

Scrap Market is Unchanged

There is no improvement or change for the better in the scrap metal situation. The one chance for business to be resumed seems to be on a lower plane. "People have become accustomed

POINTS IN WEEK'S MARKETING NOTES

Pig iron appears to have advanced to the point where buying ceases, unless it is for actual and pressing needs.

—

Pittsburgh market reports that sheet bars in some cases are selling at $67.50. A month ago the market was firm at $75. This is not reflected by any corresponding reduction in sheets.

—

Some of the independent mills state that instead of coming down to Corporation prices, they are considering making an increase.

—

During August most of the steel mills, through improved shipping facilities, were able to reduce their stocks, while the piling carried on in July really added to the stock in hand.

—

New York reports that although the machine tool market there is very quiet, there is no talk of the makers cutting prices. The continuance of cancellations might have something to do with the attitude.

—

Tight money is stated to be one of the largest considerations in the New York market.

—

Some Canadian dealers report it harder to make collections than formerly, and for that reason they are paying special attention to that end of their business.

—

The scrap metal market shows no tendency to improve. Dealers are afraid to stock beyond commitments unless they can buy "at a price."

—

Some of the furniture factories report that they are able to secure a much better result from labor now.

—

Large tonnages of sheets from some of the premium mills are being brought into Canada, one warehouse getting a dozen cars at the start of the week. One day's mail brought in orders for over 100 tons.

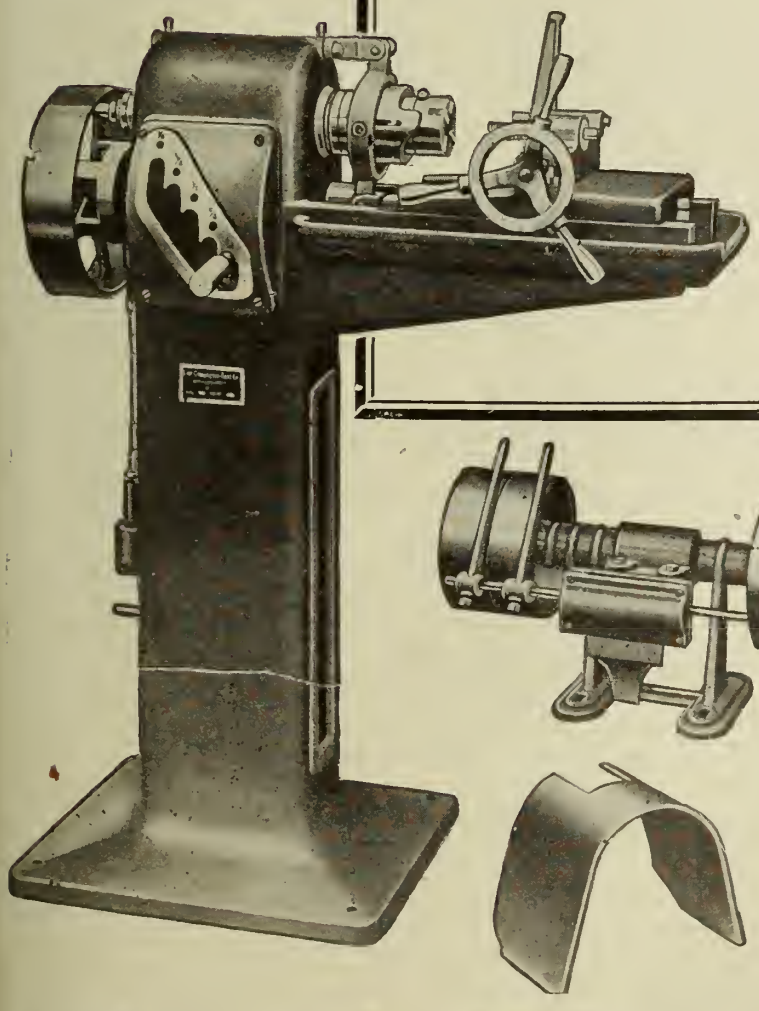
THIS WAY, PLEASE

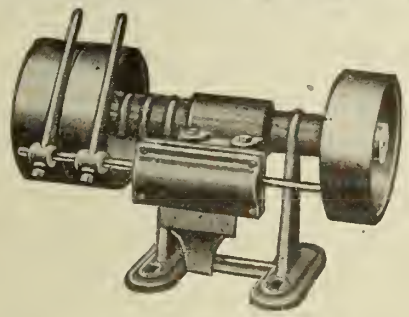
Where quantity and exactness have to be considered, the Geometric Threading Machine is just the way that suits. These machines have been tested and proved over and over again on speed, accuracy and endurance.

Geometric Threading Machines are employed on a large class of small threaded parts that cannot be produced economically on the ordinary screw machine.

Made in three sizes—to cut ⅛ to ½ inch, ¼ to ¾ inch, and ¾ to 1½ inch diameter threads. The carriage is mounted on slides and on the largest size machine is moved back and forth by rack and pinion, and in the smaller sizes by hand.

Spindle speed changes readily made, adapting the machine to the diameter and material of the work. An adjustable stop assures accurate length of thread, and automatically opens the die head, permitting of drawing the work straight back.





A line from you brings full details regarding this machine. Tell us your threading requirements—let us recommend the proper Geometric Collapsing Tap or Self-opening Die.

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NEW HAVEN CONNECTICUT

Canadian Agents:

Williams & Wilson, Ltd., Montreal. The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg, St. John, N.B., Halifax, N.S.

Canadian Fairbanks-Morse Co., Ltd., Manitoba, Saskatchewan, Alberta.

If interested tear out this page and place with letters to be answered.

to high prices for their material and it is hard to get away from that feeling," stated one of the large dealers this week. "In our case the yard is empty and the warehouse is full." This means of course, that the more expensive metals are stocked away from the weather, and such lines as can be thrown in a heap are pretty well cleaned out. There is a lot of scrap to be had, with the possible exception of cast iron and stove plate, the offerings in these continuing to be very small. Some of the dealers put forth the claim that when the reds and yellows are moving, the whites are dead. What buying is going on now is mostly "at a price" where a holder wants to liquidate his stock.

NO THOUGHT YET OF LETTING PRICE DOWN

Business Will Have to be Much Worse Before Any Such Move is Made

Special to CANADIAN MACHINERY.

NEW YORK, Sept. 2.—Despite the general dullness of the markets, there has been more inquiry in the past week in this market than has developed in some weeks. The General Electric Co. is again in the forefront, having issued inquiries for its various plants calling for more than 100 tools. About 80 tools are wanted for its Western Massachusetts plant; 17 hand and automatic screw machines are inquired for for the Bridgeport, Conn., plant, and a list for Schnectady, N.Y., calls for 25 tools. These new inquiries are somewhat surprising to the trade, which had been led to expect that the General Electric Co. would considerably curtail its expenditures for machine tool equipment. For some months the General Electric Co. has been the most active industrial buyer in the East. The new plants it has acquired at Bridgeport, Conn., Baltimore, Md., Rochester, N Y., and Fort Wayne, Ind., have all needed new equipment, and the orders placed have aggregated many hundreds of thousands of dollars.

Another indication that the railroads are expected to buy equipment of various kinds is given by the inquiry of the Safety Car Heating & Lighting Co., Jersey City, N.J., for about a dozen tools. This inquiry follows one for a similar number issued by the Federal Signal Co., Albany, N.Y., which manufactures railroad signal systems. There has been some railroad buying at Chicago during the past week or two. In the East little has been heard from the railroads, but the Baltimore & Ohio is preparing a large list, which the trade expects will be issued within a week or two.

On the whole, the machine tool business is not good. Sales during August have been fairly satisfactory in some instances, but some sellers report the poorest business in years. Prices are firm, however, and unless the volume of cancellations should grow considerably, most of the machine tool manufacturers will have nothing serious to worry about for at least two or three months and in some cases longer. Railroad transportation difficulties are being ironed out, and the worst feature of the present situation is tight money.

PIG IRON MAY HAVE GONE TO A POINT WHERE BUYING WILL QUIT

Special to CANADIAN MACHINERY

PITTSBURGH, Sept. 2. — Pig iron seems to have been advanced to a standstill, as the market is now very quiet, with almost no inquiry at all, and buyers very generally are saying positively that they will buy no iron except what they absolutely must have for immediate requirements. The furnaces, however, do not seem to have expected any large buying movement and thus, perhaps, are not greatly disappointed. The offerings have been light and some furnace interests state that in the recent movement they scaled down the inquiries in many cases, offering only half the tonnage inquired for. Since last report prices for Bessemer and basic grades have been established. As noted a week ago, last sales had been at $47 for Bessemer, and $46.50 for basic, f.o.b. valley furnaces. Sales of both grades have since been made at $48.50, and although the lots sold were small the transactions are regarded as establishing new market prices. Foundry remains quotable at $50, to which it jumped recently from $46.

The furnaces may be entirely right in their contention that pig iron is scarce and that production is likely to fall short of requirements, but the factor of buyers having no confidence in the market will certainly count for something, as that will move consumers to draw upon stocks and thus reduce the requirements. There is also the point that with many foundries activity has fallen off, new orders being scarce, and some of the high priced iron bought of late has been simply averaged with much lower priced iron previously bought, so that the cost of producing castings has been much less than it would be if nothing were used but iron bought at present prices.

Coke Steady

Connellsville coke has shown a remarkable indisposition to recede from its extremely fancy prices. There have been three adverse influences, a slight decline in coal prices, an improved car supply, resulting in Connellsville coke production increasing, and a greater disinclination on the part of furnaces to buy. For several weeks Connellsville furnace coke for spot shipment held at $18 to $18.50, while a week ago we reported the market at $17.50. In the past few days the market has been stronger, there being sales at $18 as well as at $17.50. One furnaceman reports buying coke at both prices in the same morning.

As to foundry coke, the quotable market remains at $19 to $19.50 for spot the range that has obtained as the regular market for several weeks. There has been some change in quality, but that is all. At $19.50 one can get a fairly good coke now, while three or four weeks ago $19.50 coke was rather indifferent, and $19 coke was difficult to distinguish from ordinary furnace grade.

Semi-finished Steel

Several sales of sheet bars have just been made at $67.50, Pittsburgh, though the total tonnage bought did not amount to much. Previously the market was about $70, some sales having been made at that, and others at a shade below. A month ago the market was $75. The remarkable thing is not that sheet bars have declined, but that they have declined so little, for the circumstances are such as to show that the mills are yielding in prices very grudgingly. The majority of the producers are not willing, but anxious to sell sheet bars, whereas recently it was a great favor to sell sheet bars at $80 or $90. It should be noted also that billets have been sold freely, at least in the east, on the basis of $60, Pittsburgh, and before the war billets and sheet bars ran at approximately the same price. There is no material difference in the cost of manufacture, and for producers anxious to sell sheet bars to hold out for a $7.50 differential shows that they are in no very yielding mood. There is hardly any demand for sheet bars, as the sheet mills are fairly well covered, and consumers of sheets who would like to make conversion contracts, buying sheet bars and having them converted, cannot at this time find any mill willing to make the conversion, so there is no use buying the bars. Slabs are said to be held by mills at $65, but that is purely nominal as mills could not begin to pay the price. A few weeks ago a plate mill was in the market with a bid of $50 for slabs, but did not get any.

Finished Steel Holds Up

In face of a relatively light demand the independent mills hold up their prices, showing no disposition to recede to the level of the Steel Corporation prices, and many of them even tell customers that the prospects are of advancing prices. Few, if any, customers are convinced, there being too many indications that prices of commodities in general are in a receding mood, and that demand for steel is not going to be heavy until fundamental conditions improve. The mills evidently intend to squeeze as much profit out of the present situation, one of scarcity, as they can, and to reduce prices would be to jeopardize the business now in books There are cancellations as it is, and price declines would of course provoke more. As illustrating the temper of mills, recently a large independent in-

How They Are Set and Checked

Johansson

The World's Standard Gaging System

Specialized manufacturing and the Limit System have come to stay. This means every machine shop, inspection department, and manufacturing plant must agree and know, beyond possibility of dispute, just precisely what constitutes an inch or any fractional part of an inch. They must all use measuring tools which insure quick measuring with the least possibility of error.

Johansson Gages are the accepted standard of measurement the world over. They are the most simple known method of measuring and **are guaranteed accurate to 0.00001″ at 68°F.** They are self checking so that any inaccuracies due to accident or abuse are readily discovered. They not only answer the gaging needs for the present, but for the future regardless of how the work may change.

The new reduced prices of Johansson Gages make them applicable as actual working tools in every machine shop. Send for your set to-day.

Johansson Prices Recently Reduced

Write for Catalog and Latest Price Lists

Aikenhead's

Line of tools embraces everything for the tool-room of machine and woodworking shops. From our large stocks we are always able to fill your requirements promptly; this coupled with efficient, and courteous service has won for Aikenhead's a reputation as **Canada's Leading Tool Supply House.**

Wahlstrom

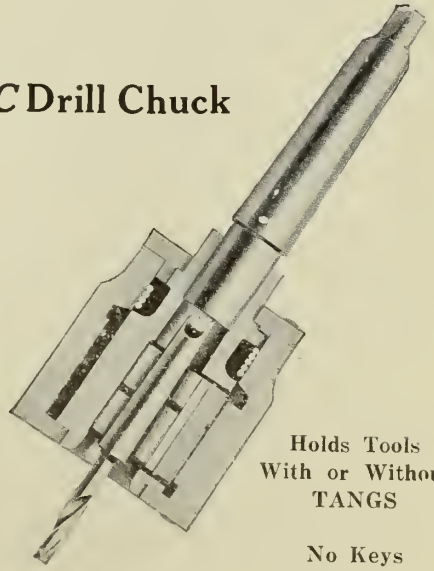
A Positive Drive, Self-Centering *AUTOMATIC* Drill Chuck

Here is a chuck which Automatically self centres the tool, its instant-acting saws closing on the entire shank in a grip that becomes firmer as the resistance to the tool increases. The clutch positively cannot slip and the jaws never mark a tool.

With a Wahlstrom, two seconds is all you need to change the operation from drilling to reaming, counterboring, or tapping —and you don't stop the spindle, simply grasp the chuck with one hand and replace the loosened tool with another. Figure out the time and labor saving in your plant on drilling jobs alone.

Made in two different styles. One style holds No. 1, 2 or 3 Morse Taper Shank tools—with or without a tang. The other style is made in three sizes, which hold all sizes of straight shank tools from ¼ to ½-inch.

Sent on ten days' trial. Booklet on request.



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No Keys
No Collets

"Everything in Tools" is our slogan. Try us.

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AIKENHEAD HARDWARE LIMITED
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terest sold several lots of plates, aggregating no large tonnage, at 3.25c, and has since put its price up to 3.50c, probably to "protect" the 3.25c business, though it is evident that 3.50c cannot be secured. In sheets some very fancy prices are going, as there is scarcely anything offered. The leading interest sold its second half tonnage months ago and on account of restricted operations it will require until some time in February to complete the business taken. The independents, as a rule, sold only for third quarter, but a recent count is said to show that the independents, on an average, are sold not only through November, but 41 per cent. into December, and thus it is exceptional for an independent to offer any sheets. Demand is light in point of tonnage, but is easily sufficient to support what market there is. Despite cancellations the mills are in strong position. Thus, while the automobile industry has cancelled a good bit of sheet business, one finds that the mills that for years have made a specialty of automobile finishes are very busy. The explanation appears to be that the automobile trade had gone to other mills to eke out supplies, taking almost anything down to common black, and when the trade found it needed less it simply cancelled the outside tonnage, so that at the reduced operation now promised for the automobile trade, say 60 to 70 per cent. of capacity, it will still keep its regular sources of sheet supply busy.

Transportation

Shipping conditions at the steel mills continue to improve. There is much more tonnage being moved than a month or two ago, but the distribution is still poor in that there are many embargoes. A mill may be shipping its output very comfortably, but at the same time some customers may be getting full supplies and others practically nothing. The mills as a whole reduced their stocks of steel slightly in August, while during July they were adding to stocks. In many cases mills are shipping considerable tonnages out of stock, but at the same time are adding nearly as much to stock, out of current production, the idea being to keep the steel relatively fresh.

PIG IRON TRADE

Market activity has dropped off to slight proportions during the past week, and in the Chicago district it was noticeable that the majority of sales were in few cases exceeding 500 tons. The market may be definitely fixed at $48.50 Valley. On the whole the market has been quieter than for some weeks past. Furnaces appear to be well sold up but there is a marked cautiousness amongst consumers owing to forecasts on the coke situation.

U.S. SCRAP METAL

The scrap market has shown decided strength during the past week and the recent heavy buying of the Carnegie Steel Company has left the market steady and heavy melting steel can be quoted firm at $29—$29.50. The rush by all interests to make delivery before the new freight rates go into force, coupled with the car shortage, threw the market into a rather chaotic condition.

MONTREAL NOTES

It is expected that the Montreal fire department will close the contracts early next month for the necessary additional equipment for fire-fighting purposes. The expenditure will be in the neighborhood of $150,000 and will include two gasoline-operated fire engines to replace steam units now in service.

* * *

The city commissioners of Montreal have decided that a new incinerator plant will be erected to replace the one recently destroyed by fire. It is not expected that construction operations will be started until next spring, but plans and specifications will be prepared shortly. The cost of the new plant will be approximately $200,000.

* * *

Promising developments are now under way for the erection of a modern match factory in this district. Sir Alexander Maguire and his brother, of the British firm of Maguire, Paterson and Palmer, were in the city last week in connection with the preliminary negotiations. It was stated that machinery was in readiness for shipment from England and that building operations will be proceeded with at once so that manufacturing could be commenced early next year.

* * *

Reuben Morris, of 889 Durocher St., Montreal, is the inventor of a new safety auto-bumper that can be operated as a fender for the prevention of serious accidents to pedestrians. A recent demonstration before city officials and prominent citizens proved the practicability of the device, which is the product of twelve years of experimental work. The appliance weighs about 35 pounds, is controlled by the steering gear, and may be locked and used as an ordinary bumper.

* * *

The Foster Motor Car and Manufacturing Co., Ltd., has recently been organized to manufacture the Foster motor car, a European type of car, of which over 10,000 are now in use in England. These machines will be fitted with the famous Herschell-Spillman motor. The company has acquired property in the east end of Montreal, and the head offices will be located at the corner of First Avenue and Ernest Street. Capt M. L. Fitgerald will be in charge of the Canadian organization, and the majority of the office and mechanical staff will be former members of the C. E. F.

SHOPS ARE BUSY IN UNITED KINGDOM

Iron and Steel Industries are Fully Occupied With Orders to Capacity of Raw Material

Cable advices have been received by F. W. Field, the British Government Trade Commissioner in Toronto, from the Department of Overseas Trade, London, England, that the United Kingdom iron and steel industries are fully occupied with home orders to the capacity of raw materials available. Manufacturers of tinplates, galvanized sheets, hardware, cutlery and pottery are in a little better position and can deal with an increased export business. Among the industries in the United Kingdom which can now handle larger business are machine tools, motor cars, except the higher grades, electric batteries and accumulators, drapery, clothing, hosiery and hats, and musical instruments. Indications in those industries point to a larger export trade in the near future. The same remarks apply to glass and glass ware.

United Kingdom manufacturers of machinery and engineering products are in a position to accept export orders.

MORE SHIPS TO TOUCH THE ORIENT

Negotiating With an Old Country Firm To Secure Passenger Vessels

Vancouver.—Speaking here at a joint luncheon of the Canadian Club and the Board of Trade, Hon. C. C. Ballantyne, Minister of Marine and Fisheries, referring to transportation and the growth of the Canadian mercantile marine, declared that Canada's ships were built at from $25 to $100 a ton lower than the American, and Canada's ships were much better built ships. Canada has 17 shipyards, he stated, and the Government received the lowest prices of all for shipbuilding from the city of Vancouver.

Sixteen Government ships had been built or were being built here, at an expense of $22.000,000, and all were to be left on the Pacific coast to care for the growing export trade, the Minister stated, and he predicted that in a very short time ships now connected with the Government railways would be plying to the Orient from Vancouver.

"While the Government has not sufficient money to build the passenger ships for this, negotiations are now under way with a large Old Country firm, and when completed the ships should be here not later than in a year's time, and perhaps sooner, the Minister said.

Toronto.—Two sections of the new floating dry dock which is being built in Montreal for the Russell Shipbuilding Co., of Toronto, have arrived here. The dock will consist of six sections and will cost about $80,000.

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Solve your Metal Cutting problems, easily, quickly and economically, by adopting the products made by

ATKINS

We make Kwik-Kut Power Hack Saw Machines which use practically the full cutting edge of the Hack Saw Blade at each stroke; Metal Cutting Band Saw Machines for general shop work, cutting all classes of metal up to 12 x 14 inches.

Your requirements for Metal Cutting Circular Saws can be supplied promptly and we solicit a trial of our "AAA" Non-Breakable and Power Hack Saw Blades and Frames.

"A Better Saw for Every Use"

E. C. Atkins & Co.

Established 1857

"The Sterling Quality Saw People"

Factory: HAMILTON, ONT

Branch: VANCOUVER, B C.

THE FINEST ON EARTH

MISCELLANEOUS

Solder, strictly	$ 0 35
Solder, guaranteed	0 39
Soldering coppers, lb.	0 62½
White lead, pure, cwt.	20 35
Red dry lead, 100-lb. kegs, per cwt.	16 00
Gasoline, per gal., bulk	0 38
Pure turp., single bbls., gal.	3 15
Linseed oil, raw, single bbls.	2 37
Linseed oil, boiled, single bbls.	2 40
Wood alcohol, per gal.	4 00
Whiting, plain, per 100 lbs.	3 00

CARBON DRILLS AND REAMERS

S.S. drills, wire sizes	32½
Can. carbon cutters, plus	20
Standard drills, all sizes	32½
3-fluted drills, plus	10
Jobbers' and letter sizes	32½
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	50
Sleeves	50
Taper pin reamers	25 off
Drills and countersinks	net
Bridge reamers	50
Centre reamers	10
Chucking reamers	net
Hand reamers	10
High speed drills, list plus	10 to 30
Can. high speed cutters, net to plus	10
American	plus 40

COLD ROLLED STEEL

[At warehouse]

Rounds and squares	$7 base
Hexagons and flats	$7.75 base

IRON PIPE FITTINGS

	Black	Galv.
Class A	60	75
Class B	27	37
Class C	18	27

Cast iron fittings, 5%; malleable bushings, 22½%; cast bushings, 22½%; unions, 37½%; plugs, 20% off list.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$10 00	$10 50
Sheets, Blue ann., No. 10	8 50	9 50
Canada plates, dull, 52 sheets	13 00	13 00
Can. plates, all bright	14 00	.....
Apollo brand, 10¾ oz. galvanized	....	....
Queen's Head, 28 B.W.G.	13 50	.....
Fleur-de-Lis, 28 B.W.G.	13 00	.....
Gorbal's Best, No. 28	....	....
Colborne Crown, No. 28.	....	....
Premier, No. 28, U.S.	11 50	11 60
Premier, 10¾-oz.	11 50	12 00
Zinc sheets	16 50	20 00

PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13.00; 5-16, $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.20; ¾ in., $9.30; ⅝ in., $9.50; 1 in., $9.10; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $13.00; 5-16 in., $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.50; ¾ in., $9.30.

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

BOILER TUBES.

Size.	Seamless	Lapwelded
1 in.	$27 00	$.....
1¼ in.	29 50	.....
1½ in.	31 50	29 50
1¾ in.	31 50	30 00
2 in.	35 00	30 00
2¼ in.	35 00	29 00
2½ in.	42 00	37 00
3 in.	50 00	48 00
3¼ in.	.. ..	48 50
3½ in.	63 00	51 50
4 in.	85 00	65 50

Prices per 100 ft., Montreal and Toronto

OILS AND COMPOUNDS.

Castor oil, per lb.	
Royalite, per gal., bulk	27½
Palacine	30½
Machine oil, per gal.	54½
Black oil, per gal.	28
Cylinder oil, Capital	82½
Petroleum fuel oil, bbls., net	18

BELTING—No 1 OAK TANNED

Extra heavy, single and double	6½
Standard	6½
Cut leather lacing, No. 1	2 00
Leather in side	2 40 3 00

TAPES

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	$4 60
Polishing wheels, bull-neck	2 00
Emery in kegs, Turkish	09
Pumice, ground	06
Emery glue	30
Tripoli composition	09
Crocus composition	12
Emery composition	11
Rouge, silver	60
Rouge, powder, nickel	45

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	.08½
Grits, 80 and finer	.6

BRASS—Warehouse Price

Brass rods, base ½ in. to 1 in. rod	0 34
Brass sheets, 24 gauge and heavier, base	$0 42
Brass tubing, seamless	0 46
Copper tubing, seamless	0 48

WASTE

XXX Extra	.24	Atlas	.20
Peerless	.22½	X Empire	.19½
Grand	.22½	Ideal	.19
Superior	.22½	X Press	.17½
X L C R	.21		

Colored

Lion	.17	Popular	.13
Standard	.15	Keen	.11
No. 1	.15		

Wool Packing

Arrow	.35	Anvil	.22
Axle	.28	Anchor	.17

Washed Wipers

Select White	.20	Dark colored	.09
Mixed colored	.10		

This list subject to trade discount for quantity.

RUBBER BELTING

Standard ... 10% Best grades... 15%

ANODES

Nickel	.55 to .60
Copper	.38 to .40
Tin	.70 to .70
Zinc	.16 to .17

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	$42 50	$43 00
Copper wire, list plus 10..		
Plain sheets, 14 oz., 14x60 in.	49 00	48 00
Copper sheet, tinned, 14x60, 14 oz.	52 00	48 00
Copper sheet, planished, 16 oz. base	56 00	55 00
Brazers', in sheets, 6 x 4 base	48 00	46 00

LEAD SHEETS

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$10 75	$14 50
Sheets, 3½ lbs. sq. ft.	10 50	14 00
Sheets, 4 to 6 lbs. sq. ft.	10 25	13 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS

Acid, boracic	$ .23
Acid, hydrochloric	.04
Acid, nitric	.11
Acid, sulphuric	.04
Ammonia, aqua	.15
Ammonium, carbonate	.2
Ammonium, chloride	.22
Ammonium hydrosulphuret	.75
Ammonium sulphate	.30
Arsenic, white	.14
Copper, carbonate, annhy	.41
Copper, sulphate	.15
Cobalt, sulphate	.20
Iron perchloride	.62
Lead acetate	.30
Nickel ammonium sulphate	.20
Nickel carbonate	.32
Nickel sulphate	.22
Potassium sulphide (substitute)	.42
Silver chloride (per oz.)	1.30
Silver nitrate (per oz.)	1.25
Sodium bisulphate	.14
Sodium carbonate crystals	.06
Sodium cyanide, 127-130%	.38
Sodium hyposulphite per 100 lbs	8.00
Sodium phosphate	.15
Tin chloride	.80
Zinc chloride, C.P.	.30
Zinc sulphate	.10

Prices per lb. unless otherwise state

"It is a sad sight to see an old man working for $100 per month who in the past drew $5,000 a year. Such men were expense men and not producers."

MORROW

HIGH SPEED FORGED DRILLS

are used in the larger shops where production counts; where the man on the drilling gets a piece-work price. If he is not provided with the best drills, he can't make good.

MORROW Drills positively give "more holes with less regrinding."

Get Them At Your Jobbers

JOHN MORROW SCREW & NUT CO., LIMITED

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Upon the Health of your employees depend your profit and production

Don't be contented with half-way goodness or makeshift drinking arrangements.

Throw out the germ-laden Drinking Cup!

Give your men a clean drink

PURO SANITARY DRINKING FOUNTAIN

(MADE IN CANADA)

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TRADE GOSSIP

May Bring Motor Plant.—The Vulcan Motor & Engineering Co., of Southport, Eng., may establish a plant in Canada for the manufacture of their Vulcan truck. Mr. Walter E. Walker, who is here in connection with the firm's display at the Toronto Exhibition, will take the opportunity to look over the prospects of developing the business.

Higher Rates on Steel.—Higher freight rates that came into effect on August 26 on American railroads will affect the cost of steel delivered to Ontario manufacturers. The rate on finished steel from Pittsburgh to Buffalo is now at 29.5 cents per 100 pounds, as against the old rate of 21 cents. The new tariff on billets is now $3.92 per long ton from Pittsburgh to Buffalo, while the former rate was $2.80.

$7.50 a Day For Miners.—After several meetings, a committee composed of representatives of the operators and miners in the Illinois fields arrived at an agreement whereby the men get an increase of $1.50 per day for an eight-hour day. The men originally demanded an increase of $2, but finally compromised on $1.50. The rate before the increase was $6 per day, and the new rate is made retroactive to August 1.

Big Industry For Quebec.—A large amalgamation of British firms is contemplating the establishment of a large matchmaking factory in Quebec, according to a statement by Sir Alfred Maguire, who has been in Canada for some weeks investigating. There will be a 50 per cent. Canadian board, and the names of Sir Lomer Gouin and George Cahoon are mentioned as members of the board, which will consist of twelve.

Japan Has Huge Steel Plant.—A new steel plate plant, regarded as the largest in the Far East, and one of the six largest in the world, has just been completed in Yawata, Kyushu, Japan, at a cost of 4,000,000 yen, announces the "Japanese Advertiser." This plant, which has a production capacity of 100,000 tons of steel plate a month, has facilities to manufacture plates sixty feet long and eleven feet wide, the largest ever manufactured in Japan.

Report on Peat Possibilities.—The Hon. Harry Mills, Minister of Mines in the Ontario Government, has received an interim report from the officials investigating the Alfred peat bog. The report asks for a further extension of a year before a report in full is given. Mr. Mills, however, thinks that enough time has been spent to secure all information, and wants the complete report in this year. The Ontario Government shares half the expense of the investigations with the Dominion Government.

To Start the Bridge.—Boats have for the past two weeks been making test holes in the rock bed both on the American sides of the Niagara River for the proposed railroad and traffic bridge from Grand Island to the Albert Weaver farm, on the boulevard, a mile north of Black Creek. Mr. Weaver's lease expires January 1, 1921. The railroad will connect Buffalo and Detroit and residents expect a boom in real estate in the county. Real estate men have already secured a number of options at fancy prices. The work will be rushed as soon as the spur to the M. C. Railroad is laid.

Price of Soft Coal Falls.—Following a complaint made by Admiral Benson, of the United States Shipping Board, that he was compelled to pay $20 per ton for bunker coals, the Department of Justice of the U.S. issued an order to district attorneys to get after profiteers. The department found that coal that was being sold for $20 per ton cost only $5.40 laid down at delivery point. Following this order, the Baltimore market price went down to $8.75 per ton, and even this price was refused by some buyers, who thought a further drop would take place.

Leave to Take Action Refused.—The Equitable Trust Company, which sought to bring an action against the Dominion Shipbuilding & Repair Co., now in liquidation, was refused permission to do so by Mr. Justice Orde. The Trust Co. claims to be entitled to the unused materials which were secured by the Shipbuilding Company on sums advanced by the Trust Co. through letters of credit. The judge directed that the Trust Company's claim should be preferred in the winding up proceedings instead of an action being taken. The materials will be worked up into the ships in hand.

Shipping Documents Must Accompany Goods.—The Customs Department of Australia has notified the Department of Trades and Commerce in Canada that in future, starting from January 1 next, no goods will be delivered unless the shipping documents are on hand. This is because a great deal of trouble has been experienced through the failure of documents to arrive with the goods from Canada. There will be exemptions to this rule only in the most exceptional circumstances, and in these cases an extra duty of 50 per cent. will be demanded pending the arrival of the documents.

Amherst Plant Busy.—The Canada Car & Foundry Co.'s plant at Amherst is very busy just now, and there is enough work on hand to keep the works fully employed for another six months. The usual difficulty in obtaining material has been experienced, but on the whole the plant is not as badly off as some others. The works are just now finishing up an order of eighty caboose cars, and the cars have been finished at the rate of about two per day since starting on the work. The sample car of the refrigerator type is nearly completed, and as soon as this is passed work will be started on the order for 600 of these cars.

Manufacture Pulp Mill Machinery.—The Waterous Co., of Brantford, has recently taken over the manufacturing

rights of the pulp mill machinery formerly owned by J. M. Voith Co., of New York. The line includes all types of pulp mill apparatus, such as pulpers, refiners, paper machine screens, silver screens, grinders, chippers, etc. The grinders are of a new type which materially reduces the cost of the production of a ton of pulp, the machines being entirely automatic in their operation. They are used by such well known mills as the Laurentide, Belgo Canadian Pulp and Paper Co., Brampton Pulp & Paper Co., and several others.

No Confirmation.—A newspaper report has the following regarding the rumor of a rolling mill at Sudbury:—There is no information to the report that the International Nickel Company is contemplating the erection of a $3,000,000 rolling plant at Sudbury, according to a statement by J. L. Agnew, vice-president of the enterprise. According to Mr. Agnew, this project has been discussed on several occasions by the directors, owing to the inconveniences which the company has sustained from having to send the metal to Bayonne, N.J., to undergo the rolling process, but it was considered that the construction of such a plant in Canada at the present time would be impracticable.

PERSONAL

At a special meeting of the Chatham city council it was decided to engage C. H. R. Fuller, of Toronto, as city engineer at a salary of $3,000 a year. Mr. Fuller is a Bachelor of Applied Science at Toronto University and is at present being employed by the Imperial Oil Co. He served in France with the same company of railway troops as Major Frank P. Adams, the retiring city engineer, who assumes a similar post in Brantford.

Mr. E. A. Humphries, who was for some years advertising representative of Canadian Machinery in Ontario and the Northern and Central States, has joined the sales force of the Wilt Twist Drill Co., at Walkerville. Since his appointment he has been in several of the districts in consultation with the representatives of the firm.

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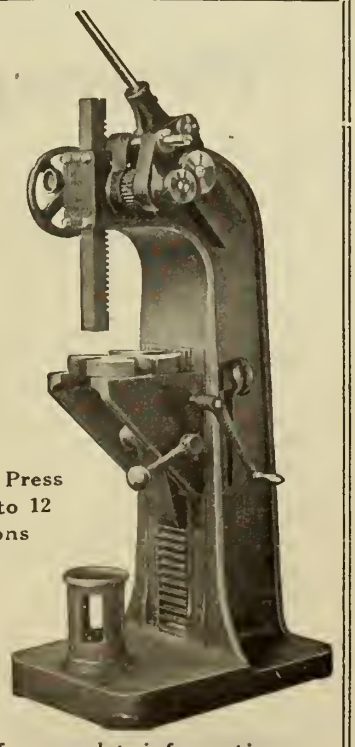
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10 to 12
tons
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INTERCHANGEABLE
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"Maple Leaf" brand costs less than leather, rubber and balata; has a positive grip on the pulley and is true running.

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CANADIAN AGENT WANTED — AMERICAN firm whose line (high grade factory specialty) is being manufactured in Canada, wishes to get in touch with live man who will act as Provincial or Dominion representative. Box 679, Canadian Machinery.

FOR HIGH-GRADE AMERICAN-MADE LATHE —14 to 26. In replying state territory you can cover and cover thoroughly. Box 682, Canadian Machinery. (c22m)

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MACHINE WORK WANTED FOR LATHES, shapers, milling machine and planer, etc. Hourly or contract basis. Prompt delivery. W. H. Sumbling Machinery Co., Toronto. (ctfm)

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28" x 10' Lodge & Shipley double back-geared Engine Lathe.
24" x 44" x 20' C.M.C. Gap Lathe.
42" x 42" x 11' Hepburn Iron Planer Four head.

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BRANTFORD PATTERN WORKS ARE PREpared to make up patterns of any kind—including marine works—to sketches, blue prints or sample castings. Prompt, efficient service. Bell 'Phone 631; Machine 'Phone 733. Brantford Pattern Works, 49 George St., Brantford, Ont. (ctfm)

FOR SALE

Enclosed liquid fuel combustion apparatus capable of generating intense heat in pipes and confined passages for heating parts of internal combustion engines and for other uses; spark ignited; blower operated. Patented April 3, 1917. Can be inspected at and for sale by H. W. Petrie Ltd., Toronto.

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One No. 1 Brown Boggs Rotary Shear, New.

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Perfected rotary engine valve, simple design, free from defects common in rotary valves. Patented Feb. 20, 1917. Can be inspected at and purchased from H. W. Petrie Limited, Toronto.

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Generator			Turbine	
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1000	6600	1500	Westinghouse	
1250	6600	1500	Westinghouse	140 lbs.
1250	2300	1500	Westinghouse	
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2500	2400	1500	Westinghouse	150 lbs.
2500	2200	1500	Westinghouse-Parsons	150 lbs.
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36" x 22' Bridgeford, g. h. Motor Drive.
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40 x 40 x 10' Powell, 2H Planer
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No. 22 Garvin, Vertical Miller
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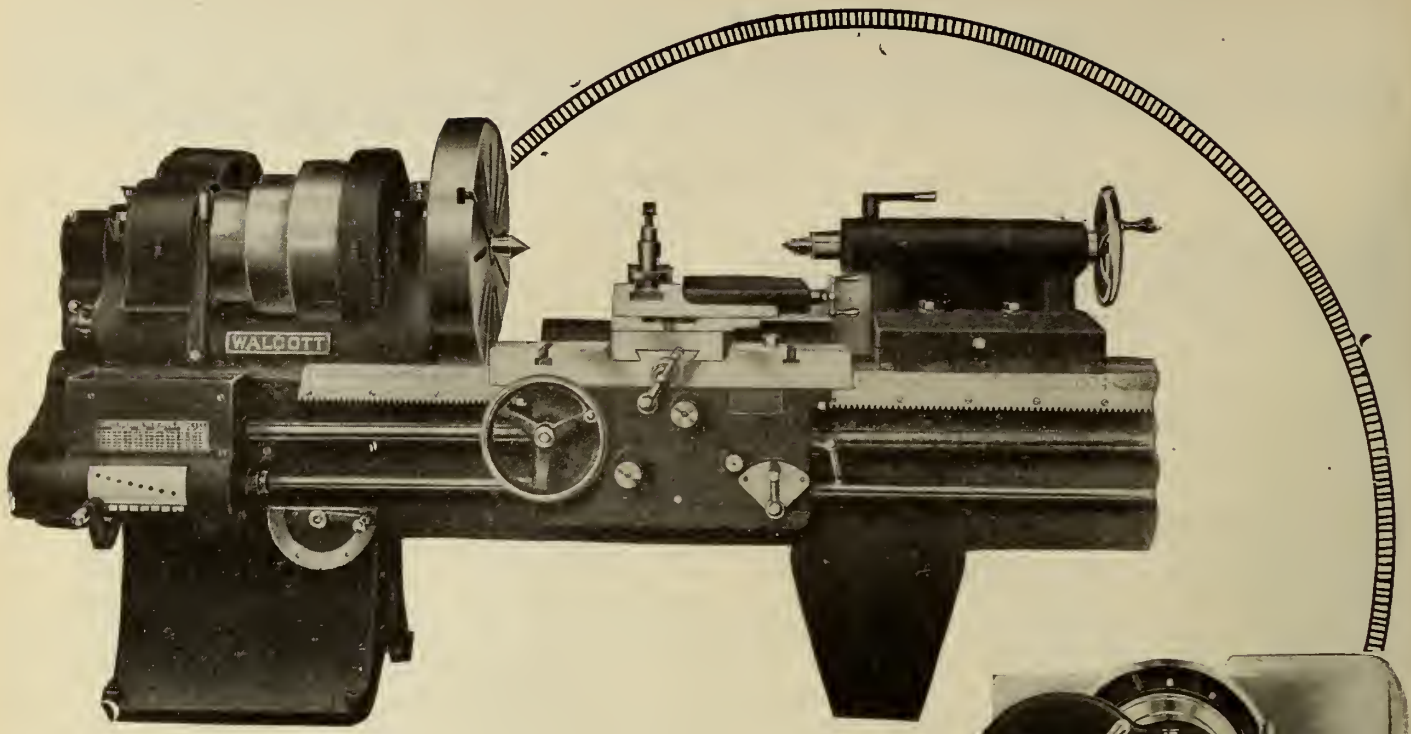

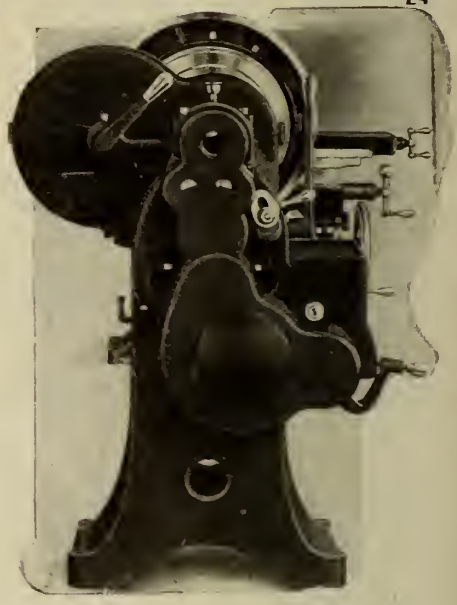

The WALCOTT

Note Carefully Its Build

Bigger, Broader, Stouter Saddle Bearings, Wider, Deeper Bridge. These are a few Walcott features of construction that lift this lathe out of the ordinary category. The experienced mechanic knows what this means. All spring, or give, is eliminated when the tool is up against the job taking a heavy cut. Still another feature should be noted: all shafts and studs are supported at both ends, a point in construction which tends to cut out spring and increase the life of the lathe.

The Walcott is constructed with double plate apron, drop forge gears in apron, rigid compound rest, back gear arm reinforced by one-piece gear guard, headstock, and many other features which have made the Walcott an outstanding machine tool.

We would urge you to write for a full description of the Walcott lathe. You will then be better able to appreciate its strength, simplicity, convenience and many fine points of construction.

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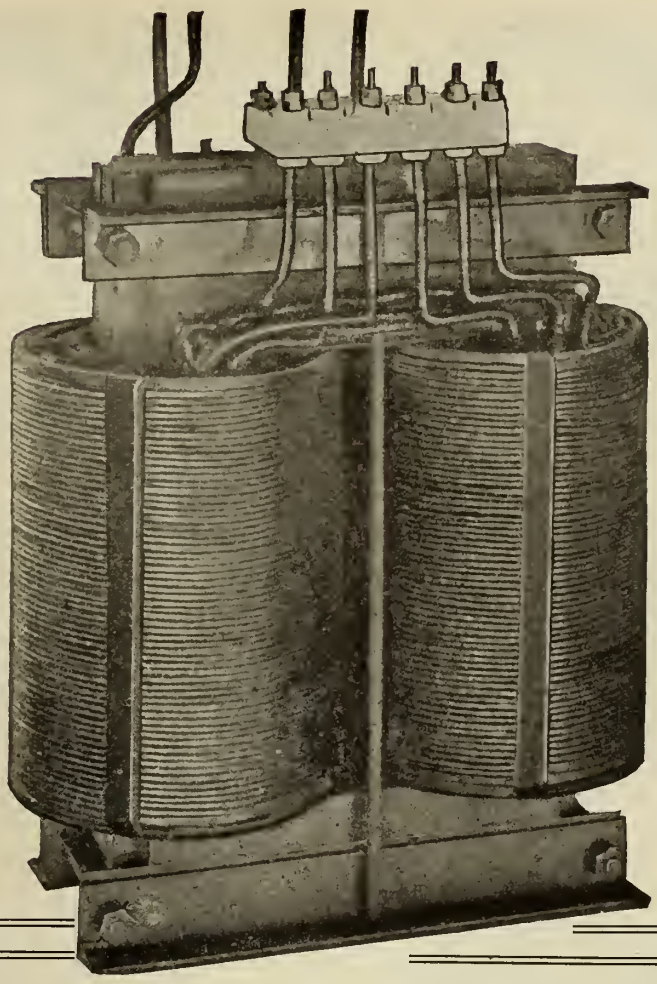

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Circular coils—the strongest known construction.

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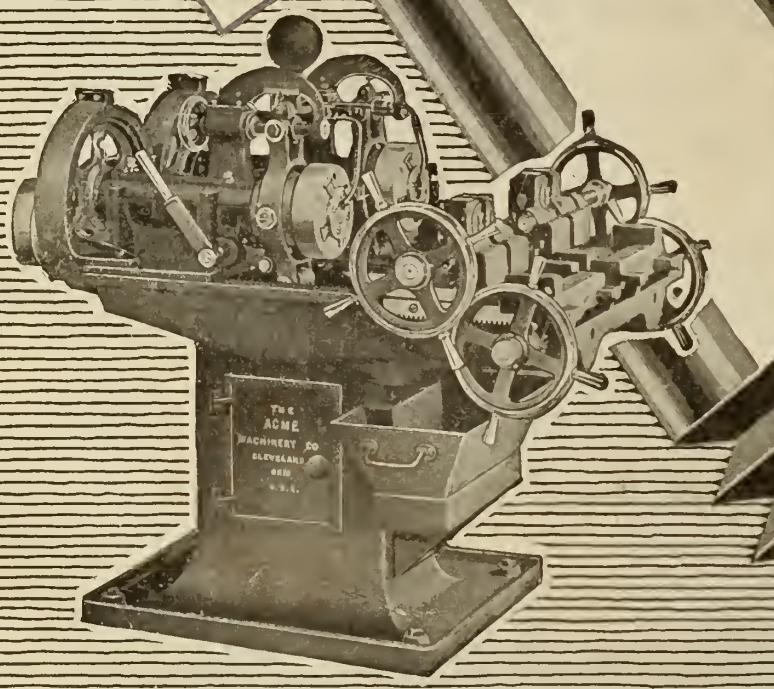

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are made in various sizes for cutting bolts from ¼ to 1 in. diameter. Their heads allow micrometer adjustments while they are in motion. The dies can be changed from one size to another in less than one minute and produce clean, accurate, highly-finished threads.

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The man who knows threading knows that there is a vast difference between mere theory and good threading practice.

He is buying threads—wants the greatest number of pieces per day—wants them to fit the gauge and at a cost which he is proud to turn in for inspection.

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These tool forges are particularly adapted for the requirements of the small machine shop for annealing and tempering dies, cutters, reamers, etc.
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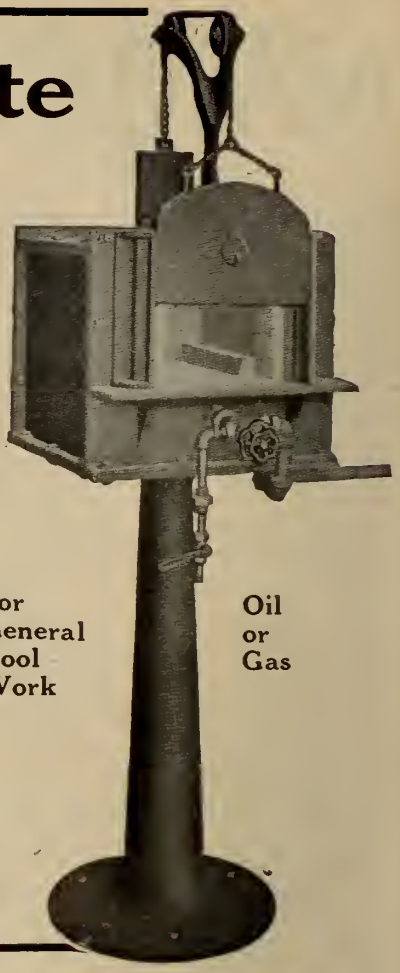

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Make a Single Spindle Machine Do the Work of a Multiple One

There's no time wasted when the Beaver Chuck and Collet are used. They permit the rapid interchange of Drills, Reamers, Counterbores, etc., **without stopping the machine.** A single spindle machine given the facility of a multiple spindle!
A self-contained device releases the collet and tool instantly —without the use of hammer, wrench or key. And there is nothing to shock or catch the operator.

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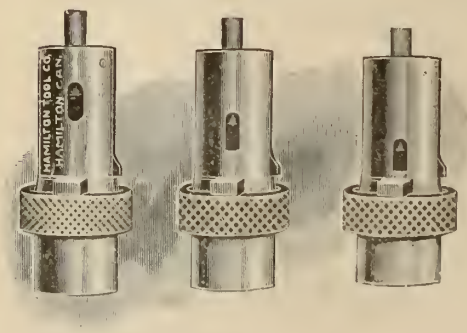

View of Collets

The Beaver Chuck and Collet are simple in construction and positive in operation. Made of high-grade tool steel throughout.

This new time-saving tool is well worth investigation. Write for full particulars to-day.

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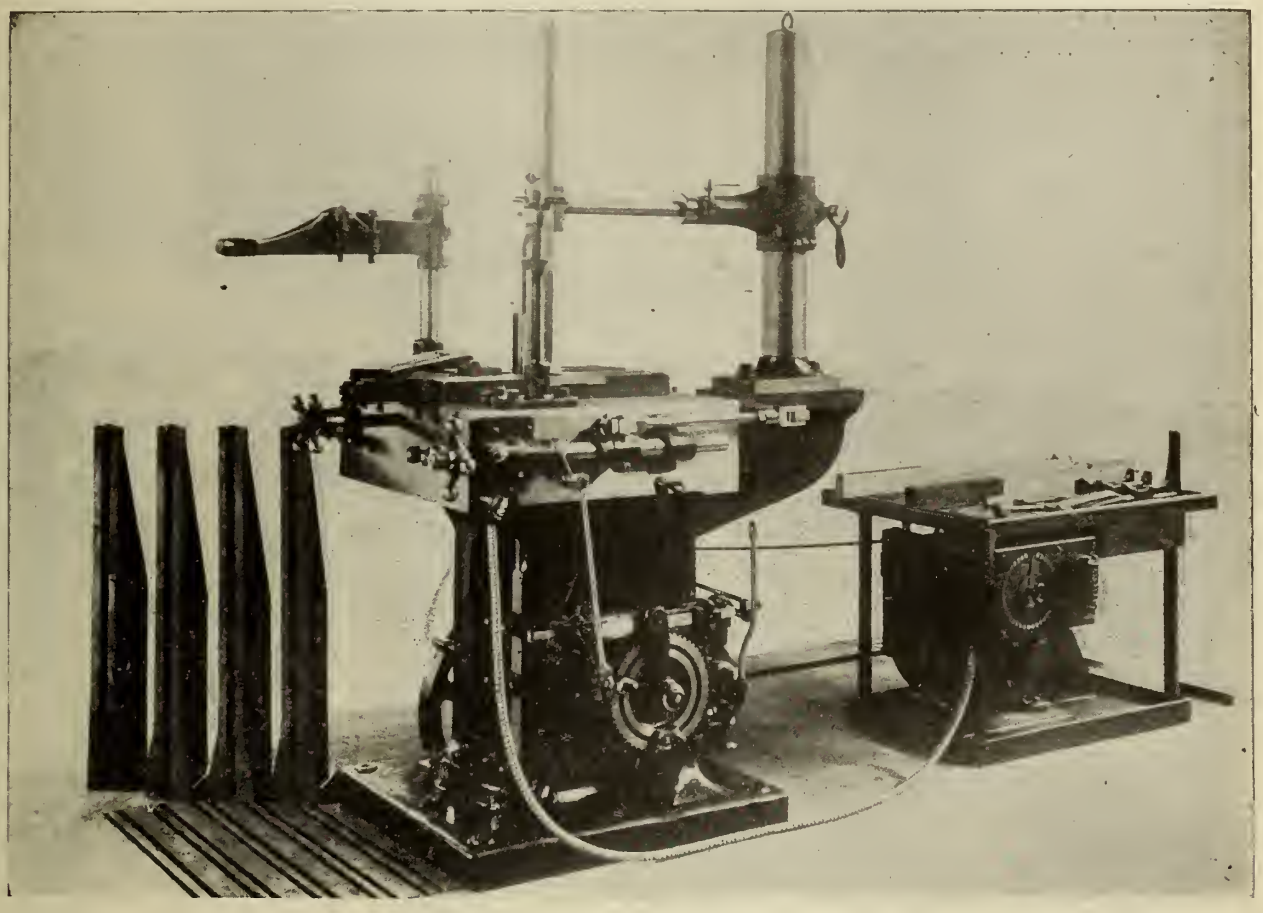
Hamilton ∴ Ontario

Morton Stationary Keyway Cutter

Fully Equipped for General Work



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The Top Plate is stationary. Positive automatic relief of cutter by moving bar. Accurate Taper Keyway adjustment. Positive automatic feed provided with limit stops. Quick stroke adjustments and rapid hand reverse. Positive backing for bar. Rapid centering device for setting work. Rapid binding attachment. Machine may be set to cut a keyway to given depth and taper before placing work on the table, keyway layout being unnecessary.

Other advantageous features of the Morton are fully described in our Bulletin No. 1A. Ask for your copy to-day.

MORTON MANUFACTURING CO.

MUSKEGON HEIGHTS, MICH., U.S.A.

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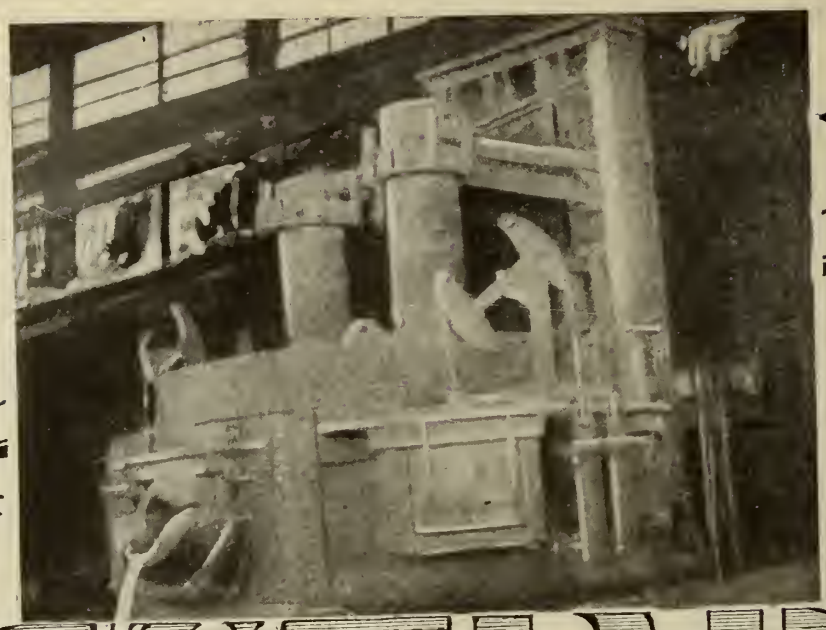

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High Speed Steel

SEVERAL factors combine to make this high-speed steel a triumph of the steel-maker's art; Electric Furnaces—entirely infallible, automatically regulated, delivering the same result time after time.

Uranium — This rare element, cousin to Radium, effects a profound change in the texture and quality of the steel.

Added to these, the constant care and skill of years of steel-making experience make the result of each melt a foregone conclusion.

Latrobe Electric Steel Co.
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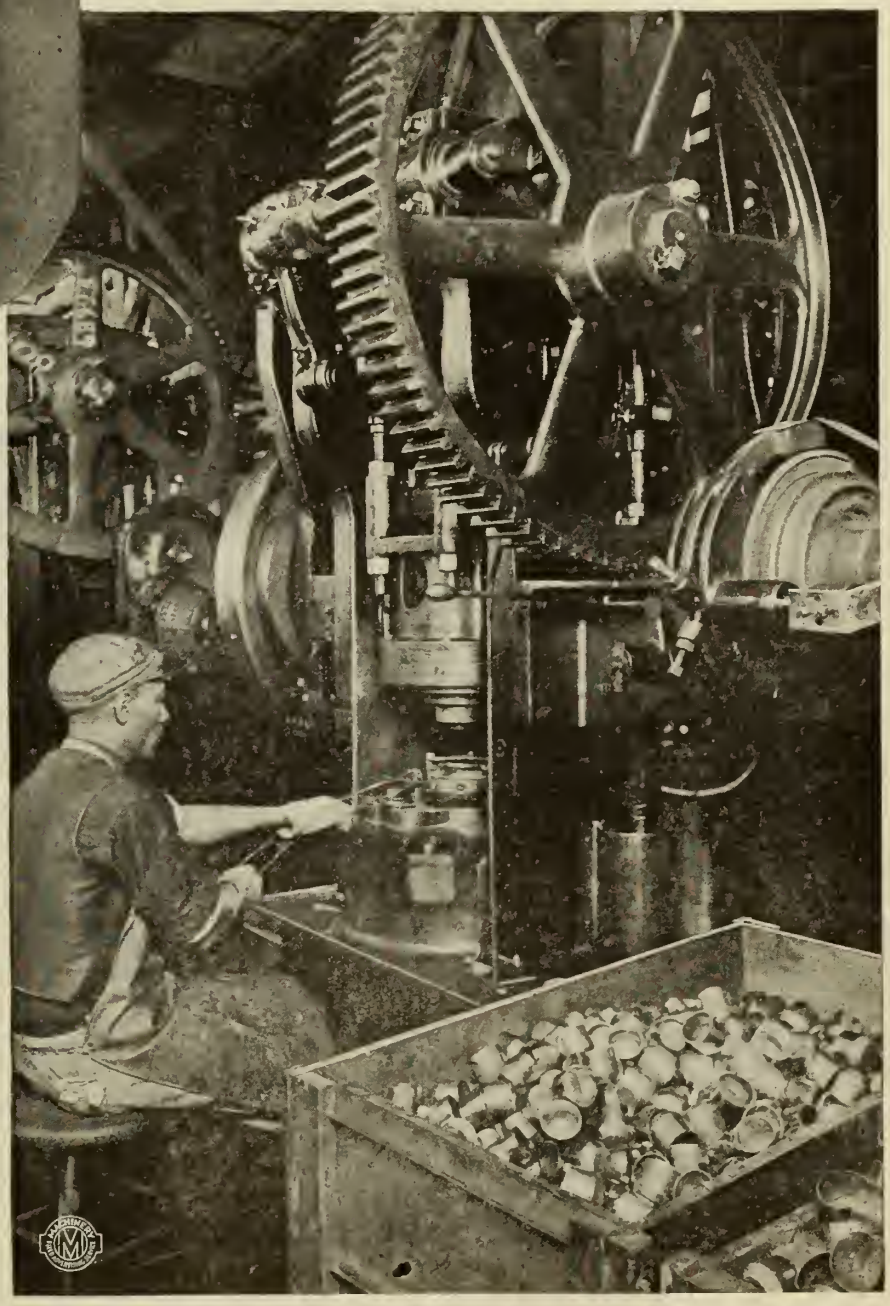
URANIUM

"BLISS" PRESSES—

for Fifteen Years Here



The service of this No. 1½ "BLISS" Double Action Toggle Press has sold three other "BLISS" Presses to the Frost Manufacturing Company, Kenosha, Wis., and all four are in constant use. When photographed this machine was blanking and drawing Tee ball connections for plumbing fixtures—parts cut from strips of .025" special annnealed drawing brass stock 4 17/32" wide. The blank is 4⅜" diameter and the shell, which is shown in the close-up, is 2 5/16" diameter and 2" deep.

These Parts Are Cut and Drawn at One Stroke

The blank holder cuts the blank and the punch drives it through the drawing die. Output is 14,000 per ten-hour day. Subsequent drawing operations performed on these shells produce the perfect ball.

E. W. Bliss Company

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American Factories: BROOKLYN, N.Y. *and* HASTINGS, MICH.

1857 — 1920

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THE TUBE COMPANY OF CANADA LIMITED

Electric and Oxy-Acetylene WELDED TUBING

Also BUTT SEAM TUBING

We have a thoroughly equipped plant for Welding by Electric and Oxy-Acetylene processes. Oxy-Acetylene Welded Tubing is recommended for bending purposes; Electric for straight, or slight bends. Butt Seam Tubing is also one of our specialties. Tubing made hot or cold rolled finish.

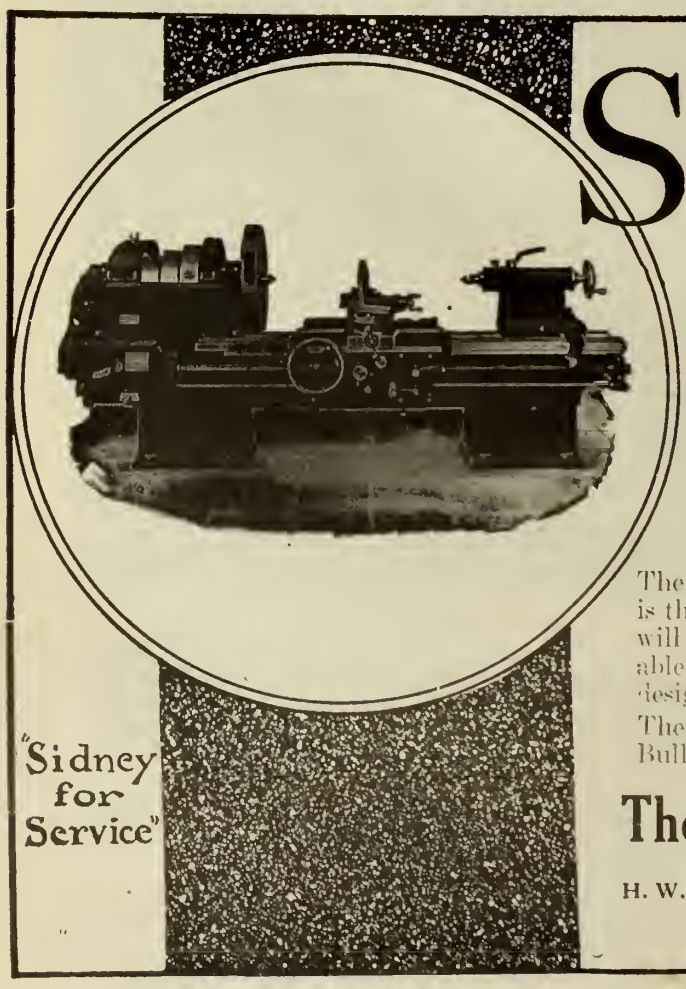
Our Work Includes Tubing for

Bicycles, Bedsteads, Automobile Parts, Electric Fixtures, Gas Fixtures, etc. Round, Square, Rectangular and Special Shapes. Sizes ⅜″ to 2″ outside diameter, from 16 to 22 gauge.

Let us advise you of the kind of tubing that will best suit your requirements. Inquiries gladly answered.

The Tube Company of Canada LIMITED

233 Dufferin Street, TORONTO, Canada



"Sidney for Service"

SIDNEY

Heavy Duty Engine Lathes

Noted for Their Power and Rigidity

One of the outstanding features of the Sidney is the manner in which it takes deep cuts through tough metals. Clean cuts without chatter, without pause. The Sidney is so designed that rigidity is maintained under severe conditions, and, in normal service.

The 25-inch Heavy Duty Quick Change Sidney here shown is the last word in lathe construction. Every improvement will be found in this, the latest model. Bed lengths available are: 10, 12, 14, 16, 18 and 20 feet. 27-inch swing design can also be supplied in these lengths.

The specific details of the Sidney are given in our new Bulletin. Write for your copy to-day.

The Sidney Tool Co., Sidney, Ohio

Canadian Agents:

H. W. Petrie, Limited
TORONTO

Yates Machinery & Supply Co.
MONTREAL, QUEBEC

DOMINION BRIDGE COMPANY, LIMITED
MONTREAL, QUE.

STRUCTURAL STEEL
FOR
Bridges Buildings Tank Work
Transmission Towers Penstocks
ALSO
Electric Hand Power Travelling Cranes
Steam Turbines

Main Office and Works: LACHINE, QUE.
Phone - Westmount 6800

BRANCH PLANTS: TORONTO OTTAWA WINNIPEG

HYDRAULIC TURBINES AND PUMPS

Our shops are equipped for building TURBINES of the largest sizes —also high speed PUMPS of large capacity for medium and low heads. Two turbines of 20,000 H.P. are now under construction.

PAPER MILL MACHINERY

Pulp Drying Machines.
Millspaugh Suction Rolls.
Millspaugh Shower Pipes.
Davies Oscillating Suction Boxes.
Press and Felt Rolls.
Brass Covered Rolls.
Pulp Digestors.
Barking Drums.
P.A.P.A. Screens (Spangenburg System) for pulp and paper.

DOMINION ENGINEERING WORKS, LIMITED
MONTREAL - QUE.

If interested tear out this page and place with letters to be answered.

New Method Saves Valuable Hours

To Duplicate Blueprints

Tracing them in the drafting room takes hours — sometimes days — of a highly paid man's time, always with a chance of errors.

The PHOTOSTAT accomplishes the same result in a few minutes at a cost of a few cents and without errors.

To Make Drawings of Small Machine Parts

in the drafting room, costs many dollars and takes hours or days of time.

A PHOTOSTAT copy of a small machine part accomplishes the same result and is made in a few minutes at a cost of a few cents.

To Make Advertising Layouts

By hand for six or a dozen publications requires hours of work by an expensive man.

The PHOTOSTAT quickly duplicates the original layout at the required size and as many times as desired at a cost of a few cents apiece.

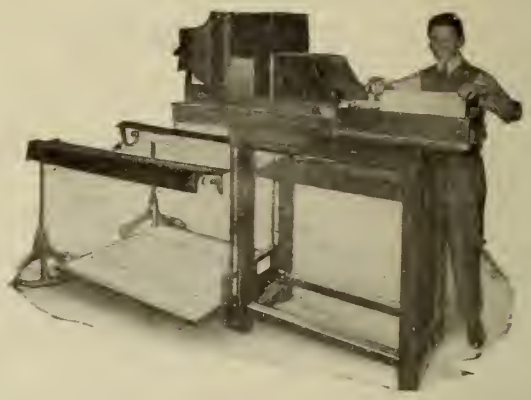
To Copy Catalog Pages

letters, reports, charts, etc., takes hours of a stenographer's time. The results cannot be exact duplicates and there are frequent errors.

The PHOTOSTAT produces an exact duplicate, without errors, in a few minutes, at a cost of a few cents.

The PHOTOSTAT

(Trade Mark Registered)



is the Up-to-Date Method for Doing All This Work

Photographic Copying Machine

Cuts Hours to Minutes
Cuts Dollars to Cents
Makes No Mistakes

"The machine pays for itself in 8 or 9 months, because of its man power savings."

Manufactured by the Eastman Kodak Company Exclusively for

COMMERCIAL CAMERA COMPANY

ROCHESTER, N.Y.

CHICAGO NEW YORK CITY PHILADELPHIA PROVIDENCE
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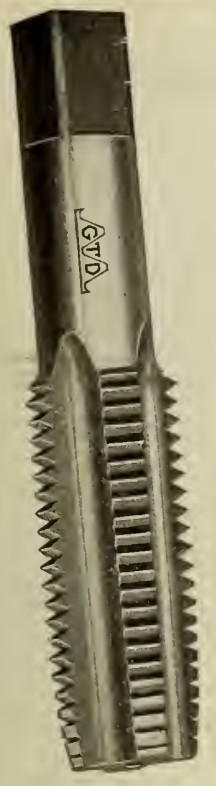
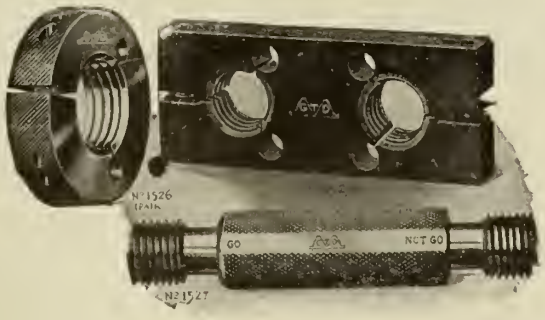
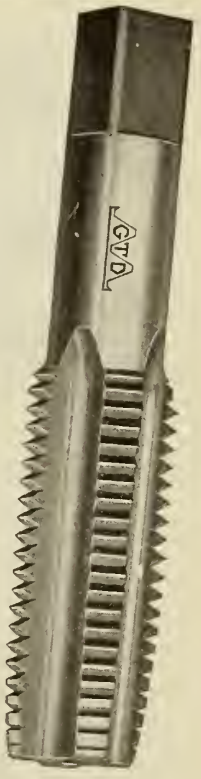
Alfred Herbert, Ltd., Coventry, England.
Societe Anonyme Alfred Herbert, Paris, France.
Societe Anonyme Belge Alfred Herbert, Brussels, Belgium
Graham Bros., Stockholm, Sweden.
Societa Anonima Italiana Alfred Herbert, Milano, Italy.







"Made in Canada"

SCREW PLATES

The "Little Giant" Screw Plates have come to be recognized as the standard equipment for repair work for garages, repair and machine shops. "Little Giant" Screw Plates are furnished in different assortments and sizes to suit all kinds of threaded work.

TAPS

Our Taps are noted for their excellent workmanship, easy-cutting and long-wearing qualities.

GAGES

Our Plug and Templet Gages are made by skilled workmen, with the latest improved appliances for acquiring strict accuracy, precision and finish.

GREENFIELD TAP AND DIE CORPORATION

OF CANADA, LIMITED GALT, ONTARIO

Successors to

Wells Bros. of Canada, Limited

USE THE COUPON →

Greenfield Tap & Die Corp. of Canada, Limited
Galt, Ontario

Please send me the following catalogs:

No. 40 Small Tools [ ]
No. 43 Gages [ ]

Name ..... Position.....

Firm .....

Address ..... C.M. 1004

If interested tear out this page and place with letters to be answered.

It Takes a Workman To Tell a File

After all, it's the man who uses a file day after day who is the best judge.

Ask any workman who uses files constantly in his day's work, and he will tell you that Famous Five Files represent the standard of file quality.

Adherence to the highest standards in manufacture for over fifty years has earned this reputation. Specially made steel, accurately cut teeth, thorough hardening, are the secrets of their success.

They are:

Kearney & Foot **American**
Great Western **Arcade**
Globe

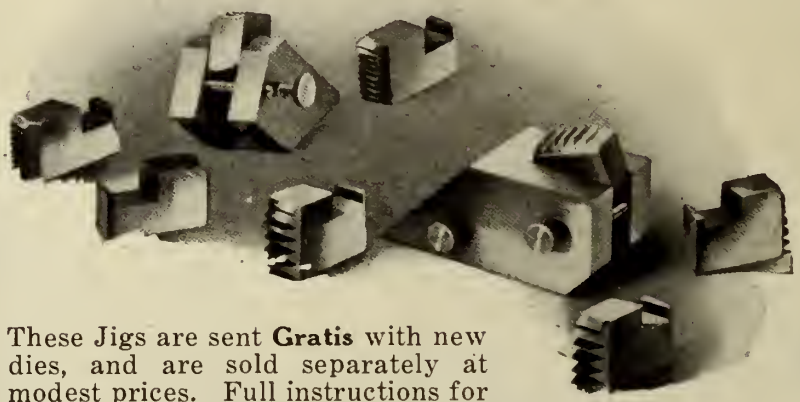
MADE IN CANADA BY

Nicholson File Company

PORT HOPE - ONTARIO

Chasers for HARTNESS Dies are easily ground

These Jigs →



and any small Grinder will grind Hartness Chasers quickly and correctly.

These Jigs are sent **Gratis** with new dies, and are sold separately at modest prices. Full instructions for Grinding Chasers are sent with chasers. **A special Grinder** for this purpose **is not required.**

Jones & Lamson Machine Company

(DIE DIVISION)

9-10 Water Lane, Queen Victoria St., LONDON, ENGLAND — SPRINGFIELD, VERMONT, U.S.A. — 503 Market St., SAN FRANCISCO California, U.S.A.

American Agents for Dies and Chasers:

Boyer, Campbell Company, Detroit.
Coghlin-Kirkley Machinery & Supply Co., Toledo, Ohio.
E. L. Essley Machy. Co., Chicago, Milwaukee and Moline.
Robinson, Cary & Sands Co., St. Paul and Duluth.

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Holland—Spliethoff, Beewukes & Company, Rotterdam, Holland.
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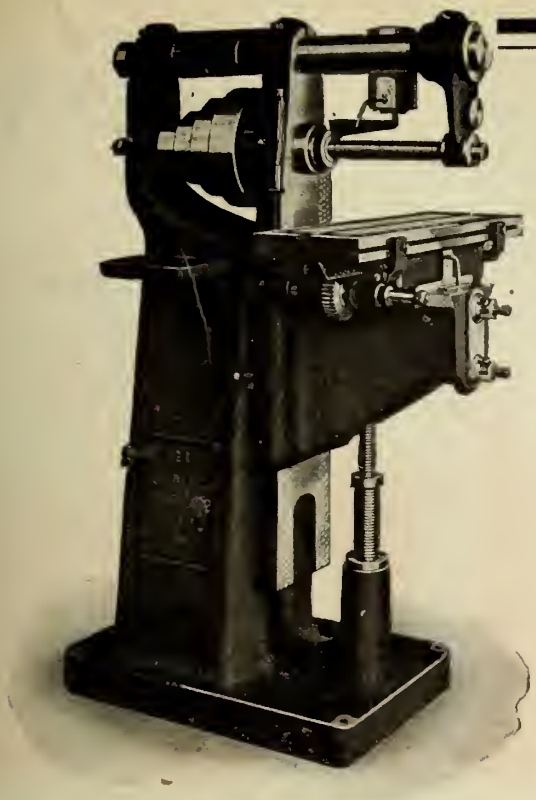


No. 1 McCrosky Heavy Duty Hand Miller

ANNOUNCING

McCrosky

Milling Machines

The McCROSKY TOOL CORPORATION has purchased the entire assets, patent rights, equipment, and goodwill of the Davenport Manufacturing Co., manufacturers of the Davenport Milling Machines. A new plant, furnished with increased equipment, assures adequate production. Immediate production will concentrate on two styles, a Heavy Duty Hand Miller and a Combination Hand and Power Miller.

McCrosky Milling Machines are a worthy addition to

McCrosky COST CUTTING TOOLS

Bulletin No. 1A has full descriptions. Send for it to-day.

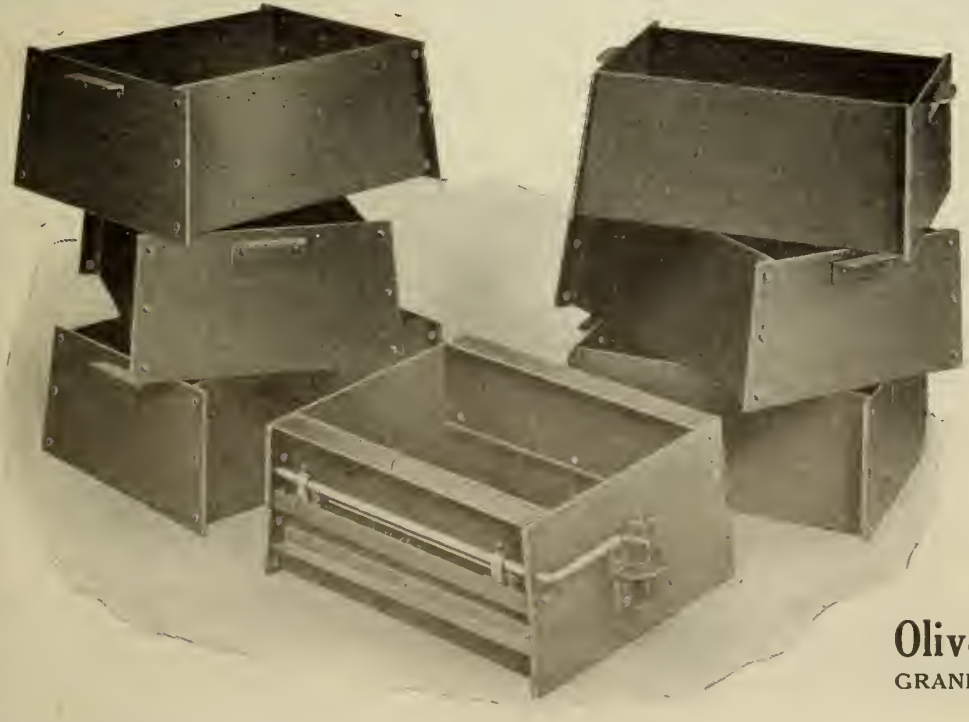
McCrosky Tool Corporation, Meadville, Pa., U.S.A.

Represented by: H. A. Harrison, Toronto; Yeates Machinery and Supply, Montreal

For Export: Benjamin Whittaker, Ltd., 56 Ludgate Hill, London, E.C.

Oliver All-Steel Self-Releasing Tapered Snap Flasks

for Bench or Machine Molding. Cut shows a Bench Flask Outfit, comprising cope, drag and six jackets as regularly furnished. Note the sand support within the flask at parting line, the lever connection for operating opposite sand support, the malleable iron lugs and pins perfectly fitted and hardened, jackets tapered to match the mold made by flask.



OLIVER STEEL TAPERED SNAP FLASKS are rapid, accurate and molders like them because they are so convenient. They save both time and labor and are suitable for Bench or Machine.

They are simple and strong and being well made will last for many years. Run-outs are impossible. Storage space is saved.

Practically Indestructible
What more is to be desired?
Write for further details.

Oliver Machinery Co.

GRAND RAPIDS, MICH., U.S.A.

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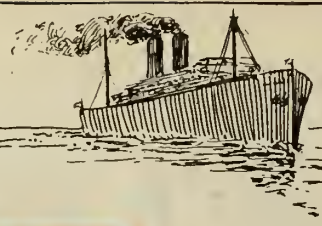


SHIPPED

"Tools that Cut Fast and True—"

Butter

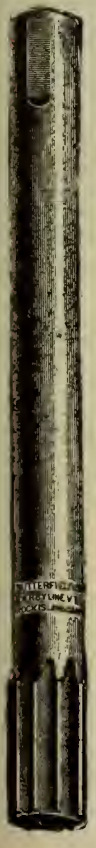
Twist Drills Taps, Dies, Reamer Gear and Milling Cutters

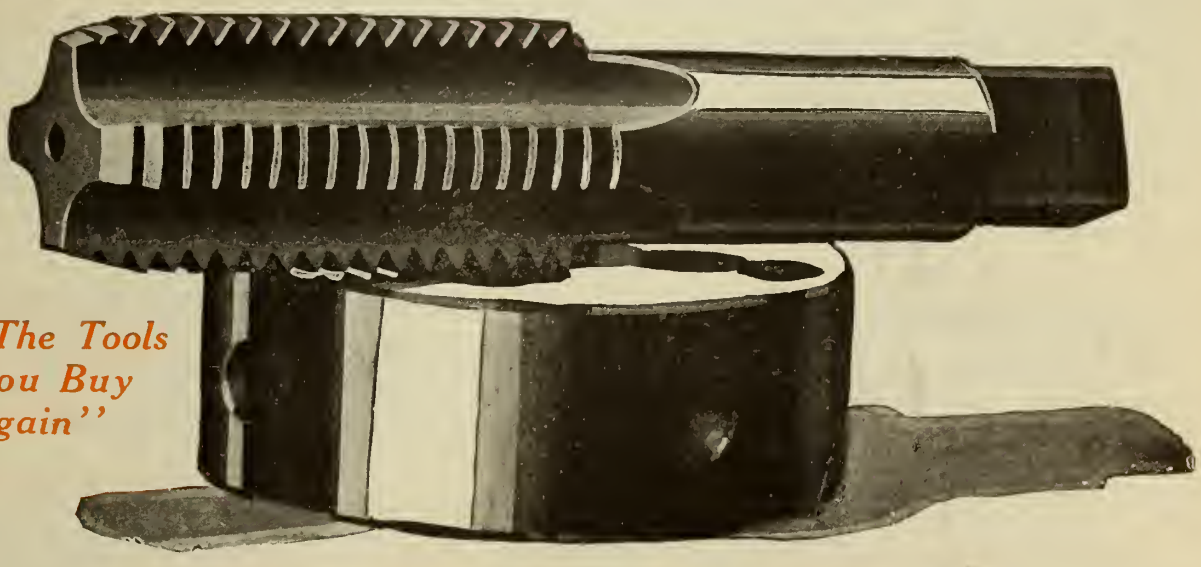
For Uniformly Dependable Service Specify Butterfield !

AROUND THE WORLD

field

BUTTERFIELD represents a **superior quality** of Canadian-made tools. They have won a reputation abroad which enables them to compete with success in the markets of the World—they are shipped to many ports.





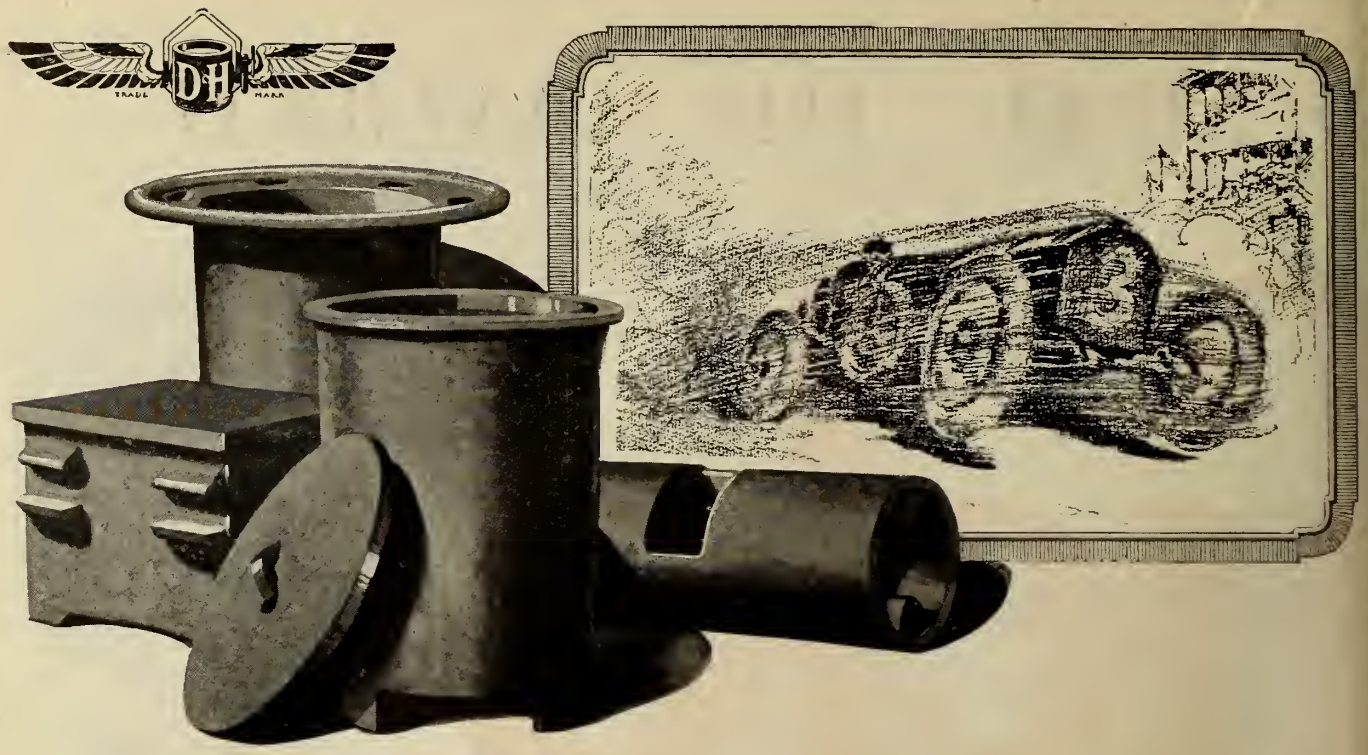
"The Tools You Buy Again"

BUTTERFIELD & CO., DIVISION

UNION TWIST DRILL COMPANY

ROCK ISLAND, P.Q. Toronto Office, 220 King St. W.

FOREIGN REPRESENTATIVES:—Great Britain, Geo. H. Alexander, 83-84 Coleshill St., London, England; France, Italy, Belgium, and Switzerland, Fenwick Freres, 8 Rue de Rocroy, Paris; Sweden, Norway, and Denmark, Ab. Sigfr. Anderson & Co., Malmo; Spain, Casamitjana Hermanos, Barcelona; Japan; Abe-Kobei & Co., Yokohama; Greece, Stephen C. Stephanson, 11 Lycourgan St., Athens; Netherlands, Wynmalen & Hausman, Rotterdam; Australia, H. R. Richardson, 82 Pitt St., Vickery's Chambers, Sydney; South America, Charles Dreyfus, B. Mitre, 785, Buenos Aires, R.A.



Victors

Bulletin N-21 Shows Why

POWER—speed—endurance: the three essentials of successful racers. Bearings, crankshafts and other case-hardened parts stand up under the strain only in the measure that they are perfect.

Perfection of case can be reached more nearly and more easily with Cast Nichrome Containers because they do not warp, grow, crack or scale under repeated heating and cooling. Heat penetration is therefore uniform throughout the life of the containers.

Thousands of hours at 1800°F. are assured by the Cast Nichrome Service Guarantee. Shorter heats, larger furnace capacity and less fuel consumption are added advantages. Stock patterns in hundreds of sizes; or special designs for special requirements—

Manufactured under HENDERSON Patents by the

Heat Treating Containers of

CANADIAN DRIVER-HARRIS Co., Ltd.

WESTERN OFFICE AND DEPOT CHICAGO 28 So JEFFERSON ST

WALKERVILLE, ONT. CANADA

AMERICAN OFFICE AND WORKS HARRISON, N J

BRITISH WORKS MANCHESTER ENGLAND

Cast Nichrome

ENDURE IN HIGH TEMPERATURE

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

THE

TRADE K–T IE A MARK

FOUNDRY

GALT, ONT.

Do Your Castings Cost Too Much?

A rearrangement of your patterns might cut their cost 25%; a different method of molding them might double your production at no increase in molding cost. *We can advise you* and we have expert metal and wood patternmakers who are able to make any changes that may commend themselves to you.

If you need some new Patterns

send us a sample, blueprint or sketch, and ask for our advice. It won't cost you anything. If our advice is good and commends itself to you, it is only fair to assume that our work will be equally satisfactory, and we need the work as badly as you need the patterns.

We are in a position to do turning, boring, drilling or other semi-finishing operations on castings supplied by us.

ASK US

STEEL TUBING

FOR Agricultural Implements, Trolley Arms, Fence Posts, Bedsteads—and all kinds of manufacturing purposes. Reliable quality, uniform in size, 14 to 20 gauge, size ⅜" to 2" outside diameter.

STANDARD TUBE & FENCE COMPANY, LTD.
WOODSTOCK, ONT.

McKenzie Saw Table

A New and Better SAW TABLE

Saves Time and Space

This New McKenzie Saw Table has several outstanding features which make it the best machine of its kind to buy. Does the same work as machines of larger dimensions, costs less, takes up less space and produces work faster. It is 23½" x 30". Distance from saw to ripping fence is 13". Floor space 30" x 36". Furnished with belt, ripping fence, two mitre fences and 9" saw.

Specially suitable for pattern shops, technical and manual training schools. **Write for prices and full particulars.**

THE D. McKENZIE MACHINE CO.

GUELPH, ONT.

If interested tear out this page and place with letters to be answered.

WHY DO YOU ADVERTISE

When You Are Behind In Deliveries ?

THIS seems to be a very natural question, and the answer involves the discussion of a vital policy of this business—a policy that is fundamental.

If we were building a business for to-day our policy would vary from day to day with the temporary changes with which every business has to contend.

But we are building for the time to come and we hope that this business will become many times greater than it is to-day. Without the proper foundation it would undergo violent changes dependent upon temporary national, local or even imaginary conditions.

If we should permit ourselves to become inflated with self-confidence when business conditions are favorable, restricting our selling and advertising activities, and go down in the dumps when conditions are not so favorable, this business would not amount to any more than the existing conditions would make of it.

We say right now, without reservations, that we hope, regardless of how aggressive and efficient our manufacturing department may be, that it will never be able to catch up with our selling organization.

If our efforts should be halted in the middle of the road in times of liberal buying to wait on the manufacturing department, there might come a time when the manufacturing department would have to suspend operations while waiting on the sales organization.

With such a policy we would be running around in a circle, disorganizing one day and reorganizing the next.

The greater the demand for our product, the quicker the turnover for merchants; and the more frequent the turnovers, the larger is the volume of profit.

In this business advertising is a sales policy—the same as our policy of maintaining a sales organization—and we might as well consider the elimination of one as the other. Neither will be eliminated, as this business needs both if we are building for the future.

We hope the idea will never creep into this organization that there will be any let-up in aggressive methods, which might suggest that when business is good there is no occasion for work and when business is poor it is too hard to get.

We constantly have in mind that the American people are much more concerned in their own affairs than in ours, and if we should restrict our selling and advertising activities they will begin to forget us—and this would be our fault.

We are going ahead with the idea of increasing the present momentum in favor of our goods; and if conditions should turn face about, our dealers and ourselves will be in a better position to hurdle obstacles than if we originated a policy for each condition as it arose.

Reprinted from "GRAPHITE," a monthly magazine published by Joseph Dixon Crucible Co., Jersey City, N.J.

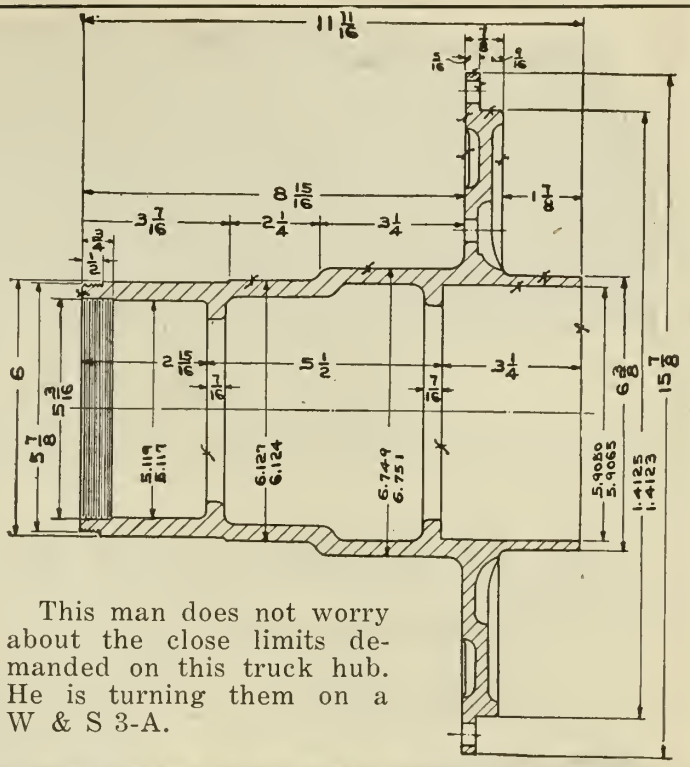
"Production—A Human Problem"

Automotive Industries
Editorial, July 8th

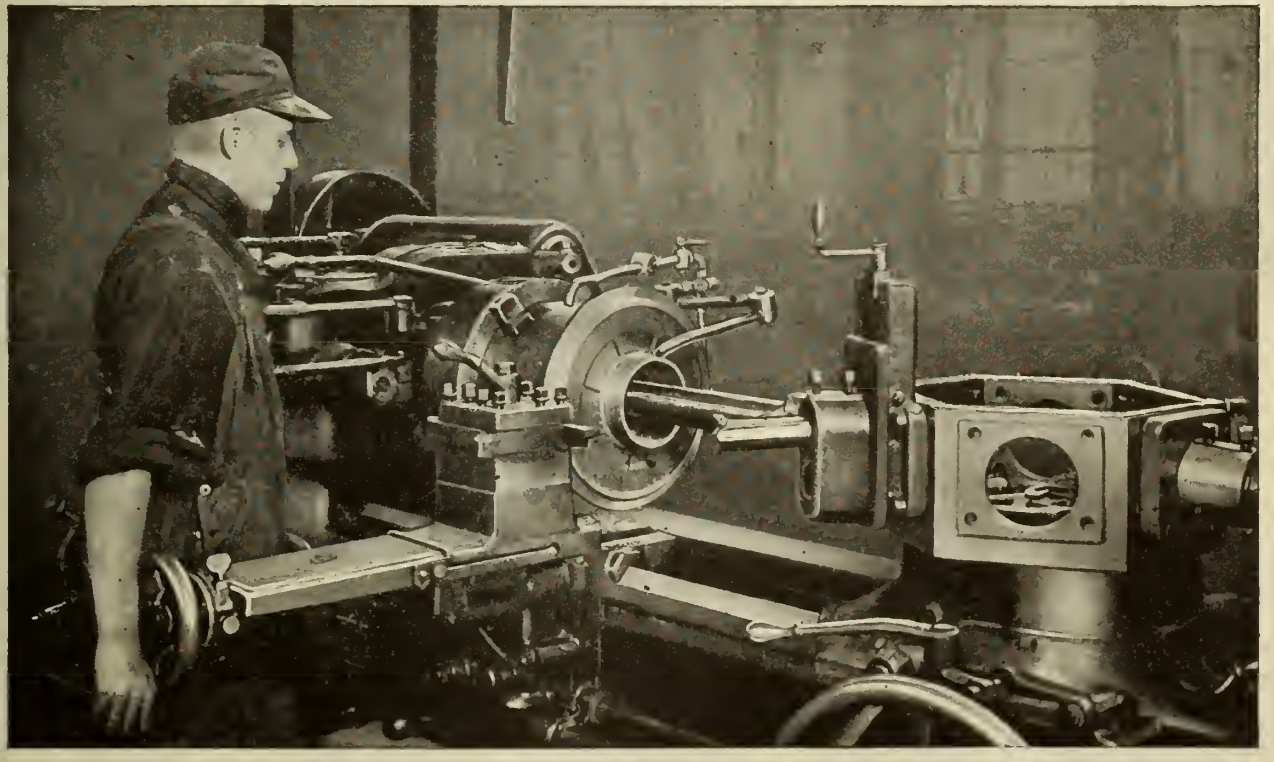
You can increase your production and profits and at the same time insure the whole-hearted co-operation of your operators by installing Warner & Swasey Turret Lathes.

Ask any Turret Lathe operator. He'll tell you he prefers to work on Warner & Swasey Turret Lathes because he can do more and better work on them with less effort.

Warner & Swasey Turret Lathes are rigid, powerful and accurate; easy to tool and easy to operate.



This man does not worry about the close limits demanded on this truck hub. He is turning them on a W & S 3-A.



The Warner & Swasey Company, CLEVELAND, OHIO, U.S.A.

New York Office, Singer Bldg. **Boston Office, Oliver Bldg.** **Buffalo Office, Iroquois Bldg.**
Detroit Office, Ford Bldg. **Chicago Office and Show Room, 618-622 Washington Bouvd.**

CANADIAN AGENTS:
A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg, Vancouver, St. John.
Williams & Wilson, Ltd., Montreal.

FOREIGN AGENTS:
Charles Churchill & Co., Ltd., London, Birmingham, Manchester, Bristol, Newcastle-on-Tyne, Glasgow.
Allied Machinery Company, Paris, Turin, Zurich, Barcelona, Brussels.
Wilhelm Sonesson Company, Malmo, Copenhagen, Stockholm, Gothenburg.
R. S. Stockvis en Zonen, Rotterdam.
Benson Brothers, Sydney, Melbourne, Adelaide.
Yamatake & Company, Tokyo.
McLeod & Company, Calcutta.
Anderson, Meyer & Company, Ltd., Shanghai, Tientsin, Pekin, Hankow, Canton, Yumanfu, Changhau, Kalgan, Hongkong.
Brossard-Mopin & Company, Saigon, Singapore, Haiphong.

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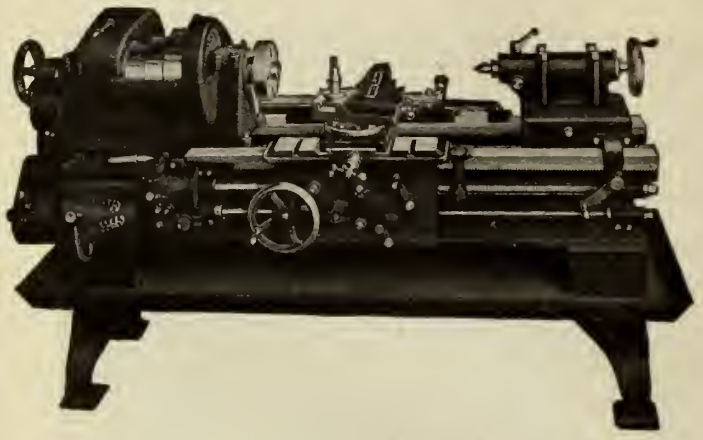
Hoyt's Nickel Genuine Babbitt For the Severest Duties And Highest Speeds

HOYT METAL COMPANY
MONTREAL TORONTO WINNIPEG

"LEHMANN LATHES"

Will Put the Same Degree of Efficiency Into *Your* Shops as They Have in Many Others



TWO SIZES—16", Swing 18¼" and 18", Swing 20¼"

Because they are constructed "right" of the best material, workmanship and design, and therefore are adaptable to all conditions, whether it be work requiring accuracy to the highest standards or for the heavy duty where power, strength and rigidity are required.

Convince yourself of these facts! Let us send you complete specifications of this superior lathe and the names of some of the larger concerns who are using "LEHMANN LATHES" for better results.

We know you are interested, so don't put off writing us. Do it to-day. Now!

LEHMANN MACHINE COMPANY, 612 S. BROADWAY, ST. LOUIS, U. S. A.

HANNA

IRON ORE - PIG IRON

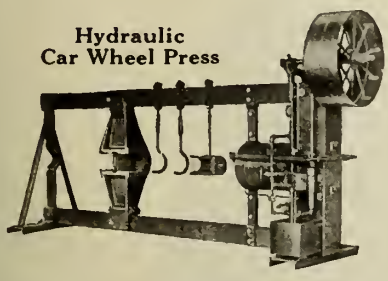
Sales Agents:

Cleveland Pittsburgh Toronto Buffalo Detroit

LOURIE HYDRAULIC PRESSES

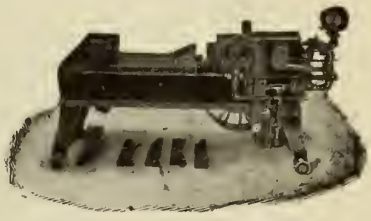
For Every Purpose Requiring Pressure

Hydraulic Car Wheel Press



We manufacture a complete line of presses for bending, straightening, forcing, forming, broaching, welding, baling, and many other purposes.

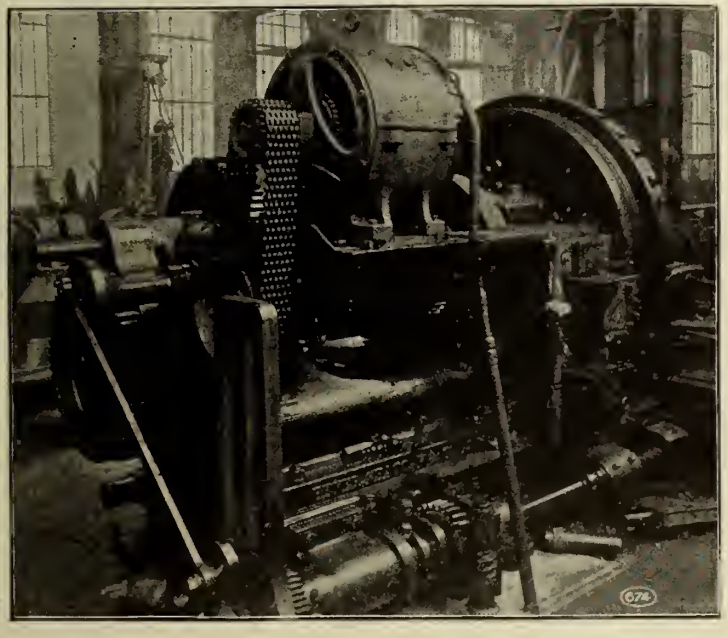
Hydraulic Bulldozer



Write for Catalogue

LOURIE MANUFACTURING CO.
SPRINGFIELD, ILLINOIS, U.S.A.

RENOLD DRIVING CHAINS



20 H.P. Renold Silent Chain Operating 36" Lathe.

are
POSITIVELY
the most
COMPACT
EFFICIENT
and
DURABLE
Means of Transmitting Power to Machine Tools

Write for our New Booklet, 200/5 "Notes on Selection of Chain Gear"

HANS RENOLD
OF CANADA, LIMITED
11 St. Sacrament St., MONTREAL

CUT GEARS
Theoretically Correct
PROMPT SERVICE
ROBERT GARDNER & SON
LIMITED
52 NAZARETH ST., MONTREAL, P. Q.
RAWHIDE OR METAL

If interested tear out this page and place with letters to be answered.

The Belt that Saves Power

P.M.S. BELTS

This is the Brand—"P.M.S." It is a truly scientific production and has proved itself the ideal belt for hard places. The "non-slip" feature, the "minimum-stretch" feature, and the exceptional adaptability and durability of P.M.S. Belting, are points that make it the choice of the most experienced Belt Buyers in Canada.

If you have power transmission problems, let our expert give you the benefit of his opinion.

Gutta Percha & Rubber, Limited

Head Office and Factory: TORONTO

BRANCHES IN ALL THE LEADING CITIES OF THE DOMINION

Says a Reader of Many Years Standing:

"I do feel that your paper is the most interesting and readable financial journal published in this country and, perhaps, in the entire North American Continent. Each week I somehow find time to read every word of it—mostly in bed, late at night. I find I have to read THE FINANCIAL POST in order to maintain myself properly abreast with the bigger things and movements taking place in this country."

THE FINANCIAL POST is published for men who are interested in big things——not necessarily men who personally have big financial interests at stake, but for men who are eager to know what is happening that will have a bearing on business and the well-being of Canada generally.

THE entire editorial organization of the MacLean Publishing Company is at hand to co-operate with the editors of THE FINANCIAL POST. Specialists in many businesses write for THE POST. A practical farmer, in constant touch with the farming conditions, deals with crop prospects.

THE POST is a paper edited by specialists for business specialists.

The Financial Post

MONTREAL
128 Bleury Street

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143 University Ave.

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Union Trust Bldg.

Subscription Price per year (52 Issues) $5.00

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TRAHERN
REG. U.S. PAT. OFF.

TRAHERN Pumps are the most efficient, durable equipment for furnishing coolant—either water or oil—to any Machine Tool.

Prolong the cutting edge of tools
Reduce tool costs
Prevent overheating
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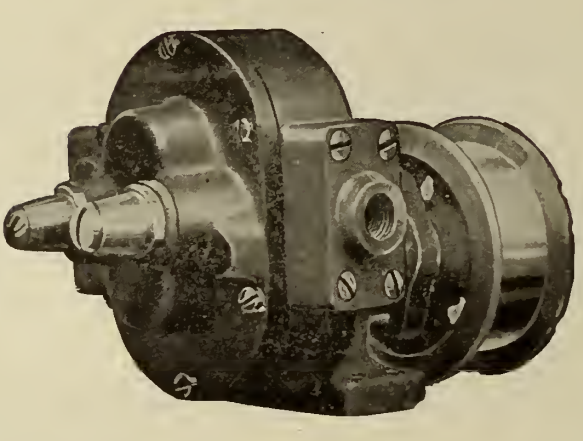

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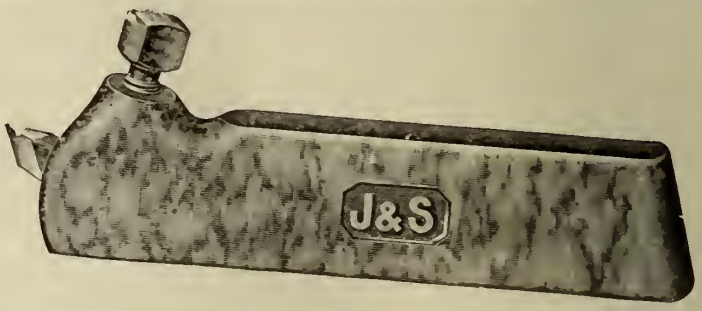

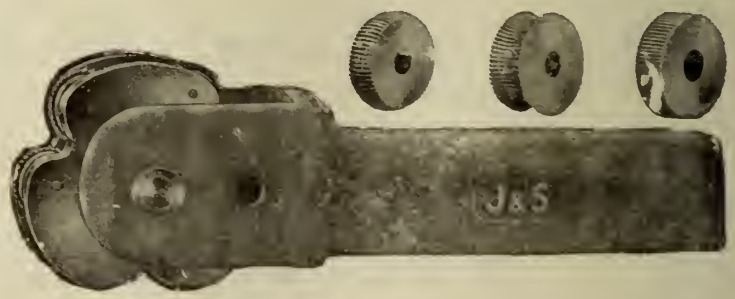

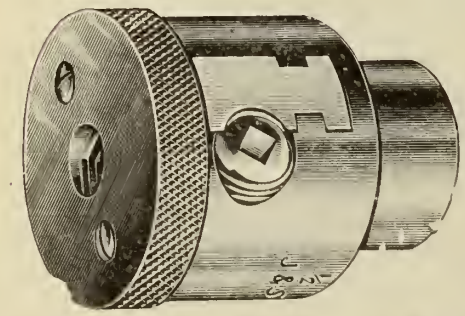

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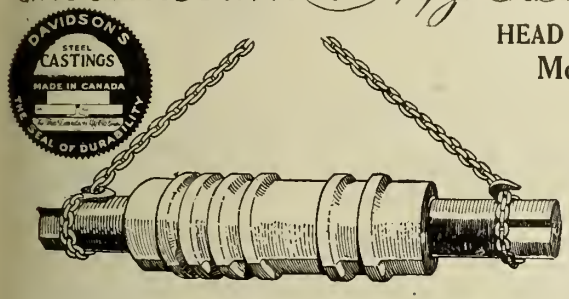

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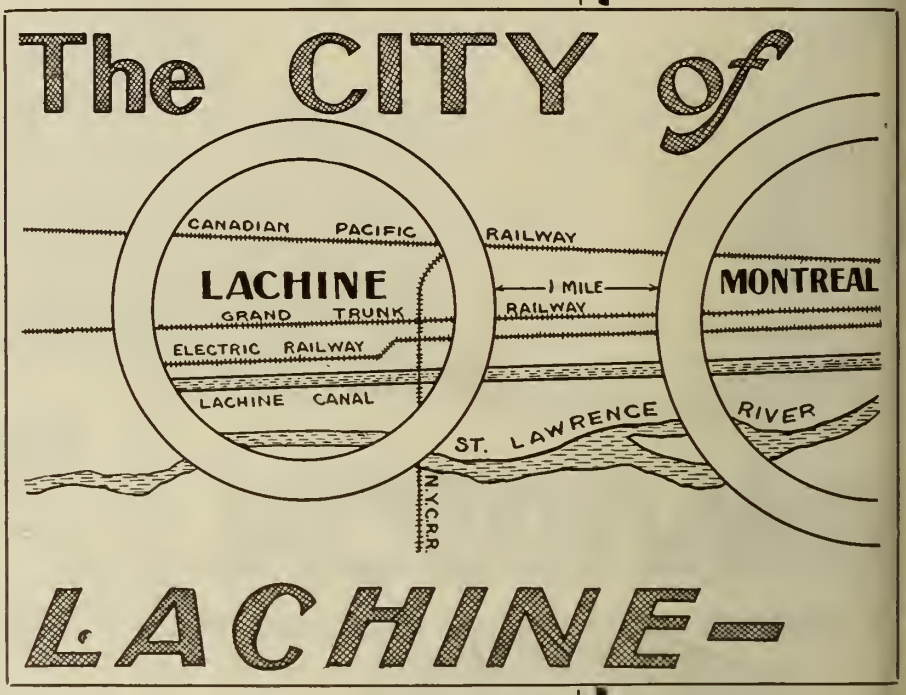

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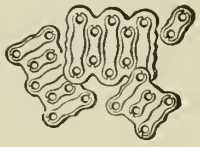

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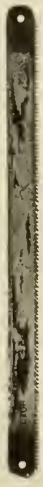

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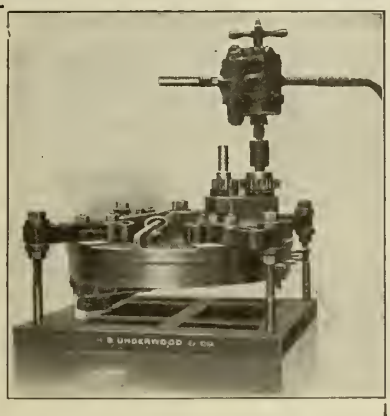

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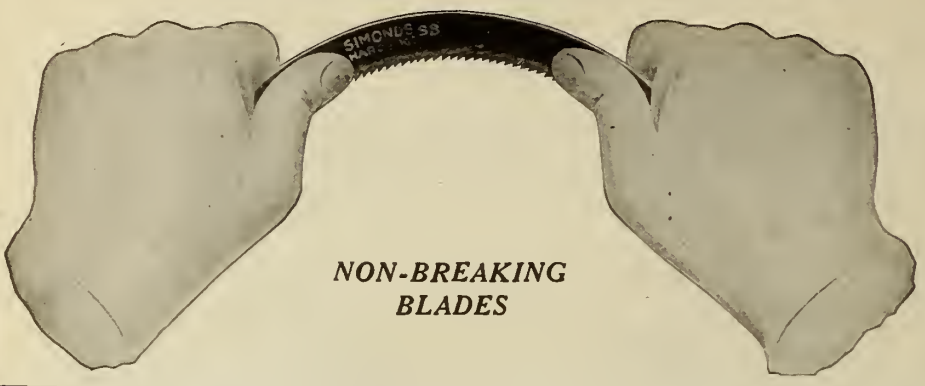

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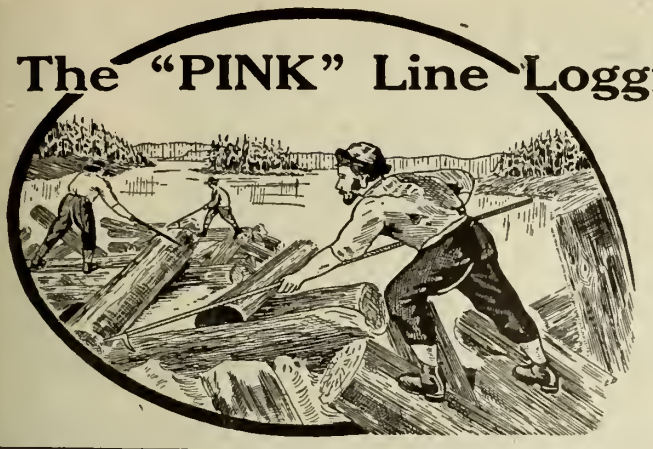

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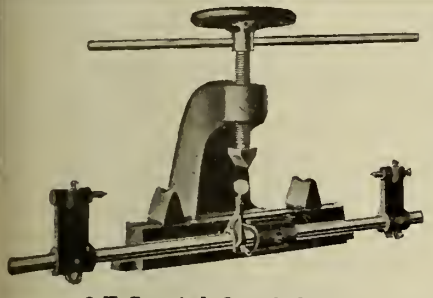

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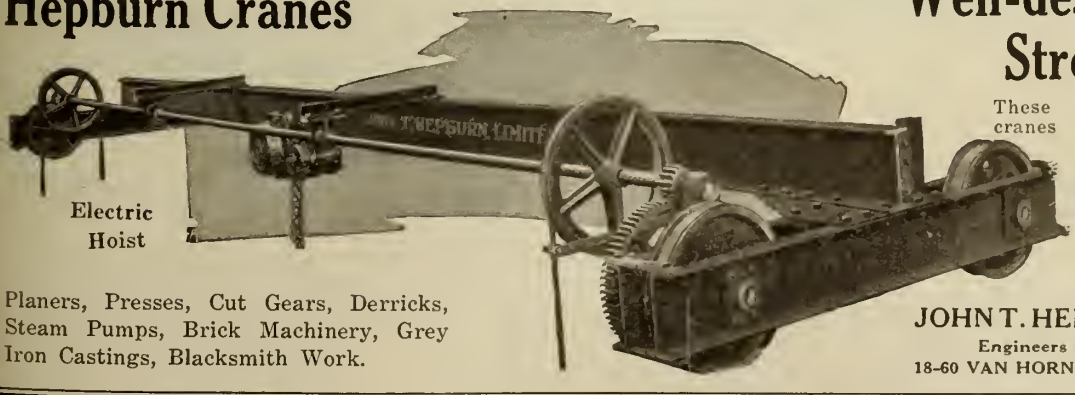

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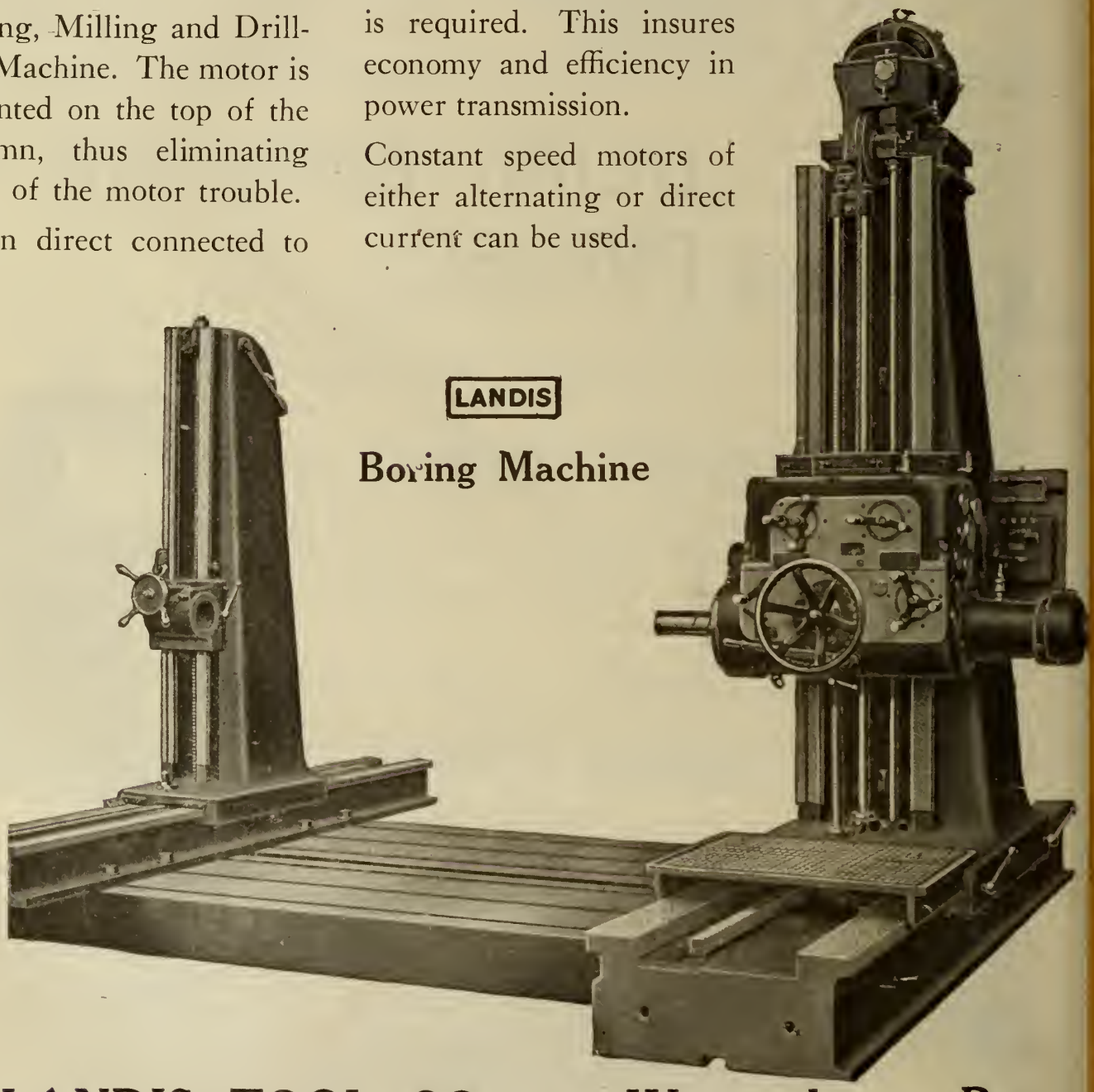

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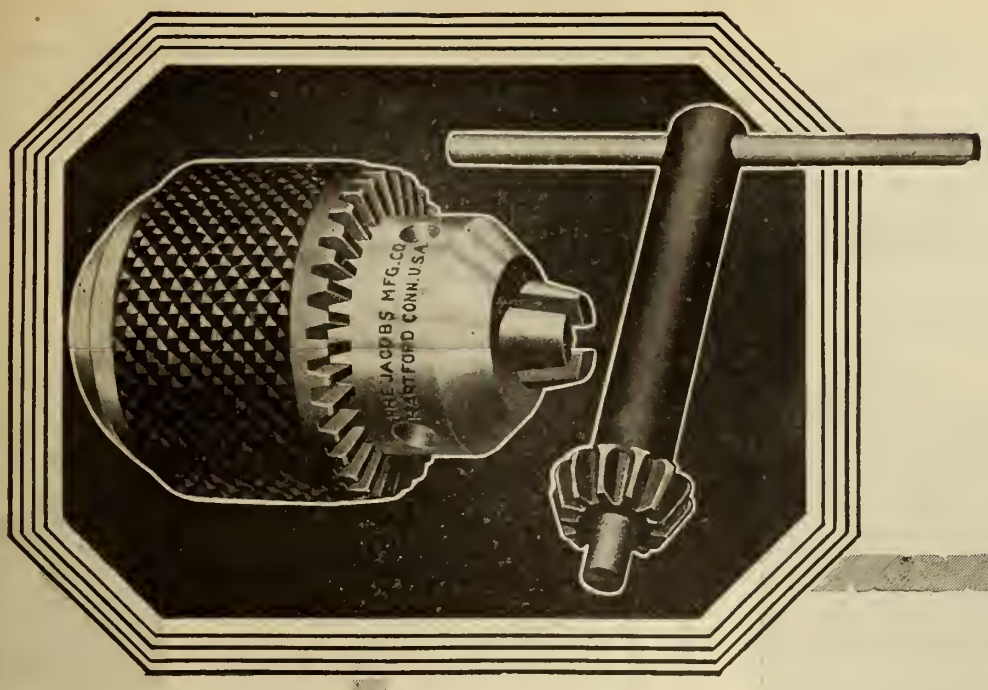

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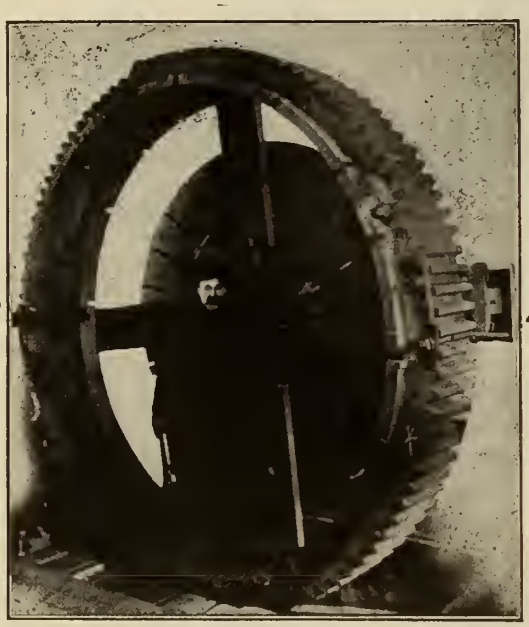

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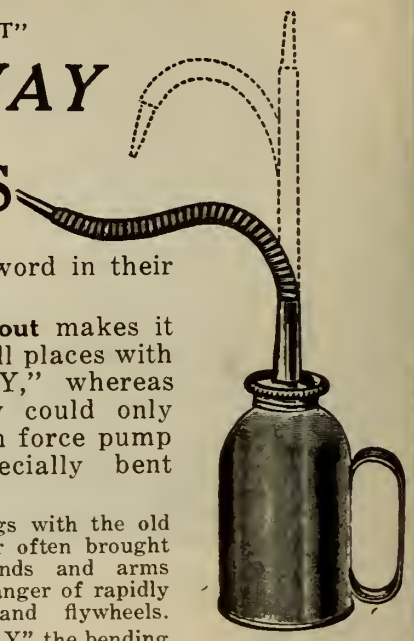

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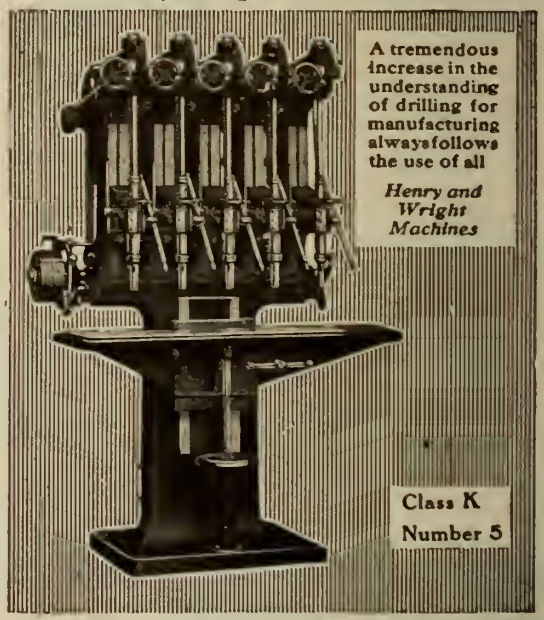
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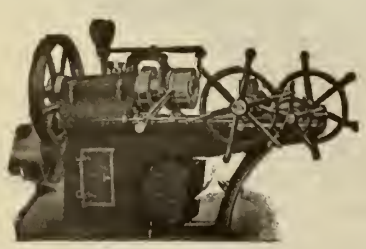

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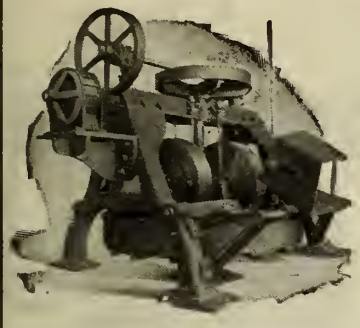

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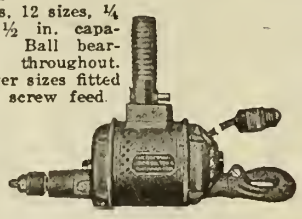

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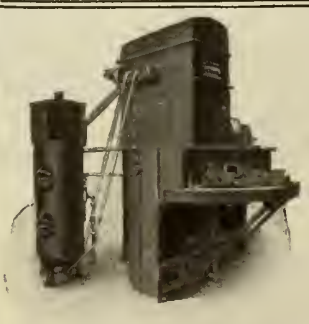
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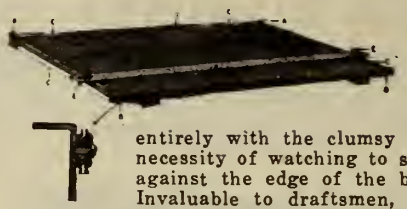

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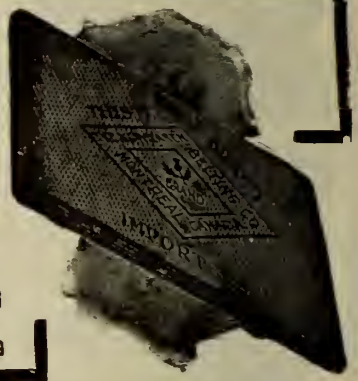

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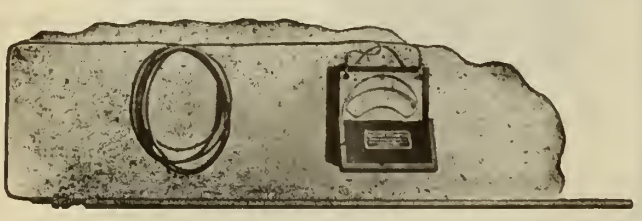

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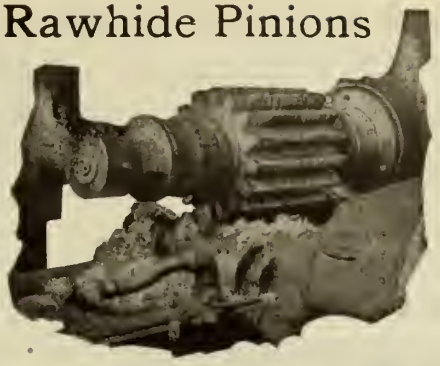

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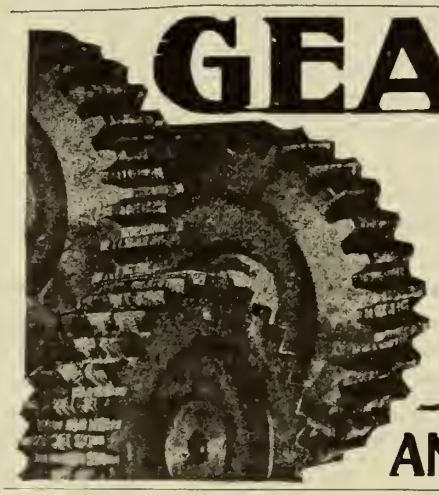

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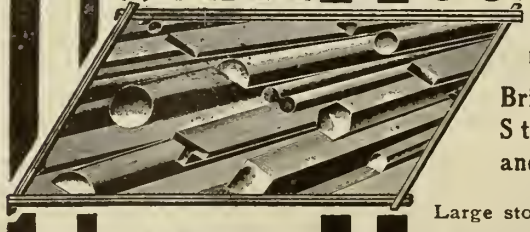

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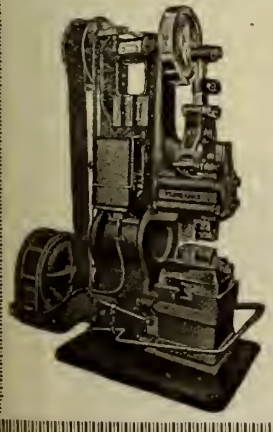

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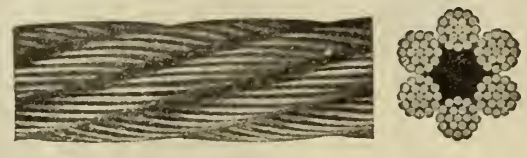

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Morrow Screw & Nut Co., John, Ingersoll.
Rice, Lewis & Son, Toronto, Ont.
Steel Co., of Canada, Ltd, Hamilton.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Co.., J. H. Brooklyn, N.Y.

BOLTS, COUPLING
Galt Machine Screw Co., Ltd., Galt, Ont.

BOLTS, STAY
Morrow Screw & Nut Co., John, Ingersoll.

BOLTS, SPRING SHAKLE
Can. Winkley Co., Ltd., Windsor, Ont.
Morrow Screw & Nut Co., John, Ingersoll

BOLTS, PATCH
Morrow Screw & Nut Co., John, Ingersoll.

BOLT AND NUT MACHINERY
Barber Mchy. Co., Ltd., Toronto, Ont.
Bertram & Sons Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Gardner & Son, Robt., Montreal.
Landis Machine Co., Waynesboro, Pa.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ohio.
Universal Mach. Co., Bowling Green, O.
Williams Machinery Co., A. R., Toronto

BOLT THREADING MACHINERY
Jardine & Co., Ltd., . B., Hespeler.
Landis Machine Co., W esboro, Pa.
National Acme Co., Cleveland, Ohio.
Victor Tool Co., Waynesboro, Pa.

BONDING MACHINES (Electric Railway)
The Lincoln Electric Co., Toronto, Ont.

BORING MACHINES, PNEUMATIC CYLINDER
Cleveland Pneumatic Tool Co., Toronto.
Canadian Fairbanks-Morse Co., Montreal
Can. Ingersoll-Rand Co., Sherbrooke Que
Garlock-Walker Mach. Co., Toronto.

BORING MACHINES, UPRIGHT AND HORIZONTAL
Barber Mchy. Co., Ltd., Toronto, Ont.
Bertram & Sons Co., John, Dundas.
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Herbert, Ltd., Alfred, Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Hoefer Mfg. Co., Freeport, Ill.
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Oliver Mach'y Co., Grand Rapids, Mich.
Rockelson Machine & Tool Co., Toronto.
Rockford Drilling Mchs. Co, Rockford, Ill
Strelinger, Chas. A. Co., Windsor, Ont.

BORING AND TURNING MILLS
Barber Mchy. Co., Ltd., Toronto, Ont.
Bertram & Sons Co., John, Dundas.
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Pond Mch. & S'ply Co., Geo. F., Montreal
Herbert, Ltd., Alfred, Toronto, Ont.
Knight Metal Products, Toronto.
Oliver Mach. Co., Grand Rapids, Mich.
Niles-Bement-Pond Co., New York.
Strelinger, Chas. A. Co., Windsor, Ont.

BOXES, CAST IRON
Brown & Sharpe Mfg. Co., Providence, R.I.

BOXES, STEEL SHOP AND TOTE
Cleveland Wire Spring Co., Cleveland.

BRAKES
Brown, Boggs & Co., Hamilton, Can.
Electric Steel & Metals, Ltd., Welland.

BRASS—SHEETS, ROLLS, PLATES, and RODS
Brown's Copper and Brass Rolling Mills, New Toronto.

BRASS ALLOYS
British Smelting & Refining Co., Ltd., Montreal, Que.

BRASS AND COPPER TUBING
Lyman Tube & Supply Co., Montreal, Que.

BRASS FOUNDERS
Canada Metal Co., Toronto.
St. Lawrence Welding Co., Montreal.
Tallman Brass & Metal Co., Hamilton.

BRASS GOODS
Crane, Ltd., Montreal, Que.

BRASS PIPE AND TUBE
Crane, Ltd., Montreal, Que.

BRASS WORKING MACHINERY
Barber Mchy. Co., Ltd., Toronto, Ont.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machinery Co., Toronto.
Warner & Swasey Co., Cleveland, O.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Pratt-O-Lite Co., Inc., Toronto, Ont.
Wood Turret Machine Co., Brasil, Ind.
Williams Machy. Co., A. R., Toronto.
Brown's Copper and Brass Rolling Mills, New Toronto.

BRAZING EQUIPMENT
Chicago Flexible Shaft Co., Chicago, Ill.

BRICKS, FIRE
Elk Fire Brick Co., Can., Ltd., Hamilton, Ont.

BRIDGES, RLY. AND HIGHWAY
Canadian Mead-Morrison Co., Limited, Montreal, Que.
Dominion Bridge Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.

BROACHING MACHINES
Strelinger Co., C. A., Windsor, Ont.

BRONZE—SHEETS, ROLLS, PLATES, and RODS
Brown's Copper and Brass Rolling Mills, New Toronto.

BRONZE, NAVAL
Canada Metal Co., Toronto.
Tallman Brass and Metal Co., Hamilton.

BRONZE COPPER
Canada Metal Co., Toronto.

BRUSHES, CARBON
Lyman Tube & Supply Co., Montreal, Que.

BUFFING AND POLISHING MACHINERY
Ford-Smith Mach. Co., Hamilton.
Pond Mchy. & S'ply Co., Geo. F. Montreal
Garlock-Walker Machinery Co., Toronto.
Petrie, Ltd., H. W., Toronto.

BUCKETS, DUMP
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
St Lawrence Welding Co, Ltd , Montreal

BUCKETS, ELEVATOR
Can. Link-Belt Co., Toronto, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
nce Welding Co, Ltd., Montreal

BUCKETS, CLAM SHELL, CRAB, DUMP
Brown Hoisting Machinery Co., Cleveland, Ohio.
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Ltd, Walkerville.

BULLDOZERS
Bertram & Sons Co., John, Dundas.
Canada Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machinery Co., Toronto.
Lourie Manufacturing Co., Springfield, Ill
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

BURNERS, OIL AND NATURAL GAS
Northern Crane Works, Ltd., Walkerville.
W. S. Rockwell Co., New York, N.Y.

BURRS, IRON AND COPPER
Parmenter & Bulloch Co., Gananoque,.

BUSHINGS, BRONZE
Morrow Screw & Nut Co., John, Ingersoll.

CALIPERS
Brown & Sharpe Mfg. Co., Providence, R.I.
Pangborn Corporation, Hagerstown, Md.

CABINETS, SAND BLAST
Pangborn Corporation, Hagerstown, Md.

CABLE, ELECTRIC
International Machinery & Supply Co., Ltd., Montreal, Que.

CABLES, TRANSMISSION AND TELEPHONES
Northern Electric Co., Ltd., Montreal.

CALKS, BOOT
Lufkin Rule Co., of Can., Windsor, Ont.

CANNERS' MACHINERY
Bliss, E. W. Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Can.

CANNERS' CONVEYORS
Can. Link-Belt Co., Toronto, Ont.

CARBIDE
Carter Welding Co., Ltd., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.
Union Carbide Co., of Canada, Limited, Weland, nt.

CARBONIZING BOXES
Can. Driver-Harris Co., Ltd., Walkerville
Katie Foundry, Galt, Ont.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.
Swedish Crucible Steel Co., Windsor.

CARRIERS, PNEUMATIC TUBE
Jones & Glasco, Montreal.

CARS, INDUSTRIAL
Can. Blower & Forge Co., Kitchener, Ont
Can. Fairbanks-Morse Co., Ltd, Montreal
Elec. Steel & Metals, Welland, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

CAR MOVERS
Holden Co., Ltd., Montreal, Que.

CASES, FILING
Economy Drawing Table Co., Adrian, Mich.

CASTINGS, ALUMINUM, BRASS BRONZE, COPPER, AND GUN METAL
Algoma Steel Corp., Sault Ste. Marie.
Franklin Mfg. Co., Syracuse, N.Y.
Canada Metal Co., Ltd., Toronto, Ont.

CASTINGS, DIE CAST
Canada Metal Co., Ltd., Toronto, Ont.
Franklin Mfg. Co., Syracuse, N.Y.
Fisher Motor Co., Ltd., Orillia, Ont.
Tallman Brass & Metals Ltd., Hamilton, Ont.

CASTINGS, STEEL—ALL KINDS
Canada Electric Castings, Ltd., Orillia, Ont.
Dominion Foundries & Steel Ltd., Hamilton, Ont.
Electric Steel & Metals Co., Welland.
Meeta Machine Co., Pittsburgh, Pa.

CASTINGS, ELECTRIC AND ALLOY STEEL
Can. Elec. Castings Co. Ltd., Orillia, Ont
Dominion Foundries & Steel Ltd., Hamilton, Ont.

CARRIERS COUPLING BOLTS
John Morrow Screw & Nut Co., Ingersoll
Alexander Fleck Ltd., Ottawa.
Tallman Brass & Metal Co., Hamilton.

CASTINGS, BENCH LEG.
Brown & Sharpe Mfg. Co., Providence, R.I.

CASTINGS, BRASS AND IRON
Algoma Steel Corp., Sault Ste. Marie.
International Machinery and Supply Co., Ltd., Montreal, Que.

CASTINGS, BUILDING
Katie Foundry, Galt, Ont.

CASTINGS, GRAY IRON
Bernard Industrial Co., A., Fortierville, Q.
Brown & Sharpe Mfg. Co., Providence, R.I.
Brown, Boggs Co., Ltd., Hamilton.
Can. Elec. Castings Co, Ltd., Orillia, Ont
Alexander Fleck, Ltd., Ottawa.
Gardner & Son, Robt., Montreal.
Hull Iron & Steel Foundries, Ltd., Hull
International Malleable Iron Co., Guelph
Kennedy & Sons, Ltd., Wm., Owen Sound.
Katie Foundry, Ltd., Galt, Ont.
Hamilton Co., Wm., Peterboro.
McFarlane Engineering Ltd., G. W., Paris, Ont.

CASTINGS, PLUMBERS'
Katie Foundry, Galt, Ont.

CASTINGS, NICHROME
Can. Driver-Harris Co., Ltd., Walkerville

CASTINGS, HARDWARE
Katie Foundry, Galt, Ont.

CASTINGS, STEEL CHROME AND MANGANESE STEEL
Thos. Davidson Mfg. Co., Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Hull Iron & Steel Foundries, Ltd., Hull.
Kennedy & Sons, Ltd, Owen Sound.

CASTINGS, MALLEABLE
International Malleable Iron Co., Guelph

CASTINGS, NICKEL STEEL
Hull Iron & Steel Foundries, Ltd., Hull.

CEMENT MACHINERY
Can. Fairbanks-Morse Co., Ltd., Montreal.
Gardner, Robt., & Son, Montreal.

CEMENT HANDLING MACHINERY
Can. Link-Belt Co., Toronto, Ont.

CEMENT TOOLS
Atkins & Co., E. C., Hamilton, Ont.

CENTERING MACHINES
Victoria Foundry Co., Ottawa, Ont.

CENTRE REAMERS
Bertram & Sons Co., John, Dundas.
Butterfield & Co., Inc., Rock Island, Que.
Gardner, Robt. & Son, Montreal.
Hurlburt, Rogers Mch. Co., South Sudbury, Mass.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co., of Canada, Galt, Ont.

CHAIN, WELDED COIL
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

CHAIN BLOCKS
Aikenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Ford Chain Block & Mfg. Co., Phila., Pa.
Garlock-Walker Machy. Co., Toronto.
Lyman Tube & Supply Co., Montreal, Que.
Morris Crane & HoistCo., Herbert, Niagara Falls, Ont.
Oliver Engineering Co., Montreal.
Rice Lewis & Son, Toronto, Ont.
Jones & Glasco, Montreal, Que.

CHAINS, AGRICULTURAL
Canadian Link-Belt Co., Ltd., Toronto, Ont.
Morse Chain Co., Ithaca, New York.
Renold of Canada Ltd., Montreal.

CHAINS, AUTOMOBILE ENGINE
Can. Link-Belt Co., Ltd., Toronto, Ont.
Morse Chain Co., Ithaca, New York.
Renold of Canada Ltd., Montreal.

CHAINS, BICYCLE, DRIVE AND BLOCK
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold of Canada Ltd., Montreal.

CHAINS, FOR ELEVATORS AND CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Petrie, Ltd., H. W., Toronto.
Renold of Canada Ltd., Montreal.
Williams Mchy Co., A. R., Toronto, Ont.

CHAIN, MALLEABLE, DETACHABLE AND RIVETED
Can. Link-Belt Co., Toronto, Ont.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

CHAINS, POWER TRANSMISSION
Canadian Link-Belt Co., Ltd., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, New York.
Glasgow, N.S.
Renold of Canada Ltd., Montreal.

CHAINS, SPROCKET WHEEL
Can. Link-Belt Co., Ltd., Toronto, Ont.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.

CHAIN DRIVES
Can. Link-Belt Co., Toronto, Ont.
Coventry Chain Co., Coventry, England.
Jones & Glasco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold of Canada Ltd., Montreal.

CHASERS
National Acme Co., Cleveland, Ohio.
Taylor, J. A. M., 318 Stair Bldg., Toronto, Ont.

CHEMISTS
Toronto Testing Lab'tory, Ltd., Toronto

CHUCKS, AERO, AUTOMATIC
Garvin Machine Co., New York.

CHUCKS, CENTERING
Hopkson & Pettis Mfg. Co., New Haven Conn.

CHUCKS, COLLET, AIR
Elliott & Whitehall Mach. & Tool Co Galt, Ont.
Smalley-General Co., Inc., Bay City, Mich
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

CHUCKS, DRILL, LATHE AND UNIVERSAL
Aikenhead Hardware Co., Toronto, Ont
Bertram & Sons Co., John, Dundas
Can. Blower & Forge Co., Kitchener, Ont
Can. Fairbanks-Morse Co., Ltd., Montreal
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Ltd., Brantford.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Mach'y Co., Toronto.
Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Chicago, Ill.
Herbert Ltd., Alfred, Toronto, Ont.
Jacobs Mfg. Co., Hartford, Conn.
Ker & Goodwin Machine Co., Ltd.
Knight Metal Products, Toronto.
Modern Tool Co., Erie, Pa.
Rice Lewis & Son, Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

CHUCKS, DRILL, AUTOMATIC AND KEYLESS
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener.
McCrosky Tool Corp., Meadville, Pa., U. S. A.
Strelinger, Chas. A. Co., Windsor, Ont.

CHUCKS, FRICTION AND TAP
Victor Tool Co., Waynesboro, Pa.

CHUCKS, MAGNETIC
Heald Machine Co., Worcester, Mass.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co, Ltd., A. R., Montreal

CHUCKS, RING WHEEL
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.

CHUCKS, WHEEL, CAR
Hopgson & Pettis Mfg. Co., New Haven Conn.

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Barber Mchy. Co., Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Garvin Machine Co., New York.
Gisholt Machine Co., Madison, Wis.
National Acme Co., Windsor, Vt.
Niles-Bement-Pond Co., New York.
Rockelson Machine & Tool Co., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Warner & Swasey Co., Cleveland, O.
Wood Turret Mach. Co., Brasil, Ind.
Williams Mchy Co., A. R., Toronto, Ont.

CIRCULATING SYSTEMS FOR LUBRICATING OIL
Bowser Co., Ltd., S. F., Toronto, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

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CLEANING COMPOUND
Oakley Chemical Co., New York.

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CLOCKS, WATCHMAN, PORTABLE
Gisholt Machine Co., Madison, Wis.

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Crane, Ltd., Montreal, Que.

CLUTCHES, CHAIN
Wright Mfg. Co., Lisbon, Ohio.

CLUTCHES, FRICTION AND PULLEY
Bernard Industrial Co., A., Fortierville, Q
Can. Link-Belt Co., Toronto, Ont.
Carlyle Johnson Mach. Co., Manchester Conn.
Positive Clutch & Pulley Wks., Aurora Ont.
Jones & Glasco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que

COAL CRUSHERS
Canadian Link-Belt Co., Ltd., Toronto, Ont.
Canadian Mead-Morrison Co., Limited, Montreal, Que.

COAL HANDLING MACHINERY
Brown Hoisting Machinery Co., Cleveland, Ohio.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Canadian Mead-Morrison Co., Limited, Can. Link-Belt Co., Toronto, Ont.
Montreal, Que.
Dominion Bridge Co., Montreal, Que.
MacGovern & Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert
Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont
Nova Scotia Steel & Coal Co., New

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COLLARS, SHAFTING
Can. Driver-Harris Co., Ltd., Walkerville
Williams & Co., J. H., Brooklyn, N.Y

COLLECTORS, PNEUMATIC
Can. Blower & Forge Co., Kitchener
Sturtevant Co., B. F., Galt, Ont.

COLLETS
Becker Milling Machine Co., Boston

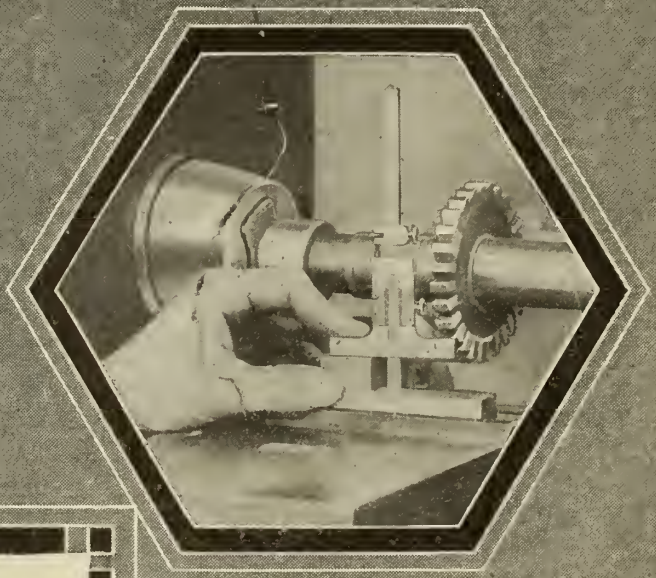
COMPOSITION INGOT
Canada Metal Co., Toronto, Ont.

COMPOUNDS, CUTTING AND GRINDING, DRAWING, STAMPING
Oakley Chemical Co., New York, N.Y.

COMPRESSORS, AIR
Atkine & Co., E. C., Hamilton, Ont.
Can. Ingersoll-Rand Co., Sherbrooke.
Cleveland Pneumatic Tool Co., Toronto.
Curtis Pneumatic Machy. Co., St. Louis
Elliott & Whitehall, Galt, Ont.
Garlock-Walker Machy. Co., Toronto.
Holden Co., Ltd., Montreal, Que.
MacGovern & Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto.

B.S.

Is The Tool Room Complete ?



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CONDUITS

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Globe Engineering Co., Hamilton, Ont.
Homer & Wilson, Hamilton, Ont.
Katie Foundry, Ltd., Galt, Ont.
Victoria Foundry Co., Ottawa.

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Can. Link-Belt Co., Toronto, Ont.
Jones & Glasco, Montreal.

CONVEYORS—McCASLIN GRAVITY BUCKET

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Garlock-Walker Machinery Co., Toronto.
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Brown's Copper and Brass Rolling Mills, New Toronto.

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Rice Lewis & Son, Toronto, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.

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Brown & Sharpe Mfg. Co., Providence, R.I.
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Ford-Smith Machine Co., Hamilton, Ont.
Foster Machine Co., Elkhart, Ind.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co, Ltd., A. R., Montreal
Williams Mchy Co., A. R., Toronto, Ont.

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Can. Link-Belt Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto.
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CRANES, OVERHEAD, HAND AND

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Independent Pneumatic Tool Co., Chicago

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Can. Link-Belt Co., Toronto, Ont.
Northern Crane Works, Walkerville.

ELECTRIC

Volta Manufacturing Co., Welland, Ont.

CUPS, OIL

Can. Winkley Co., Ltd., Windsor, Ont.

COVERS, OIL HOLE

Can. Winkley Co., Ltd., Windsor, Ont.

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Brown Hoisting Machinery Co., Cleveland, Ohio.
Can. Link-Belt Co., Toronto, Ont.
Canadian Mead-Morrison Co., Limited, Montreal, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.

CRANE RUNWAYS

MacKinnon Steel Co., Sherbrooke, Que.

CRANES, JIB

Brown Hoisting Machinery Co., Cleveland, Ohio.

CRANES, LOCOMOTIVE

Brown Hoisting Machinery Co., Cleveland, Ohio.
Holden Co., Ltd., Montreal, Que.

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Brown Hoisting Machinery Co., Cleveland, Ohio.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Morris Crane and Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Petrie, Ltd., H. W., Toronto.

CRANES, PILLAR

Brown Hoisting Machinery Co., Cleveland, Ohio.

CRANES, TRAVELLING, ELECTRIC AND HAND POWER

Brown Hoisting Machinery Co., Cleveland, Ohio.
Can. Link-Belt Co., Toronto, Ont.
Curtis Pneumatic Machy. Co., St. Louis.
Dominion Bridge Co., Montreal.
Hepburn, John T., Ltd., Toronto.
Lyman Tube & Supply Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Niles-Bement-Pond Co., New York.
Northern Crane Works, Walkerville.
Oliver Engineering Co., Montreal.

CRANK SHAFTS

Canada Found's & Forgings Ltd., Welland
Williams & Co., J. H., Brooklyn, N.Y.

CRANES, PORTABLE

Aikenhead Hardware Co., Toronto, Ont.
Brown Hoisting Machinery Co., Cleveland, Ohio.
Can. Link-Belt Co., Toronto.
Lyman Tube & Supply Co., Montreal, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Rice Lewis & Son, Toronto, Ont.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

CRIMPS, LEATHER

Graton & Knight Mfg. Co., Worcester, Mass.

CRUSHERS

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Elec. Steel & Metals, Welland, Ont.

CUPOLAS

Can. Blower & Forge Co., Kitchener.
Northern Crane Works, Walkerville.

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Bowser Co., Ltd., S. F., Toronto, Ont.

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See Bolt Cutters.

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Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Fellows Gear Shaper Co., Springfield, Vt.

CUTTERS, FLUE

Cleveland Pneumatic Tool Co., Toronto,

CUTTER HEADS

Oliver Machinery Co. Grand Rapids, Mich

CUTTERS, PIPE (See Pipe Cutters)

CUTTERS, MILLING

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Cleveland Twist Drill Co., Cleveland.
Elliott & Whitehall Mach. & Tool Co, Galt, Ont.
Foss Mchy. & Sply Co., G. F., Montreal.
Garvin Machine Co., New York.
Illinois Tool Works, Chicago, Ill.
Ingersoll Mache. Co., Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Toronto, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Whitney Mfg. Co., Hartford, Conn.
Wilt Twist Drill Co. Walkerville, Ont.

CUTTER RELIEVING MACHINES

Cleveland Milling Machine Co., Cleveland.

CUTTING-OFF MACHINES

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Atkins & Co., E. C., Hamilton, Ont.
Bertram & Sons Co., John, Dundas.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Foss Mchy & S'ply Co., Geo. F., Montreal
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hurlburt, Rogers Machy. Co., South Sudbury, Mass.
Kennedy & Sons, Wm., Owen Sound.
Lyman Tube & Supply Co., Montreal, Que.
Niles-Bement-Pond Co., New York, N.Y.
Prest-O-Lite Co., Inc., Toronto, Ont.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Wells Bros. of Can., Galt, Ont.
ford, Ont.
Williams Tool Corp. of Can. Ltd., Brantford, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

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Swan & Finch, Inc., New York.

CUTTING OIL, RECLAIMING SYSTEM

Bowser Co., Ltd., S. F., Toronto, Ont.

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Prest-O-Lite Co., Inc., Toronto, Ont.
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Ford-Smith Machine Co., Hamilton, Ont.
Smalley General Co., Inc., Bay City, Mich

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Kelley Reamer Co., Cleveland, O.

DEHUMIDIFYING

B. F. Sturtevant Co, Galt, Ont.

DERRICKS

Aikenhead Hardware Co., Toronto, Ont.
Dominion Bridge Co., Montreal.
Hepburn Co., Ltd., J. T., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

DERRICK HOISTS

Canadian Mead-Morrison Co., Limited, Montreal, Que.

DIAMOND (BORTZ)

Furniss, Clarke & Co., Montreal, Que.

DIAMOND TOOLS

Can. Desmond-Stephan Mfg. Co., Hamilton
Ford-Smith Machine Co., Hamilton, Ont.
Furniss, Clarke & Co., Montreal, Que.
Joyce-Koebel Co., Inc., New York City.
Wheel Trueing Tool Co., Detroit.
Petrie, Ltd., H. W., Toronto.

DIAMONDS, CARBON AND BORTZ

Joyce Koebel Co., Inc., New York, N.Y.
Wheel Trueing Tool Co., Detroit.

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Joyce, Koebel & Co., Inc., New York.
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Fisher Motor Co., Ltd., Orillia, Ont.
Tallman Brass & Metals Ltd., Hamilton, Ont.

DIE HEADS, AUTOMATIC

Greenfield Tap & Die Corp., Greenfield Mass.
Wells Bros. of Can., Galt, Ont.
Petrie, Ltd., H. W., Toronto.

DIES, BRASS PRINTING, EMBOSSING AND LETTERING

Matthews, Jas. H., & Co., Pittsburgh, Pa

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Butterfield & Co., Rock Island, Que.
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A. B. Jardine & Co., Ltd., Hespeler, Ont.
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Butterfield & Co., Rock Island, Que.
Brown, Rogers Co., Hamilton, Ont.
Crescent Mche. Co., Ltd., Montreal, P.Q.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardner, Robt. & Son, Montreal.
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Pilot Steel & Tool Co., Montreal, Que.
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Kimber & Hillier Mfg., Co., St. Catharines, Ont.

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Murchey Machine & Tool Co., Detroit.
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Niles-Bement-Pond Co., New York.
Strelinger, Chas. A. Co., Windsor, Ont.
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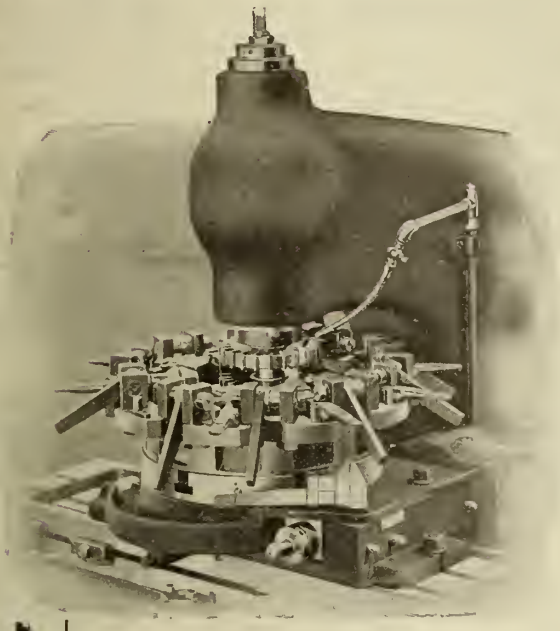
MILWAUKEE MILLING MACHINES



MILWAUKEE Vertical Milling Machines, like the horizontals, have a flanged spindle in place of a spindle with a threaded nose. The reverse for the spindle is self-contained—no overhead apparatus is necessary.

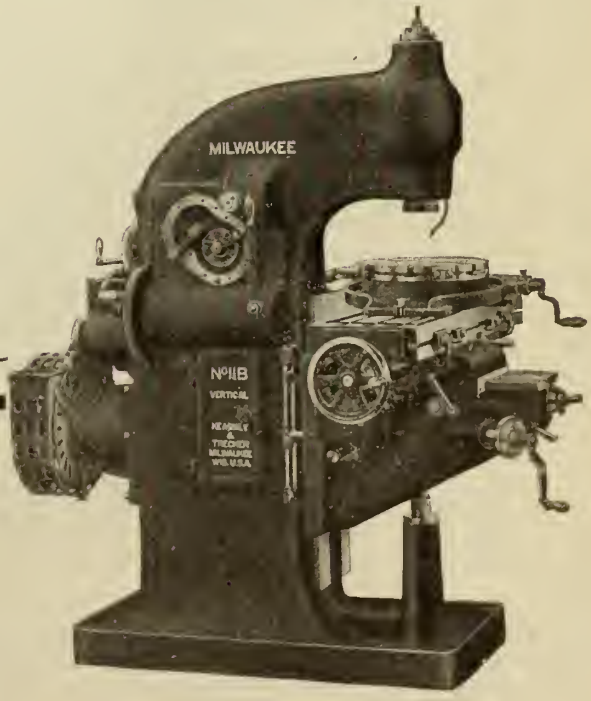
With the flanged spindle construction, cutters are held close to the spindle bearing and may be run in either direction that proves desirable. This is a most advantageous feature.

The spindle head is non-adjustable, except for wear, as sufficient adjustment for all practical purposes can be obtained by adjusting the knee alone. The non-adjustable spindle head construction is decidedly strong and rigid.

The main driving gear is always in a fixed position immediately behind the main bearing, reducing the torsional strain on the spindle and bringing the drive close to the cutter.

Milwaukee Vertical Milling Machines embody the same general features as the horizontal types. The column is a box section, semi-steel casting, reinforced with heavy vertical and horizontal internal walls. The knee is also a box section, semi-steel casting and has a solid top and extended slide. The table is of ample proportions and is not cored out but is finished all over, removing the possibility of distortion due to scale being left on one side.

Write for a copy of catalogue No. 21.



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ENAMELWARE
Crane, Ltd., Montreal, Que.

END MILLS
John Morrow Screw & Nut Co., Ingersoll

ENGINEERS—INDUSTRIAL CLEANING (Free Consultation)
Oakley Chemical Co., New York, N.Y.

ENGINEERS
Samuel Osborne (Canada) Ltd., Montreal.

ENGINES—HOISTING, PILE DRIVING, BRIDGE ERECTING, MINING
Canadian Mead-Morrison Co., Limited, Montreal, Que.

ENGINES, STEAM, GAS, GASOLINE
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Canadian Fairbanks-Morse Co., Montreal.
Holden Co., Ltd., Montreal, Que.
Johnson Mach. Co., Carlyle, Manchester, Conn.
MacGovern & Co., Montreal, Que.
Sturtevant Co., B. F., Galt, Ont.

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Johnson Mach. Co., Carlyle, Manchester, Conn.
Petrie, Ltd., H. W., Toronto.
A. R. Williams Machy. Co., Toronto.

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Holden Co., Ltd., Montreal, Que.
Ker & Goodwin Machine Co., Ltd., Brantford, Ont.

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Dom. Steel Products Co., Ltd., Brantford
Holden Co., Ltd., Montreal, Que.

ENGINES, MARINE
Can. Ingersoll-Rand Co., Sherbrooke, Que
Sturtevant Co., B. F., Galt, Ont

ENGINES, STATIONARY, FUEL, OIL, GAS OR GASOLINE
Holden Co., Ltd., Montreal, Que.

ESCUTCHEON PINS
Parmenter & Bulloch, Gananoque, Ont.

EXHAUST HEADS AND HOODS
Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Sturtevant Co., B. F., Galt, Ont.

EXHAUSTERS
Can. Blower & Forge Co., Kitchener, Ont.
Pangborn Corporation, Hagerstown, Md.
Petrie, Ltd., H. W., Toronto.
Sturtevant Co., B. F., Galt, Ont.
Can. Driver-Harris Co., Walkerville, Ont.

EXTRACTORS, TAP
Walton Co., The, Hartford, Conn.

EYE BOLTS AND NUTS
Can. Foundries & Forgings, Ltd., Welland, Ont.

EYE PROTECTORS
Standard Optical Co., Geneva, N.Y.

FACTORY GATES
Page Steel & Wire Co., Adrian, Mich.

FACTORY LOCATIONS
City of St. Johns, Quebec.

FACTORY SITES
City of St. Johns, Quebec.

FANS
Baird Machine Co., Bridgeport, Conn.
Can. Blower & Forge Co., Kitchener, Ont.
Sturtevant Co., B. F., Galt, Ont.

FENCING, WIRE
Page Steel & Wire Co., New York, N.Y.

FENCE, IRON AND FACTORY
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Page Steel & Wire Co., Adrian, Mich.

FERRO-TUNGSTEN
Vanadium-Alloys Steel Co., Pittsburgh, Pa

FIBRE, RODS AND SHEETS
Diamond State Fibre Co., Bridgeport Pa.

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Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Wm., Sheffield, Eng.
Ingersoll File Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Marshall, Son & Bunney, Toronto, Ont.
Nicholson File Co., Port Hope, Ont.
Rice Lewis & Son, Toronto, Ont.
Simonds Mfg. Co., Fitchburg, Mass.
Strelinger, Chas. A. Co., Windsor, Ont.
Whitman & Barnes Mfg. Co., Akron, O.
Wilkinson & Kompass, Hamilton, Ont.

FILES, COMMUTATOR SLOTTING
Lyman Tube & Supply Co., Montreal, Que.

FILING MACHINES, BENCH AND MOTOR DRIVEN
Barry Mfg. Co., Chicago, Ill.
Cochrane-Bly Co., Rochester, N.Y., U.S.A

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General Combustion Co., Ltd., Montreal, Que.

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Elk Fire Brick Co., Can., Ltd., Hamil-
General Combustion Co., Ltd., Montreal, Que.

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Brown & Sharpe Mfg. Co., Providence, R.I.

FIRE EXTINGUISHERS
Strong, Kennard & Nutt Co., Cleveland, O.

FITTINGS, CAST IRON, SCREWED, FLANGED
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Brown Engineering Corp., Toronto, Ont.
Crescent Mche. Co., Ltd., Montreal, Que.
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.
Toronto Tool Co., Toronto, Ont.

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William Hamilton Co., Peterboro, Ont.

FORGES, HAND PORTABLE
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Can. Blower & Forge Co., Kitchener.
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Rice Lewis & Son, Toronto, Ont.
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FORGES, OIL
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FORGINGS
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Nova Scotia Steel & Coal Co., New Glasgow, N.S.

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Garlock-Walker Machy. Co., Toronto, Ont
National Machy. Co., Tiffin, Ohio
Petrie, Ltd., H. W., Toronto.
Chicago Flexible Shaft Co., Chicago, Ill

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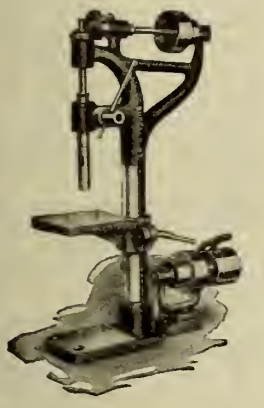

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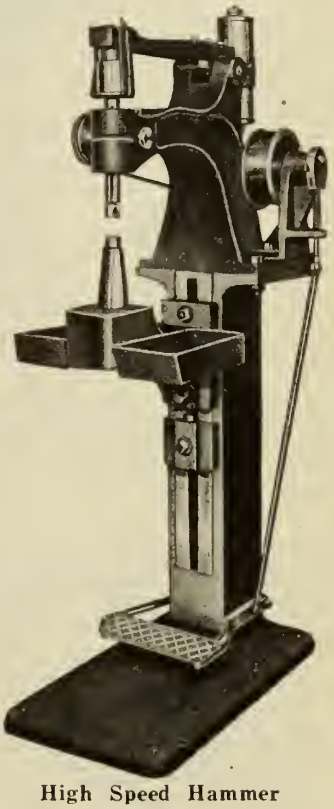
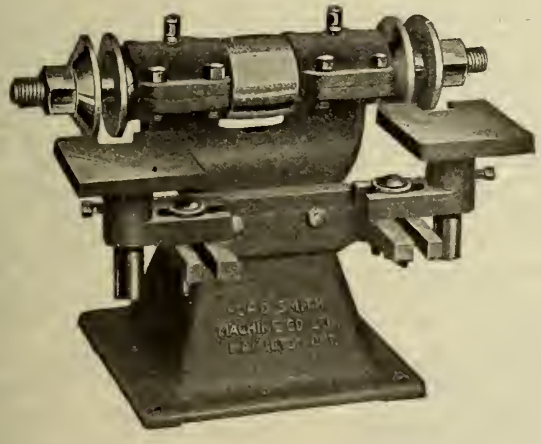


High Speed Hammer



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GAUGES, HYDRAULIC
Taylor Instrument Co., Rochester, N.Y.

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Greenfield Tap & Die Corp., Greenfield
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Streitnger, Chas. A. Co., Windsor, Ont.
Taylor, J. A. M., 318 Stair Bldg., Toronto
Toronto Tool Works, Toronto, Ont.
Wells Brothers Co. of Canada, Galt, Ont.

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Dom. Found. & Steel, Hamilton, Ont.
Kaiser-Ellison & Co., Ltd., Montreal.
Williams & Co., J. H., Brooklyn, N.Y.

GEAR BLANKS, CAST
Katie Foundry, Galt, Ont.

GEAR BLANKS, RAWHIDE
Lyman Tube & Supply Co., Montreal, Que.

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Fellows Gear & Shaper Co., Springfield, V.

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Fellows Gear & Shaper Co., Springfield, V.
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Petrie, Ltd., H. W., Toronto.
A. R. Williams Machy. Co., Toronto.

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Renold of Canada Ltd., Montreal.

GEARS, COMPENSATING
Morse Chain Co., Ithaca, New York.
Can. Link-Belt Co., Ltd., Toronto, Ont.

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Can. Link-Belt Co,, Toronto, Ont.
Diamond State Fibre Co., Bridgeport, Pa.
Dom. Steel Products Co., Ltd., Brantford.
Dominion Bridge Co., Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Elliott & Whitehall, Galt, Ont.
Gardner, Robt., & Son, Montreal.
Hamilton Gear & Machine Co., Toronto.
Hull Iron & Steel Found., Ltd., Hull, Q.
Jones & Glasco, Montreal.
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Philadelphia Gear Works, Philadelphia
Victoria Foundry Co., Ottawa.

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Gardner, Robt., & Son, Montreal.
Grant Gear Works, Boston, Mass.
Hamilton Gear & Machine Co., Toronto.
Hamilton Co., Ltd., Wm., Peterborough,
Jones & Glasco, Montreal.
Lyman Tube & Supply Co., Montreal, Que.
Philadelphia Gear Works, Philadelphia.
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GEARS, SPRING
Morse Chain Co., Ithaca, New York.

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Oliver Machinery Co., Grand Rapids, Mich

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GRINDERS, BENCH
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Garvin Machine Co., New York.
Globe Engineering Co., Hamilton, Ont.
Greenfield Machine Co., Greenfield, Mass.
Greenfield Tap & Die Corp., Greenfield, M.
Heald Machine Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.
Manhattan Machine & Tool Co., Grand Rapids, Mich.
Norton Co., Worcester, Mass.
Pratt & Whitney Co., Dundas, Ont.
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Gardner Machine Co., Beloit, Wis.
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Petrie, Ltd., H. W., Toronto.
Streitnger, Chas. A. Co., Windsor, Ont.
United States Elec. Tool Co., Cincinnati.
Wells Bros. of Canada, Galt, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

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Greenfield Machine Co., Greenfield, Mass.
Heald Machine Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Norton Co., Worcester, Mass.
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Grant Mfg. & Mach. Co., Bridgeport, Con
Garlock-Walker Machinery Co., Toronto.
Greenfield Machine Co., Greenfield, Mass.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool Co., Chicago
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
United States Elec. Tool Co., Cincinnati
Wisconsin Electric Co., Inc., Racine, Wis.
Williams Mchy Co., A. R., Toronto, Ont.
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Universal Grinding Mach. Co., Fitchburg, Mass.

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Heald Machine Co., Worcester, Mass.

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Barber Mchy. Co., Ltd., Toronto, Ont.
Fitchburg Grinding Mach. Co., Fitchburg, Mass.

GRINDERS, PNEUMATIC
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Cleveland Pneumatic Tool Co., Toronto.
Garlock-Walker Machinery Co., Toronto.
Heald Machine Co., Worcester, Mass.
Independent Pneumatic Tool Co., Chicago
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Brown & Sharpe Mfg. Co., Providence, R.I
Bristol Machine Tool Co., Bristol, Conn.
Manhattan Machine & Tool Co., Grand Rapids, Mich.

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Armstrong Bros. Tool Co., Chicago.
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Blount & Co., J. G., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I
Ford-Smith Machine Co., Hamilton, Ont.
Greenfield Machine Co., Greenfield, Mass.
Greenfield Tap & Die Corp., Greenfield.
National-Acme Co., Cleveland, Ohio.
Tabor Mfg. Co., Philadelphia, Pa.
Wells Bros. of Canada Galt, Ont.

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Manhattan Machine & Tool Co., Grand Rapids, Mich.
Modern Tool Co., Erie, Pa.
Norton Co., Worcester, Mass.
Williams Mchy Co, Ltd., A. R., Montreal

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Heald Machine Co., Worcester, Mass.
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Gisholt Machine Co., Madison, Wis.
Norton Co., Worcester, Mass.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

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Gardner & Son, Robt., Montreal.
Garvin Machine Co., New York.
Garlock-Walker Machy. Co., Toronto.
Greenfield Machine Co., Greenfield, Mass.
Haskins & Co., R. C., Chicago, Ill.
Herbert Ltd., Alfred, Toronto, Ont.
Niles-Bement-Pond Co., New York, N.Y.
Norton Co., Worcester, Mass.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
Wisconsin Electric Co., Racine, Wis.
Williams Mchy Co., A. R., Toronto, Ont.
Williams Tool Corp. of Can. Ltd., Brantford, Ont.

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Brown & Sharpe Mfg. Co., Providence, R.I
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Ford-Smith Machine Co., Hamilton, Ont.
Foss Mchy. & S'ply Co. G. F., Montreal.
Norton Co., Worcester, Mass.

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Atkins & Co., E. C., Hamilton, Ont.
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Diamond Saw & Stamping Wks., Buffalo.
Ford-Smith Machine Co., Hamilton, Ont.
Kayser-Ellison & Co., Ltd., Montreal.
Lyman Tube & Supply Co., Montreal, Que.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Plewes, Ltd., Winnipeg, Man.
Pilot Steel & Tool Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto.
Racine Tool & Machine Co., Racine, Wis.
Rice Lewis & Son, Toronto, Ont.
Simonds Mfg. Co., Fitchburg, Mass.
L. S. Starrett Co., Athol, Mass.
Standard Machy. & Supplies, Montreal.
Strelinger, Chas. A. Co., Windsor, Ont.
Victor Saw Works, Ltd., Hamilton.
Wilkinson & Kompass, Hamilton.
Williams Mchy Co., A. R., Toronto, Ont.

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Atkins & Co., E. C., Hamilton, Ont.
Can. Fairbanks-Morse Co., Montreal.
Ford-Smith Machine Co., Hamilton, Ont.
Garvin Machine Co., New York City.
Victor Saw Works, Hamilton, Ont.
Rice Lewis & Son, Toronto, Ont.
Streitnger, Chas. A. Co., Windsor, Ont.
Wilkinson & Kompass, Hamilton, Ont.

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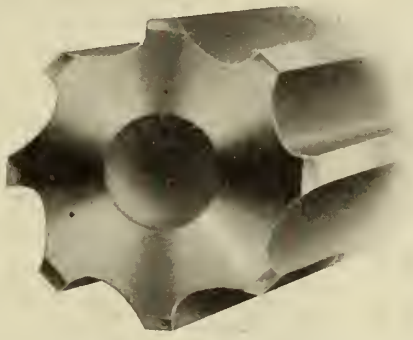
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., E. C., Hamilton, Ont.
Can. Fairbanks-Morse Co., Montreal.
Diamond Saw & Stamping Wks., Buffalo.
Foss Mchy. & S'ply Co., G. F., Montreal.
Ford-Smith Machine Co., Hamilton.
Perfect Machine Co., Galt, Ont.
Starrett Co., L. S., Athol, Mass.
Victor Saw Works, Hamilton, Ont.
Williams Mchy. Co., A. R., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

HAMMERS, FORGING
Nazel Eng. & Mach. Wks., Philadelphia.

HAMMERS, ELECTRIC
Hoskins & Co., R. C., Chicago, Ill.

Imco Flute Depth



Average Flute Depth

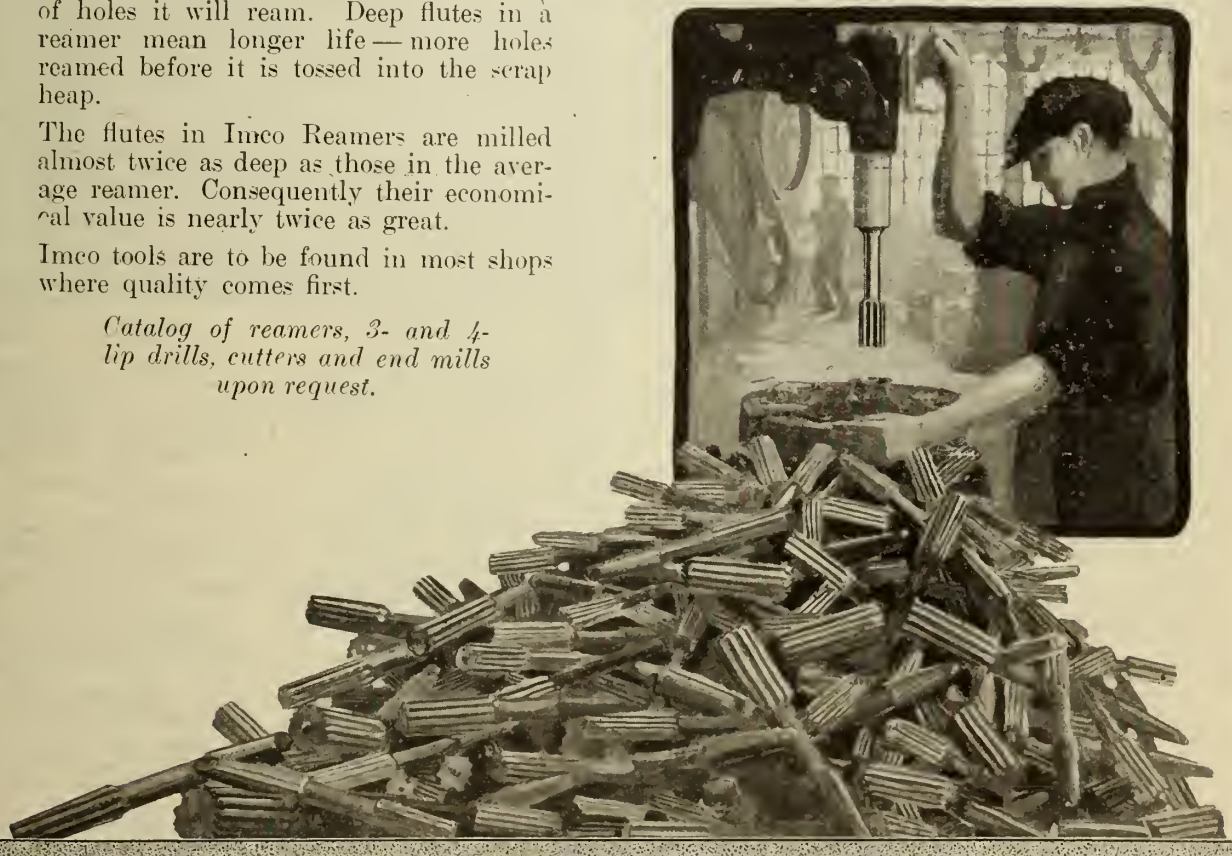
A Reamer's Value Is Its Length of Life

A reamer is just as good as the number of holes it will ream. Deep flutes in a reamer mean longer life — more holes reamed before it is tossed into the scrap heap.

The flutes in Imco Reamers are milled almost twice as deep as those in the average reamer. Consequently their economical value is nearly twice as great.

Imco tools are to be found in most shops where quality comes first.

Catalog of reamers, 3- and 4-lip drills, cutters and end mills upon request.



INGERSOLL MACHINE COMPANY
INGERSOLL ONT.

CHAS. A. STRELINGER CO., LIMITED, Windsor, Ontario

HAMMERS (DROP), MOTOR AND BELT DRIVEN
Beaudry & Co., Boston, Mass.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton.
Can. Billings & Spencer, Ltd., Welland.
Canada Machinery Corp., Galt, Ont.
High Speed Hammer Co., Rochester, N.Y.
Jardine & Co., A. B., Hespeler, Ont.
Niles-Bement-Pond Co., New York, N.Y.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Toledo Machine & Tool Co., Toledo.
United Hammer Co., Boston, Mass.
Williams Mchy Co, Ltd., A. R., Montreal

HAMMERS, HELVE POWER
Canada Machinery Corp., Galt, Ont.
Petrie, Ltd., H. W., Toronto.
West Tire Setter Co., Rochester, N.Y.
Williams Mchy Co, Ltd., A. R., Montreal

HAMMERS, CHIPPING, CAULKING, PNEUMATIC
Can. Ingersoll-Rand Co., Montreal, Que.
Garlock-Walker Machinery Co., Toronto.
Independent Pneumatic Tool Co., Chicago.
Nazel Eng. & Mach. Wks., Philadelphia.

HAMMERS, MARKING
Matthews & Co., Jas. H., Pittsburgh, Pa.

HAMMERS, NAIL MACHINE
Rice Lewis & Son, Toronto, Ont.
United Hammer Co., Boston, Mass.

HAMMERS, POWER
Nazel Eng. & Mach. Wks., Philadelphia.

HAMMERS, STEAM
Canada Machinery Corp., Galt, Ont.
Niles-Bement-Pond Co., New York.

HAND PLANERS
Oliver Mchry. Co., Grand Rapids, Mich.

HAND PLANING AND JOINTING MACHINERY
Oliver Engineering Co., Montreal, P.Q.

HAND LEATHERS OR PADS
Graton & Knight Mfg. Co., Montreal.

HANDLES, FIBRE
Diamond State Fibre Co., Bridgeport, Pa.

HANGERS
Brown & Sharpe Mfg. Co., Providence, R.I.
Canadian Link-Belt Co., Ltd., Toronto, Ont.

HANGERS, SHAFT
Algoma Steel Corp., Sault Ste. Marie.
Chapman Double Ball Bearing Co., Toronto.
Gray Ball Bearing Co., Ltd., Toronto.
Baird Machine Co., Bridgeport, Conn.
Can. S K F Co., Toronto, Ont.
Gardner & Son, Robt., Montreal.
Jones & Glassco, Montreal.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co, Ltd., A. R., Montreal

HARDNESS TESTING INSTRUMENTS
Shore Instrument & Mfg. Co., New York.

HEAD, AUXILIARY
Hoefer Mfg. Co., Freeport, Ill.

HEATING AND VENTILATING ENGINEERS
Can. Blower & Forge Co., Kitchener, Ont.
Sturtevant Co., B. F., Galt, Ont.

HEAT GAUGES, HARDENING AND ANNEALING
Shore Instrument & Mfg. Co., New York

HEAT TREATING EQUIPMENT
Chicago Flexible Shaft Co., Chicago, Ill.

HELMETS, SANDBLAST, AMMONIA
Strong, Kennard & Nutt Co., Cleveland

HIGH SPEED STEEL
See Steel.

HINGE MACHINERY
Baird Machine Co., Bridgeport, Conn.

HINGES
Butterfield & Co., Inc., Rock Island, Que.
London Bolt & Hinge Wks., London, Ont.

HOBS
Greenfield Tap & Die Co., Greenfield, Mass
Pratt & Whitney Co., Dundas, Ont.
Taylor, J. A. M., 318 Stair Bldg., Toronto
Wells Bros. of Canada, Galt, Ont.

HOBBING MACHINES
Herbert, Ltd., Alfred, Toronto, Ont.

HOISTING MACHINERY
Canadian Mead-Morrison Co., Limited, Montreal, Que.

HOISTS, AIR
Can. Ingersoll-Rand Co., Ltd., Sherbrooke
Holden Co., Ltd., Montreal, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

HOISTS, CHAIN AND PNEUMATIC
Can. Ingersoll-Rand Co., Montreal, Que.
Garlock-Walker Machinery Co., Toronto.
Ford Chain Block & Mfg., Philadelphia.
Independent Pneumatic Tool Co., Chicago
Lyman Tube & Supply Co., Montreal, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Wright Mfg. Co., Lisbon, Ohio.
Williams Mchy Co, Ltd., A. R., Montreal

HOISTS, ELEC., STATIONARY, MONO RAIL
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
A. Leatty & Sons, Ltd., Welland, Can.
Oliver Engineering Co., Montreal.
Volta Mfg. Co., Welland, Ont.

HOISTS, ELECTRICAL
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Montreal, Que.
Electric Steels & Metals Ltd., Welland
Kennedy & Sons, Owen Sound, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co, Ltd., A. R., Montreal

HOLDERS, ADJUSTABLE LENGTH
Eclipse Counterbore Co., Ltd., Walkerville, Ont.

HOLDERS, STEEL DIE FOR MARKING
Matthews & Co., Jas. H., Pittsburgh, Pa.

HOLDERS, ELECTRIC
Electric Steels & Metals, Ltd., Welland

HOOKS, BELT LACING
Clipper Belt Lacer Co., Grand Rapids.

HOPPERS
MacKinnon Steel Co., Ltd., Sherbrooke.
Dominion Bridge Co., Montreal, Que.
William Hamilton Co., Peterboro, Ont.
Toronto Iron Works, Ltd., Toronto, Ont.

HOSE, FIRE PROTECTION
Quaker City Rubber Co, Philadelphia, Pa
International Mach. Sply, Ltd., Montreal

HOSE, PNEUMATIC
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto.
Gutta Percha & Rubber, Ltd., Toronto.
Independent Pneumatic Tool Co., Chicago.
Quaker City Rubber Co., Philadelphia, Pa.
Wells Bros. Co. of Canada, Galt, Ont.

HOSE, ALL KINDS
Goodyear Tire & Rubber Co., of Canada, Ltd., Toronto.
Gutta Percha & Rubber, Ltd., Toronto.
Quaker City Rubber Co, Philadelphia, Pa
International Mach. Sply, Ltd., Montreal
Dunlop Tire & Rubber Goods Co., Ltd., Toronto.

HOSE, SAND BLAST
Pangborn Corporation, Hagerstown, Md.
Goodyear Tire & Rubber Co. of Can., Ltd. Toronto
Quaker City Rubber Co., Philadelphia, Pa.
Intern'l. Machine Tool Co., Indianapolis.

HOSE, STEAM, SUCTION AND WATER
Gutta Percha & Rubber, Ltd., Toronto.
Quaker City Rubber Co, Philadelphia, Pa
International Mach. Sply, Ltd., Montreal
Dunlop Tire & Rubber Goods Co., Ltd., Toronto.

HUMIDIFIERS
Sturtevant Co., B. F., Galt, Ont.

HYDRAULIC ACCUMULATORS
Dom. Steel Products Co., Ltd., Brantford.

HYDRAULIC MACHINERY
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Dom. Steel Products Co., Ltd., Brantford.
Eastern Production Co., Detroit, Mich.
Garlock-Walker Machinery Co., Toronto.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Metalwood Mfg. Co., Detroit, Mich.
Niles-Bement-Pond Co., New York.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.
West Tire Setter Co., Rochester, N.Y.
Victoria Foundry Co., Ottawa.

HYDRAULIC TURBINES
Que.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,

HYDROMETERS, HYGROMETERS, HYGRODRIKS
Taylor Instrument Co., Rochester, N.Y.

INDICATORS, SPEED
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., E. C., Hamilton, Ont.
Brown & Sharpe Mfg. Co., Providence.
Starrett Co., L. S., Athol, Mass.

INDEX CENTRES
Brown & Sharpe Mfg. Co., Providence, R.I.
Dickow, Fred. C., Chicago, Ill.
Ford-Smith Machine Co., Hamilton, Ont.
Garvin Machine Co., New York.
Petrie, Ltd., H. W., Toronto.

INDICATING INSTRUMENTS
Taylor Instrument Co., Rochester, N.Y.

INDICATING SCALES
Can. Kron Scale Co., Montreal.

INDUSTRIAL SITES
City of St. Johns, Quebec.

INGOTS, BRASS, BRONZE, GUN METAL, PHOSPHOR
Thomas Moore & Son, Montreal.

INGOTS, FORGING AND ROLLING
Electric Steel & Metals Co., Welland.

INSULATING COMPOUNDS
Robertson Co., Ltd., H. H., Sarnia, Ont.

INSTRUMENTS, ENGINEERING
Consolidated Optical Co., Toronto.

IRON ORE
Hanna & Co., M. A. Cleveland, O.

IRON, WROUGHT, ROLLED, PIG
Swedish Steel & Impt. Co., Ltd., Montreal

JACKS
Aikenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Engineering Co.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Norton, A. O., Coaticook, Que.
Rice Lewis & Son, Toronto, Ont.
Petrie, Ltd., H. W., Toronto.

JACKS, PIT AND TRACK
Canadian Fairbanks-Morse Co., Montreal
Lyman Tube & Supply Co., Montreal, Que.
Northern Crane Works, Walkerville.

JAWS, FACE PLATE
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Ltd., Brantford.
Skinner Chuck Co., New Britain, Conn.

JIGS, TOOLS, ETC.
Ackworthie Ltd., J., Birmingham, Eng.
Brown Engineering Corp., Toronto.
Crescent Mach. Co., Ltd., Montreal, P.Q.
Elliott & Whitehall Mach. & Tool Co., Galt.
Gisholt Machine Co., Madison, Wis.
Globe Engineering Co., Ltd., Hamilton.
Homer & Wilson, Hamilton, Ont.
Jones & Lamson, Springfield, Vt.
Toronto Tool Co., Toronto, Ont.

JOURNAL WEDGES
Canada Foundries & Forgings, Welland.
Dominion Foundries & Steel Ltd., Hamilton, Ont.

KEY SEATERS
Garlock-Walker Machy. Co., Toronto, Ont.
Garvin Machine Co., New York.
Morton Mfg. Co., Muskegon Heights, M.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Machy. Co., A. R., Toronto.

KEYS, MACHINE
Whitney Mfg. Co., Hartford, Conn.
Williams & Co., J. H., Brooklyn, N.Y.

KILNS
Can. Blower & Forge Co., Kitchener, Ont.
General Combustion Co., Ltd., Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
Sturtevant Co., B. F., Galt, Ont.

KNIVES, MACHINE
Atkins & Co., E. C., Hamilton, Ont.

LABELS AND TAGS
Matthews & Co., Jas. H., Pittsburgh, Pa.

LABORATORIES, INSPECTION AND TESTING (see Chemists)

LADLES, FOUNDRY
Northern Crane Works, Walkerville.

LACING MACHINES
Clipper Belt Lacer Co., Grand Rapids, M.

LAG SCREW GIMLET POINTERS
National Machy. Co., Tiffin, Ohio.

LATH
Robertson, Ltd., H. H., Sarnia, Ont.

LATHES, CHUCKING
Acme Machine Tool Co., Cincinnati, Ohio.
Petrie, Ltd., H. W., Toronto.
Wood Turret Machine Co., Brazil, Ind.

LATHE CHUCKS (See Chucks)

LATHE DOGS AND ATTACHMENTS
Armstrong Bros. Tool Co., Chicago.
Hendey Machine Co., Torrington, Conn.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

LATHES, AUTOMATIC AND SEMI-AUTOMATIC
Gisholt Machine Co., Madison, Wis.
Herbert, Ltd., Alfred, Toronto, Ont.
Wood Turret Machine Co., Brazil, Ind.

LATHES, AXLE
Barber Mchy. Co., Ltd., Toronto, Ont.
Betts Mach. Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.

LATHES, BORING
Barber Mchy. Co., Ltd., Toronto, Ont.
Bridgeford Mach. Tool Works, Rochester.
Canada Machinery Corp., Galt, Ont.
Ledge & Shipley, Cincinnati, O.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.

LATHES, PRECISION, BENCH
W. F. & John Barnes Co., Rockford.
J. G. Blount & Co., Everett, Mass.
Canadian Fairbanks-Morse Co., Montreal.
Geo. F. Foss Machy. & Supply Co., Montreal.
Garlock-Walker Machinery Co., Toronto.
Hardinge Bros., Chicago, Ill.
Petrie, Ltd., H. W., Toronto.
Pratt & Whitney Co., Dundas, Ont.
Seneca Falls Mfg Co., Seneca Falls, N.Y.
Strelinger Co., C. A., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

LATHES, BRASS
Ackworthie Ltd., J., Birmingham, Eng.
Acme Machine Tool Co., Cincinnati, Ohio.
Hardinge Bros., Chicago, Ill.
Wood Turret Machine Co., Brazil, Ind.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

LATHES, ENGINE
Acme Machine Tool Co., Cincinnati, O.
Barber Mchy. Co., Ltd., Toronto, Ont.
John Bertram & Sons, Co., Dundas.
Canada Machy. Corp., Galt, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cisco Machine Tool Co., Cincinnati, O.
G. F. Foss, Mchy. & S'ply Co., Montreal
Garlock-Walker Machinery Co. Toronto.
Garvin Machine Co., New York.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Kennedy & Sons, Wm., Owen Sound, Ont.
Lehman Mach. Co., St. Louis, Mo.
R. McDougall Co., Galt.
Niles-Bement-Pond Co., New York.
Perfect Machine Co., Galt, Ont.
Rae Mach. Tool Co., Hamilton.
Standard Equipment & Tool Wks. Montreal, P.Q.
Seneca Falls Mfg. Co., Seneca Falls, N.Y.
Sidney Tool Co., Sidney, Ohio.
Strelinger Co., C. A., Windsor, Ont.
Walcott Lathe Co., Jackson, Mich.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
Wm. Rae Mach. Tool Co., Hamilton.
A. R. Williams Machy. Co., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

LATHES, FOOT POWER
Seneca Falls Mfg. Co., Seneca Falls, N.Y.

LATHES, HORIZONTAL
Intern'l. Mchy. Supplies Ltd., Montreal.
Wood Turret Machine Co., Brazil, Ind.

LATHES, JOURNAL TRUEING
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.

LATHE MANDRELS, HARDENED AND GROUND
Elliott & Whitehall, Galt, Ont.

LATHES, PATTERNMAKERS'
J. G. Blount Co., Everett, Mass.
Can. Machinery Corp., Galt.
Wood Turret Machine Co., Brazil, Ind.
G. F. Foss Mchy. & S'ply Co., Montreal
Garlock-Walker Machy. Co., Toronto, Ont.

LATHES, POLISHING
Ackworthie Ltd., J., Birmingham, Eng.
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

LATHES, SCREW CUTTING
Barber Mchy. Co., Ltd., Toronto, Ont.
Bertram & Sons Co., John, Dundas, Ont.
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Cisco Machine Tool Co., Cincinnati, O.
Foss Mchy. & Sply Co., G. F., Montreal
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Hepburn Ltd., John T., Toronto, Ont.
Lehman Machine Co., St. Louis, Mo.
Niles-Bement-Pond Co, New York.
Rae Mach. Tool Co., Hamilton.
Seneca Falls Mfg. Co., Seneca Falls, N.Y.
Strelinger Co., C. A., Windsor, Ont.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
Williams Machy. Co., A. R., Toronto.
Wood Turret Machine Co., Brazil, Ind.

LATHES, SPINNING
Bliss Co., E. W., Brooklyn, N.Y.

LATHES, TOOL ROOM
Barber Mchy. Co., Ltd., Toronto, Ont.
Cisco Machine & Tool Co., Cincinnati, O
Canada Machinery Corporation, Galt, Ont.
Knight Metal Products, Toronto.
Lehman Machine Co., St. Louis, Mo.
Rae Mach. Tool Co., Hamilton.
Seneca Falls Mfg. Co., Seneca Falls, N.Y.
Strelinger, Chas. A. Co., Windsor, Ont.

LATHES, QUICK CHANGE
Lehman Machine Co., St. Louis, Mo.

LATHE SAWS
Atkins & Co., E. C., Hamilton, Ont.

LATHES, TURRET
Acme Machine Tool Co., Cincinnati, Ohio
Hardinge Bros., Chicago, Ill.
Herbert Ltd., Alfred, Toronto, Ont.

LEAD, PIG AND BAR
British Smelting & Refining Co., Ltd., Montreal, Que.
Hoyt Metal Co., Toronto, Ont.

LEAD BURNING OUTFITS
Turner Brass Works, Sycamore, Ill.

LEATHER STRAPPING
Graton & Knight Mfg. Co., Worcester, M

LENSES FOR GOGGLES
Standard Optical Co., Geneva, N.Y.

LEVELS
Hughes, Owens Co., Ltd., Montreal, Que.

LIDS, SCREW TOP AND HINGE
Can. Winkley Co., Ltd., Windsor, Ont.

LINK BELTING
See Belting, Chain.

LIFT TRUCKS
Can. Kron Scale Co., Montreal.

LINOLEUM MILL MACHINERY
Bertrams, Ltd., Edinburgh, Scotland.

LOCKERS, STEEL WARDROBE AND STEEL MATERIAL
Canada Wire & Iron Gds. Co., Hamilton
Dennis Wire & Iron Works, London, Ont

LUBRICANTS
Cataract Refining & Mfg. Co., Toronto.
Swan & Finch, Inc., New York.

LUBRICANTS, CUTTING AND GRINDING, DRAWING, STAMPING
Oakley Chemical Co., New York, N.Y.

LUBRICATING, OIL FILTERING AND CIRCULATING SYSTEMS
Bowser Co., Ltd., S. F., Toronto, Ont.

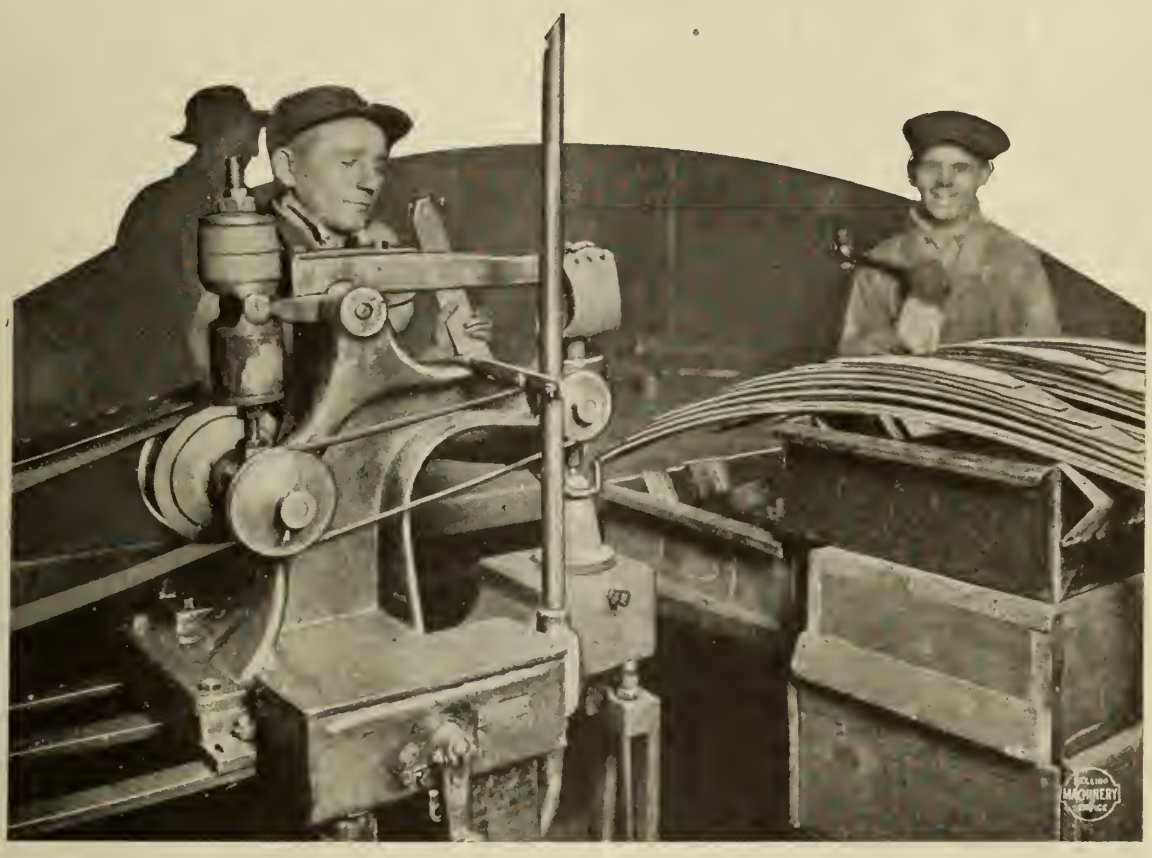
LUBRICATORS
Trabon Pump Co., Rockford, Ill.

LUMBERMEN'S TOOLS
Thos. Pink Co., Ltd., Pembroke, Ont.

MACHINE COUNTER WEIGHTS
Katie Foundry, Galt, Ont.

MACHINE TOOLS
Barber Mach. Co., F. F., Toronto, Ont.
Knight Metal Products, Toronto.

High Speed Hammers
on Auto Springs



There are Six of a Kind in this Cleveland Plant

This auto spring assembling scene is reproduced six times simultaneously in the plant of the Perfection Spring Company, Cleveland, Ohio. Six high speed riveting hammers work in self-contained departments at the same job. The operation consists of riveting rebound clips into auto springs with 3/8" diameter steel rivets. Though the work is heavy, production is four springs per minute, as the actual riveting time is but eight seconds. We build high speed hammers in sizes to head rivets cold, from the smallest to 1½" in diameter. Can you afford to do without them?

You are invited to submit your riveting problems to us. Send sample with loose rivets or sketch showing dimensions, size and location of rivets, we will do the rest.

THE HIGH SPEED HAMMER CO., Inc.
ROCHESTER, NEW YORK, U.S.A.

If interested tear out this page and place with letters to be answered.

MACHINERY DEALERS

Archibald & Co., Chas. P., Montreal.
Barber Mchy. Co., Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Elliott & Whitehall, Galt, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Machy. Co., A. R., Toronto.

MACHINERY GUARDS (See Guards: MACHINERY SUPPLIES

Crescent Machine Co., Ltd., Montreal.
Globe Engineering Wks., Hamilton, Ont.
Knight Metal Products, Toronto.

MACHINERY, SPECIAL

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Crescent Machine Co., Ltd., Montreal, Que.
McClean Machine & Tool Co., Ltd., Hamilton, Ont.

MACHINISTS' TOOLS

Atkins & Co., E. C., Hamilton, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.

MAGNETIC BRAKES FOR ELECTRIC MOTORS

Volta Mfg. Co., Welland, Ont.

MANDRELS

Butterfield & Co., Inc., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Jardine & Co., A. B., Hespeler, Ont.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
McCrosky Tool Corp., Meadville, Pa., U. S. A.
Pratt & Whitney Co., Dundas, Ont.

MARKING DEVICES

Matthews & Co., Jas. H., Pittsburgh, Pa

MARKING MACHINERY

Brown, Boggs Co., Hamilton, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal
Perrin, Wm. R., Toronto.
Petrie, Ltd., H. W., Toronto.

MATERIALS, HANDLING PLANTS

Canadian Mead-Morrison Co., Limited, Montreal, Que.

MATS, RUBBER MATTING

Quaker City Rubber Co., Philadelphia, Pa
International Mchy. S'ply., Ltd., Montreal

MEASURING MACHINES

Pratt & Whitney Co., Dundas, Ont.

MEASURES, REGISTERING

Bowser Co., Ltd., S. F., Toronto, Ont.

MEASURING TAPES AND RULES

Chesterman & Co., Jas., Sheffield, Eng.

MERCHANTS, IRON AND STEEL

Samuel Osborne (Can.), Ltd., Montreal.

METALLURGISTS

See Chemists.

METAL CLEANERS

Oakley Chemical Co., New York, N.Y.

METAL CUTTING MACHINES

Atkins & Co., E. C., Hamilton, Ont.
Lyman Tube & Supply Co., Montreal, Que.

METAL SAWS

See Saws.

METAL, ANTI-FRICTION

Thos. Moore & Son, Montreal.

METAL SAWS, POWER

E. C. Atkins & Co., Inc., Indianapolis.
Hoefer Mfg. Co., Freeport, Ill.
Lyman Tube & Supply Co., Montreal, Que.

METALS

British Smelting & Refining Co., Ltd., Montreal, Que.
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.
Canada Metal Co., Toronto, Ont.
Deloro Smelting & Refining Co., Ltd, Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.

METAL, STAMPINGS, SMALL

Can. Winkley Co., Ltd., Windsor, Ont.

METERS, OIL, GASOLINE, KEROSENE, ETC.

Bowser Co., Ltd., S. F., Toronto, Ont.
General Combustion Co., Ltd., Montreal, Que.

MICROMETERS

Taylor, J. A. M., 518 Stair Bldg., Toronto.
Petrie, Ltd., H. W., Toronto.

MILLS, BRACE AND TUBE

Elec. Steel & Metals, Welland, Ont.

MILL SPECIALTIES

Atkins & Co., E. C., Hamilton, Ont.

MILLS, SAND

Frost Mfg. Co., Chicago, Ill.

MILL MACHINERY

Alexander Fleck, Ltd., Ottawa.
Greenfield Tap & Die Corp., Greenfield
Wells Bros. of Canada, Galt, Ont.

MILLING ARBORS

Ackworthie Ltd., J., Birmingham, Eng.
Barber Mchy. Co., Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Kearney & Trecker Co., Milwaukee, Wis.
Strelinger, Chas. A. Co., Windsor, Ont.

MILLING ATTACHMENTS

Ackworthie Ltd., J., Birmingham, Eng.
Barber Mchy. Co., Ltd., Toronto, Ont.
Becker Milling Machine Co., Boston, Mass.
Bertram & Sons Co., John, Dundas, Ont.
Brown & Sharpe Mfg. Co., Providence.
Canada Machinery Corp., Galt, Ont.
Cincinnati Milling Machine Co., Cincinnati
Ford-Smith Mach. Co., Hamilton, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal
Hardinge Bros., Inc., Chicago, Ill.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Knight Metal Products, Toronto.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Standard Equipment & Tool Wks., Montreal, P.Q.
Strelinger, Chas. A. Co., Windsor, Ont.

MILLING MACHINES, PROFILE

Barber Mchy. Co., Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

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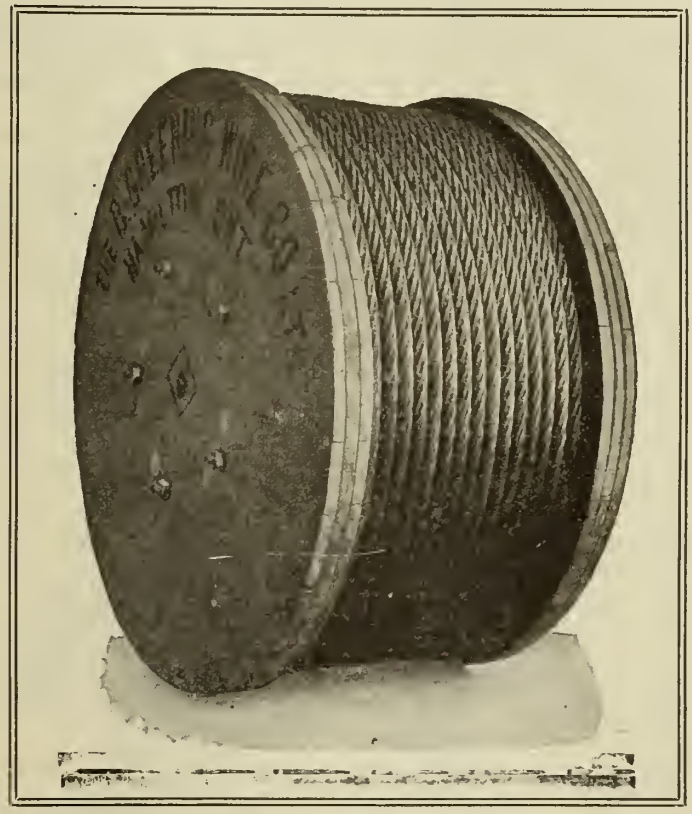

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Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall, Son & Bunney, Toronto.

RAWHIDE PINIONS (See Gears)

REAMERS
Butterfield & Co., Inc., Rock Island, Que.

REAMERS, ADJUSTABLE
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Elliott & Whitehall Machine and Tool Co., Galt, Ont.
Greenfield Tap & Die Corp., Greenfield.
Ingersoll Machy. Co., Ingersoll, Ont.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
McCrosky Tool Corp., Meadville, Pa., U. S. A.
Pierce, Ltd., Winnipeg, Man.
Pratt & Whitney Co., Dundas, Ont.
The Kelly Reamer Co., Cleveland, O.
J. A. M. Taylor, 115 Stair Bldg., Toronto
Wells Bros. of Can., Galt, Ont

REAMERS, BRIDGE, EXPANDING AND HIGH SPEED
Atkins & Co., Ltd., Wm., Sheffield, Eng
Aikenhead Hardware Co. Toronto.
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Elliott & Whitehall Machine and Tool Co., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Lyman Tube & Supply Co., Montreal, Que
Marshall, Son & Bunney, Toronto.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Morse Twist Drill & Mch. Co., New Bedford, Mass.
McCrosky Tool Corp., Meadville, Pa., U. S. A.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Samuel Osborne, Ltd., Montreal, P.Q.
Strelinger, Chas. A. Co., Windsor, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

REAMERS, STEEL TAPER AND SELF-FEEDING
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

REAMERS, CHUCKING
Ackworthie Ltd., J., Birmingham, Eng.
Atkins & Co., Ltd., Wm., Sheffield, Eng
Butterfield & Co., Inc., Rock Island, Que.
Elliott & Whitehall Machine and Tool Co., Galt, Ont.
Greenfield Tap & Die Corp., Greenfield.
Ingersoll Machy. Co., Ingersoll, Ont.
Marshall, Son & Bunney, Toronto.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
Wells Bros. of Canada, Galt, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

REAMERS, HAND
Ackworthie Ltd., J., Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Elliott & Whitehall, Galt, Ont.
Greenfield Tap & Die Corp., Greenfield
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wells Bros. of Can., Galt, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

REAMERS, PIN
Ackworthie Ltd., J., Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield
Morrow Screw & Nut Co., John, Ingersoll.
Wells Bros. of Can., Galt, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

REAMER FLUTING MACHINES
Garvin Machine Co., New York.

REAMING MACHINES, PNEUMATIC
Cleveland Pneumatic Co. of Can., Toronto
Garlock-Walker Machinery Co. Toronto.
Holden Co., Ltd., Montreal, Que.

RECORDING INTRUMENTS
Bristol Co., Waterbury, Conn.
Gisholt Machine Co., Madison, Wis.
Taylor Instrument Co., Rochester, N.Y.

REELS, WIRE AND TEXTILE MFG
American Pulley Co., Philadelphia, Pa.

REGULATORS, AUTOMATIC
Electric Steels & Metals, Ltd., Welland.

REGULATORS, PRESSURE, TEMPERATURE
Can. Fairbanks-Morse Co., Montreal.
Taylor Instrument Co., Rochester, N.Y.

REPAIR WORK — SAWS
Atkins & Co., E. C., Hamilton, Ont.

REPAIR WORK, ALL KINDS
Elec. Steel & Metals, Welland, Ont.

RIVETS.
Aikenhead Hardware Co., Toronto, Ont.
Parmenter & Bulloch Co., Gananoque.
Bliss, Lewis & Son, Toronto.
Steel Co. of Canada, Ltd., Hamilton.

RIVET HEATERS
Chicago Flexible Shaft Co., Chicago, Ill.

Gear Cutting With the "IFS" Left Out

The Gear Shaper Way

A production manufacturer knows that he will secure good gears IF he has an accurate cutter, an accurate machine and a machine working on the correct principle. The whole question of good gears is resolved in this one little word "IF."

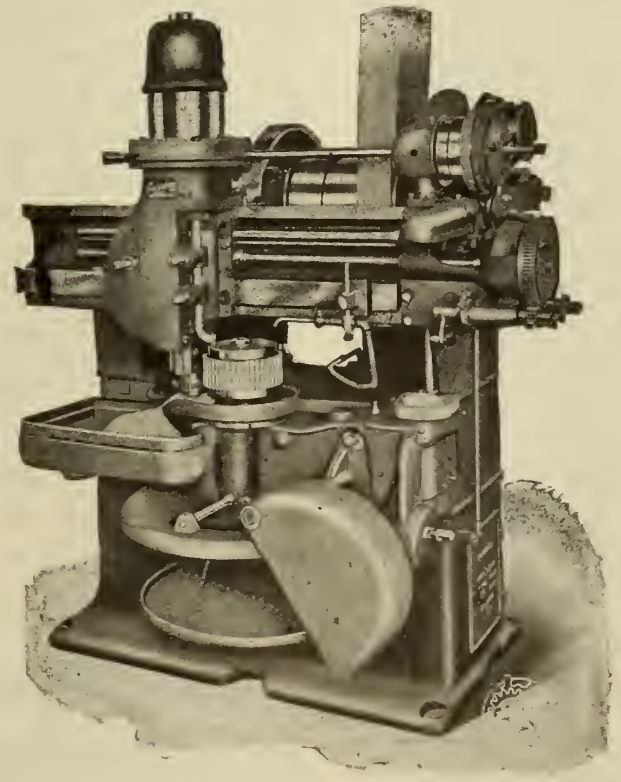
When the Gear Shaper was originally designed, the question of "IF" was taken into consideration and every possible means known to mechanical engineering was employed to eliminate the "IFS" from gear cutting.

That we have been successful in solving the problem is evidenced by the fact that each ensuing year sees a larger number of manufacturers adopting the Gear Shaper method.

How the Gear Shaper has accomplished this is clearly explained in our general catalog "Commercial Gear Cutting," which is a treatise on the subject of:—

Gear Cutting with the "IFS" Left Out.

Send for your copy to-day.



The Fellows Gear Shaper—the machine which has taken the "IFS" out of gear cutting.

The Fellows Gear Shaper Company

Springfield, Vermont, U.S.A.

FOREIGN AGENTS:—Alfred Herbert, Limited, Coventry, England; Société Anonyme Alfred Herbert, Paris, France; Societa Anonima Italiana Alfred Herbert, Milan, Italy; Alfred Herbert, Limited, Yokohama, Japan; Societe Anonyme Alfred Herbert, Barcelona, Spain; Societe Anonyme Belge Alfred Herbert, Brussels, Belgium; Alfred Herbert (India), Limited, Calcutta, India.

If interested tear out this page and place with letters to be answered.

RIVETERS, PNEUMATIC, HYDRAULIC, HAMMER, COMPRESSION
Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Montreal.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.

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Grant Mfg. & Machine Co., Bridgeport.
High-Speed Hammer Co., Rochester.
Petrie, Ltd., H. W., Toronto.
F. B. Shuster Co., New Haven, Conn.
Strelinger Co., C. A., Windsor, Ont.

ROAD BUILDING EQUIPMENT
Can. Ingersoll-Rand Co., Ltd., Sherbrooke.
Holden Co., Ltd., Montreal, Que.

ROAD-MAKING MACHINERY
G. F. Foss Mchy & Sply. Co., Montreal.

RODS, ROPE AND SPRING
Page Steel & Wire Co., Adrian, Mich.

RODS, PURE NICKEL, MONEL METAL, NICHROME
Can. Driver-Harris Co., Ltd., Walkerville.

ROLLER CHAINS
Can. Link-Belt Co., Toronto.
Jones & Glasco, Montreal.
Lyman Tube & Supply Co., Montreal, Que.
Renold of Canada Ltd., Montreal.

ROLLS, BENDING, STRAIGHTENING
John Bertram & Sons Co., Dundas.
Brown, Boggs Co., Ltd., Hamilton.
Can. Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machinery Co., Toronto.
Niles-Bement-Pond Co., New York.
Petrie Ltd., H. W., Toronto.
Toledo Machine & Tool Co., Toledo, O.

ROLLS CRUSHING
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

ROLLS AND TABLES
Dominion Foundries & Steel Ltd., Hamilton, Ont.
Ilea. Steel & Metals, Welland, Ont.

ROOFING
H. H. Robertson, Ltd., Sarnia, Ont.

ROPE, GALX, MONEL METAL, BRONZE, TILLER AND SASH CORD
Can. Driver-Harris Co., Ltd., Walkerville.

ROTARY SHEARS
The Quickwork Co., St. Mary's, Ohio

ROLLING MACHINES, SHEET METAL
Manhattan Machine & Tool Co., Grand Rapids, Mich.

ROLLING MILL MACHINERY
Dom. Steel Products Co., Ltd., Brantford
Mesta Machine Co., Pittsburgh, Pa.

ROLL LATHES
Mesta Machine Co., Pittsburgh, Pa.

ROLLS, BENDING, STRAIGHTENING
Manhattan Machine & Tool Co., Grand Rapids, Mich.

ROLLS, CRUSHING
Can. Link-Belt Co., Toronto.

ROOF COOLERS
Electric Steels & Metals, Ltd., Welland

RUBBER MOULDS AND CORES
Elliott & Whitehall, Galt, Ont.

RUBBER MILL DRIVES
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Dom. Steel Products Co., Ltd., Brantford.
Can. Link-Belt Co., Toronto.

RUBBER MILL MACHINERY
Bertrams Ltd., Edinburgh, Scotland.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Dom. Steel Products Co., Ltd., Brantford.

RUBBER MOULDS & CORES
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

RUBBER PRODUCTS, MECHANICAL
Dunlop Tire & Rubber Goods Co., Ltd., Montreal.

RUBBING BRICKS
Dominion Abrasive Co., Mimico, Ont.

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Brown & Sharpe Mfg. Co., Providence.
James Chesterman & Co., Ltd., Sheffield
Rice, Lewis & Son, Toronto.
L. S. Starrett Co., Athol, Mass.

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Lufkin Rule Co. of Can., Windsor.

RULES, BOXWOOD, FOLDING
Lufkin Rule Co. of Can., Windsor.

RULES, BOARD AND LONG
Lufkin Rule Co. of Can., Windsor.

RUST PREVENTATIVES
Oakley Chemical Co., New York, N.Y.

SAW MILL CONVEYORS
Can. Link-Belt Co., Toronto.
Petrie, Ltd., H. W., Toronto.

SAND MILLS
Frost Mfg. Co., Chicago, Ill.

SAND-BLAST EQUIPMENT

SAND BLAST SUPPLIES AND ACCESSORIES
Pangborn Corporation, Hagerstown, Md

SAND BLAST ABRASIVES
Pangborn Corporation, Hagerstown, Md.

SAND MIXING MACHINERY
Frost Mfg. Co., Chicago, Ill.

SANITARY DRINKING FOUNTAINS
Pure Sanitary Drinking Fountain Co., Haydenville.

SANDING MACHINES
Canada Machinery Corp., Galt.

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Can. Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt.
Robert Gardner & Son, Montreal.
Curtis Pneumatic Machy Co., St. Louis
Hamilton Co., Ltd., Wm., Peterborough, Ont.
A. R. Williams Machy. Co., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

SASH SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

SAWS FOR EVERY USE
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Cochrane-Bly Co., Rochester, N.Y., U.S.A.
Wm. Atkins & Co., Ltd., Sheffield, Eng.
Marshal, Son & Bunney, Toronto.
Plewes Ltd., Winnipeg, Man.
Simonds Mfg. Co., Fitchburgh, Mass.
Tabor Mfg. Co., Philadelphia, Pa.

SAWS, HACK (See Hack Saws)

SAW GUARDS
Ackworthie Ltd., J., Birmingham, Eng.
Atkins & Co., E. C., Hamilton, Ont.

SAWING MACHINES, CIRCULAR, FOR COLD METAL
Cochrane-Bly Co., Rochester, N.Y., U.S.A.

SAWS, METAL, HACK AND BAND
Atkins & Co., E. C., Hamilton, Ont.

SAWS, SILVER STEEL
E. C. Atkins & Co., Inc., Indianapolis

SAW SHARPENERS
Cochrane-Bly Co., Rochester, N.Y., U.S.A.
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Can., Galt, Ont.

SAWS, SLITTING
J. A. M. Taylor, Stair Bldg., Toronto.
Atkins & Co., E. C., Hamilton, Ont.
Elliott & Whitehall Machine and Tool Co., Galt, Ont.

SAWS — HIGH-SPEED FRICTION
Atkins & Co., E. C., Hamilton, Ont.

SAWS — PATTERN SHOP
Atkins & Co., E. C., Hamilton, Ont.

SAWS — SWING
Atkins & Co., E. C., Hamilton, Ont.

SCALES
Jan. Kron Scale Co., Montreal, P.Q.

SCALES, MECHANICS'
Lufkin Rule Co. of Can., Windsor.

SCLEROSCOPES
Shore Instrument & Mfg. Co., New York.

SCREENING MACHINERY
Can. Link-Belt Co., Toronto.

SCREW EXTRACTORS
Cleveland Twist Drill Co., Cleveland.

SCREW MACHINES, HAND, AUTOMATIC
Barber Mchy. Co., Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Ltd., Toronto
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield.
A. B. Jardine & Co., Hespeler.
National Acme Co. Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto.
Pratt & Whitney Co., Dundas, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
Warner & Swasey Co., Cleveland, O.
Wells Bros. of Can., Galt, Ont.
Wood Turret Mach. Co., Brazil, Ind.

SCREWS, MACHINE, SET, CAP AND SPECIAL
Galt Machine Screw Co., Galt.
John Morrow Screw & Nut Co., Ingersoll.
National Acme Co. Montreal.
Rice Lewis & Son, Toronto.
Steel Co. of Canada, Ltd., Hamilton.
Wilkinson & Kompass, Hamilton.

SCREW COLLARS
Galt Machine Screw Co., Ltd., Galt, Ont.
John Morrow Screw & Nut Co., Ingersoll.

SCREW MACHINES, PLAIN WIRE FEED
Barber Mchy. Co., Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.

SCREW PLATES
Ackworthie Ltd., J., Birmingham, Eng.
Butterfield & Co., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield.
A. B. Jardine & Co., Hespeler.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto.
J. A. M. Taylor, Stair Bldg., Toronto.
Wells Bros. of Can., Galt.
Wilkinson & Kompass, Hamilton.

SCREWS, SAFETY SET
Galt Machine Screw Co., Ltd., Galt, Ont.

SCREW SLOTTERS
Butterfield & Co., Inc., Rock Island, Que.
Garvin Machine Co., New York.
National Acme Co., Cleveland, O.
Pratt & Whitney Co. Dundas, Ont.

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Pangborn Corporation, Hagerstown, Md.

SELF-OPENING DIES
See Dies.

SEPARATORS, SAND
Pangborn Corporation, Hagerstown, Md.

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Aikenhead Hardware Co., Toronto.
Bristol Co., Waterbury, Conn.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wilkinson & Kompass Hamilton.

SHANKS, STRAIGHT AND TAPER
Jacobs Mfg. Co., Hartford, Conn.

SHAPERS
Barber Mchy. Co., Ltd., Toronto, Ont.
John Bertram & Sons Co., Dundas.
Can. Fairbanks-Morse Co., Montreal.
Canadian Machinery Corp., Galt.
Cochrane-Bly Co., Rochester, N.Y., U.S.A.
Geo. F. Foss Mchy. & Sply. Co., Montreal
Robt. Gardner & Son, Montreal.
Garlock-Walker Mach'y. Co., Toronto.
Herbert, Ltd., Alfred, Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Milwaukee Shaper Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto.
Rae Mach. Tool Co., Hamilton.
Strelinger Co., C. A., Windsor, Ont.
Standard Equipment & Tool Wks., Montreal.
Walcott Lathe Co., Jackson, Mich.
Williams Mchy Co., A. R., Toronto, Ont.

SHAPERS, GEAR
Fellows Gear & Shaper Co., Springfield, V.
Knigh Metal Products, Toronto.

SHAFTING
Algoma Steel Corp., Sault Ste. Marie, O.
Can. Fairbanks-Morse Co., Montreal.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machy. Co., Ltd., Toronto
Jones & Glasco, Montreal.
Niles-Bement-Pond Co., New York.
Can. Drawn Steel Co., Hamilton.
Peckovers, Ltd., Toronto, Ont.
Petrie, Ltd., H. W., Toronto.
Pratt & Whitney Co., Dundas.
Rice, Lewis & Son Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
A. R. Williams Machy. Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

SHARPENING STONES
Norton Co, Worcester, Mass.
Rice, Lewis & Son, Toronto.

SHEARING MACHINES, ANGLE IRON, BAR AND GATE
John Bertram & Sons Co., Dundas.
Bertrams Ltd., Edinburgh, Scotland.
Canada Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machy. Co., Ltd., Toronto
A. B. Jardine & Co., Hespeler, Ont.
Long & Allstatter Co., Hamilton, Ohio.
Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co., Toledo, O.

SHEARS, POWER
John Bertram & Sons Co., Dundas.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co. Ltd., Hamilton.
Can Blower & Forge Co, Kitchener.
Canada Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machy. Co., Ltd., Toronto
Long & Allstatter, Hamilton, Ohio.
A. B. Jardine & Co., Hespeler, Ont.
National Machy. Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
H. D. Stoll Co., Inc., Buffalo, N.Y.
Strelinger, Chas. A. Co., Windsor, Ont.
Toledo Machine & Tool Co., Toledo, O.
Williams, White & Co., Moline, Ill.
Williams Mchy Co., A. R., Toronto, Ont.

SHEARS, ROTARY
The Quickwork Co., St. Mary's, Ohio.

SHEARS, PNEUMATIC
Toledo Machine & Tool Co., Toledo, Ohio

SHEARS, PLATE CUTTING, SLITTING
Dom. Steel Products Co., Ltd., Brantford.
Quickwork Co., St. Mary's, Ohio.

SHEARS, SPLITTING
Dom. Steel Products Co., Ltd., Brantford.

SHEARS, IRREGULAR AND CIRCLE CUTTING
The Quickwork Co., St. Mary's, Ohio.
D. H. Stoll Co., Inc., Buffalo, N.Y

SHEARS, SERPENTINE
The Quickwork Co., St. Mary's, Ohio.

SHEARS, SQUARING
Brown, Boggs & Co., Hamilton, Ont.
D. H. Stoll Co., Inc., Buffalo, N.Y.

SHEET METAL WORKING MACHINERY
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SHEET METAL WORKING TOOLS
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E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton.
Peck, Stow & Wilcox Co., Southington, C.
Petrie, Ltd., H. W., Toronto.
D. H. Stoll Co., Inc., Buffalo, N.Y.
Strelinger, Chas. A. Co., Windsor, Ont.

SHEETS, CRUCIBLE, CAST
British Smelting & Refining Co., Ltd., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal

SHEETS, BLACK AUTO AND GALVANIZED
Peckovers, Ltd., Toronto, Ont.

SHEETS, NICKEL RESIST ALLOY
Can. Driver-Harris Co., Ltd., Walkerville.

SHELVING, STEEL
Dennis Wire & Iron Works, London.

SHIPYARD MACHINERY, SHOP FURNITURE
Dennis Wire & Iron Works, London.

SIDE TOOLS
Armstrong Bros. Tool Co., Chicago.
J. H. Williams & Co., Brooklyn, N.Y.

SILENT CHAINS
Can. Link-Belt Co., Toronto, Ont.
Jones & Glasco, Montreal.
Renold of Canada Ltd., Montreal.

SLEDGES
Aikenhead Hardware Co., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.
Wilkinson & Kompass, Hamilton, Ont

SLEDGES, CAST IRON
Katie Foundry, Galt, Ont.

SLICING CLAMPS
Peck, Stow & Wilcox Co., Southington, Conn.

SLINGS, CHAINS
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

SLOTTERS
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
Herbert, Ltd., Alfred, Toronto, Ont.
National-Acme Co., Cleveland, Ohio.
Niles-Bement-Pond Co., New York.

SMOKESTACKS
William Hamilton Co., Peterboro, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

SNIPS, TINNERS AND SHEET METAL WORKERS
Kearney & Trecker Co., Milwaukee, Wis.
J. Morrow Screw & Nut Co., Ingersoll, Ont

SOCKETS
Brown & Sharpe Mfg. Co., Providence.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
Keystone Mfg. Co., Buffalo, N.Y.
Modern Tool Co., Erie, Pa.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.

SOIL PIPE FITTINGS, CAST IRON
Katie Foundry, Galt, Ont.

SOLDERING IRONS
Aikenhead Hardware Co., Toronto, Ont.
Brown, Boggs & Co., Hamilton, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.

SOLDER
British Smelting & Refining Co., Ltd., Montreal, Que.
Aikenhead Hardware Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.
Tallman Brass & Metal Co., Hamilton.

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British Smelting & Refining Co., Ltd., Montreal, Que.

SPEED REDUCING GEARS
Can. Link-Belt Co., Toronto, Ont.
Jones & Glasco, Montreal.

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Barnes, Wallace Co., Bristol, Conn.
Can. Steel Foundries, Ltd., Montreal.
Cleveland Wire Spring Co., Cleveland.
Dunbar Bros. Co., Bristol, Conn.
Garlock-Walker Machinery Co., Toronto.

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Baird Machine Co., Bridgeport, Conn.
Barber Mchy. Co., Ltd., Toronto, Ont.
Bertram, John, & Sons Co., Dundas.
Bliss, E. W. Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada.
Brown Engineering Corp., Toronto, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Globe Engineering Co., Ltd., Hamilton
Hamilton Co., Ltd., Wm., Peterborough
A. B. Jardine & Co., Hespeler, Ont.
Katie Foundry, Galt, Ont.
Ker & Goodwin Machine Co., Ltd., Brantford, Ont.
McCrosky Tool Corp., Meadville, Pa., U. S. A.
National-Acme Co., Cleveland, Ohio.
Mesta Machine Co., Pittsburgh, Pa.
Rae Mach. Tool Co., Hamilton.
Stoll Co. D. H., Buffalo, N.Y.
Victoria Foundry Co., Ottawa, Ont.
William R. Perrin, Ltd., Toronto.
Williams Tool Corp. of Can. Ltd., Brantford, Ont.

SPECIAL TOOLS, MACHINERY
Crescent Machine Co., Ltd., Montreal, Que.
McClean Machine & Tool Co., Ltd. Hamilton, Ont.
Hoggson & Pettis Mfg. Co., New Haven Conn.

SPOT FACERS, INTERCHANGEABLE
Eclipse Counterbore Co., Ltd., Walkerville, Ont.

SPRING COILING AND WINDING MACHINERY
Baird Machine Co., Bridgeport, Conn.
Garvin Machine Co., New York.

SPRING MAKING MACHINERY (AUTOMATIC)
Baird Machine Co. Bridgeport, Conn.

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SPRINGS STEEL
Barnes Co., Wallace, Bristol, Conn.

SPROCKETS, COMPENSATING
Morse Chain Co., Ithaca, New York.

SPROCKETS, SPRING
Morse Chain Co., Ithaca, New York.

SPROCKETS, CHAIN
Can Link-Belt Co., Toronto, Ont.
Grant Gear Works, Boston, Mass.
Jones & Glasco, Montreal.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works Philadelphia
Renold of Canada Ltd., Montreal.

SPRINGS FOR TOYS AND ELECTRIC DEVICES
The Dunbar Bros. Co., Bristol, Conn.

SPROCKET WHEELS, CAST
Can. Link Belt Co., Toronto, Ont
Lyman Tube & Supply Co., Ltd., Montreal

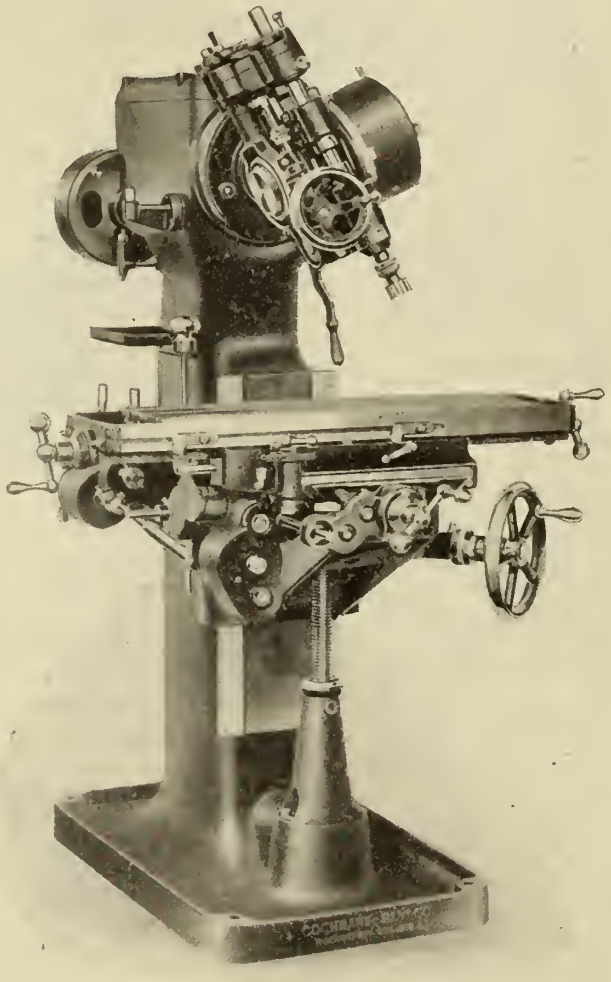
Cochrane-Bly

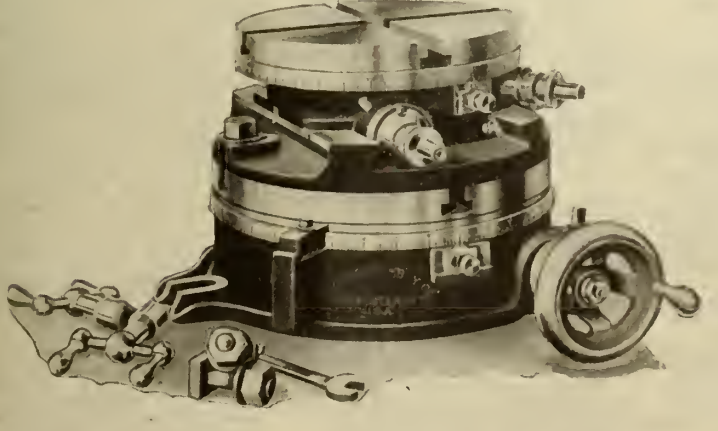
No. 14 Universal Vertical Miller

Head is adjustable 360 degrees right and left and 45 degrees front and back of center. Drilling, boring and milling operations can be performed at any angle and by use of circular and compound tables, from any number of centers at one setting of the work.

Milling spindle has 3½″ vertical adjustment with micrometer gauge screw. Spindle is hollow and will hold sleeves and collets for straight or taper shank cutters, drills, etc. Power feeds are 18½″ longitudinal and 9″ transverse, vertical adjustment 18″.

The above machine is a strictly high-grade precision tool and very efficient on dies, jigs, fixtures, templates, gauges, metal patterns, and many operations on machine parts.





The Circular Tables as shown make it possible to work at any angle and from any number of centers or on five sides of a cube at any setting of the work.

Send for catalog.

Cochrane-Bly Co.

Rochester New York

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SAFETY CYLINDERS
Oliver Mach. Co., Grand Rapids, Mich.

SANDERS
Oliver Mach. Co., Grand Rapids, Mich.

SAW BENCHES
Oliver Mach. Co., Grand Rapids, Mich.

SAW GUARDS
Oliver Mach. Co., Grand Rapids, Mich.

SAWING MACHINES
Herbert Ltd., Alfred, Toronto, Ont.

SAWS SWING
Oliver Mach. Co., Grand Rapids, Mich.

SMALL TOOLS
Herbert Ltd., Alfred, Toronto, Ont.

STAYBOLT TOPS
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

STAIRS, IRON
Canada Wire & Iron Goods Co., Hamilton, Ont.

STAMPINGS, SHEET BRASS, COPPER, ALUMINUM AND STEEL
Dom. Forge & Stamping Co., Walkerville
Globe Engineering Co., Hamilton, Ont.
Homer & Wilson, Hamilton, Ont.

STAMPING MACHINERY
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs, & Co., Hamilton, Can.
Canada Machinery Corp., Galt, Ont.
Matthews, Jas. H & Co., Hartford, Conn.

SAFETY CYLINDERS
Oliver Mach. Co., Grand Rapids, Mich.

STEAM APPLIANCES
Darling Bros., Ltd., Montreal, Quebec.

STEAM SEPARATORS AND TRAPS
Can. Fairbanks-Morse Co., Montreal.

STEAM HOISTING ENGINES
Canadian Mead-Morrison Co., Limited, Montreal, Que.

STEAM TURBINES
General Combustion Co., Ltd., Montreal, Que.
Sturtevant Co., B. F., Galt, Ont.

STEEL BALLS
See Balls Steel.

STEEL, CRUCIBLE TOOL
Atkins & Co., Ltd., Wm. Sheffield, Eng
Baines & David, Toronto.
Illingworth Steel Co., John, New York
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.

STEEL, CARBON, FERRO-TUNGSTEN
Armstrong, Whitworth of Can., Montreal
Atkins & Co., Ltd., Wm., Sheffield, Eng
Baines & David, Toronto.
Firth & Sons, Thos., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.
Latrobe Electric Steel Co., Latrobe, Pa
Lincoln Electric Co. of Canada, Ltd., Toronto, Ont.
Marshall, Son & Bunney, Toronto.
Peckovers, Ltd., Toronto, Ont.
Samuel Osborne (Can.), Ltd., Montreal.
Vanadium-Alloys Steel Co., Pittsburgh

STEEL, CHROME MOLYBDENUM
United Alloy Steel Corp., Canton, Ohio.

STEEL CHROME VANADIUM
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.
Atkins & Co., Ltd., Wm. Sheffield, Eng
Marshall, Son & Bunney, Toronto
United Alloy Steel Corp., Canton, Ohio.

STEEL CHROME NICKEL
Firth & Sons, Ltd., Thos., Montreal,
Kayser-Ellison & Co., Ltd., Montreal.
Lyman Tube & Supply Co., Ltd., Montreal
Norton, Ralph B., Agent, Montreal.
Atkins & Co., Ltd., Wm., Sheffield, Eng
Marshall, Son & Bunney, Toronto
United Alloy Steel Corp., Canton, Ohio.

STEEL CASTINGS
Can. Elec. Steel Casting Co., Aurora, Ont
Davidson Mfg. Co., Ltd., Montreal, Que.
Dominion Foundries & Steel Ltd., Hamilton, Ont.
Dom. Iron & Steel, Sydney, N.S.
Joliette Steel Co., Montreal, Que.
Kennedy & Sons, Wm., Owen Sound.
Electric Steel & Metals Co., Welland.
Nova Scotia Steel & Coal Co., Windsor.
Swedish Crucible Steel Co., Windsor.

STEEL, COLD DRAWN
United Alloy Steel Corp., Canton, Ohio.

STEEL, COLD ROLLED
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Can. Drawn Steel Co., Hamilton, Ont.
Kayser-Ellison & Co., Ltd., Montreal.
Rice Lewis & Son, Toronto, Ont.
Swedish Steel & Importing Co. Ltd., Montreal.
Union Drawn Steel Co., Hamilton, Ont

STEEL, ELECTRIC FURNACE
United Alloy Steel Corp., Canton, Ohio.

STEEL FJAB
Lincoln Electric Co., of Canada, Ltd., Toronto, Ont.

STEEL, NICKEL
Atkins & Co., Ltd., Wm., Sheffield, Eng
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal
United Alloy Steel Corp., Canton, Ohio.

STEEL, HIGH SPEED
Armstrong-Whitworth of Can., Montreal
Baines & David, Toronto.
Wm. Atkins & Co., Sheffield, Eng.
Can. Fairbanks-Morse Co., Montreal
Deloro Smelting & Refining Co., Ltd. Toronto, Ont.
H. A. Drury Co., Ltd., Montreal.
Firth & Sons, Thos., Montreal, Que.
Illingworth Steel Co., J., New York.
Kayser Ellison & Co., Sheffield, Eng.
Latrobe Electric Steel Co., Latrobe, Pa.
Marshall, Son & Bunney, Toronto, Ont.
Osborne, Samuel, Montreal, P.Q.
Plewes, Ltd, Winnipeg, Man.
Pilot Steel & Tool Co., Montreal, Que.
Ralph B. Norton, Montreal, Que.
Rice Lewis & Son, Toronto, Ont.
Swedish Steel & Importing Co., Ltd., Montreal.
Vanadium-Alloys Steel Co., Pittsburgh.

STEEL, CHROME, MANGANESE
Joliette Steel Co., Montreal, Que.

STEEL, OPEN HEARTH
Illingworth Steel Co., John, New York
United Alloy Steel Corp., Canton, Ohio.

STEEL PLATES
Dominion Foundries & Steel Ltd., Hamilton, Ont.

STEEL PRODUCTS AND MACHINERY
Dom. Steel Products Co., Ltd., Brantford

STEEL, ROCK DRILL
Armstrong, Whitworth of Canada, Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.
Lincoln Electric Co. of Canada, Ltd., Toronto, Ont.

STEEL, SPECIAL ANALYSIS
United Alloy Steel Corp., Canton, Ohio.

STEEL, SPRING AND REINFORCING
Peckovers, Ltd., Toronto, Ont.
United Alloy Steel Corp., Canton, Ohio.

STEEL, STRUCTURAL
Algoma Steel Corp., Sault Ste. Marie
Dom. Iron & Steel Co., Sydney, N.S.
MacKinnon Steel Co., Sherbrooke, Que.
Peckovers, Ltd., Toronto, Ont.

STEEL, TOOL
Armstrong, Whitworth of Can., Montreal
Atkins & Co., Wm., Sheffield, Eng.
Baines & David, Toronto.
Can. Fairbanks-Morse Co., Montreal.
Drury Co., H. A., Montreal, Que.
Deloro Smelting & Refining Co., Ltd, Toronto, Ont.
Firth & Sons, Thos., Montreal, Que.
Hawkridge Bros. Co., Boston, Mass.
Kayser-Ellison & Co., Ltd., Montreal.
Lincoln Electric Co., of Canada, Ltd., Toronto, Ont.
Lyman Tube & Supply Co., Ltd., Montreal
Marshall, Son & Bunney, Toronto, Ont.
Latrobe Electric Steel Co., Latrobe, Pa.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son Toronto, Ont.
Vanadium-Alloys Steel Co., Pittsburgh.

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Armstrong, Whitworth of Can., Montreal.
Dominion Foundries & Steel Ltd., Hamilton, Ont.
Drury, H. A., Co., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.
Vanadium-Alloys Steel Co., Pittsburgh.
Wells Bros. of Can., Galt, Ont.

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Wells Bros., of Can., Galt, Ont.

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A. B. Jardine & Co., Ltd., Hespeler, Ont.
Rice Lewis & Son, Toronto, Ont.
Wells Bros., Co., of Canada, Galt, Ont.

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Bertrams, Ltd., Edinburgh, Scotland.

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Page Steel & Wire Co., Adrian, Mich.

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William Hamilton Co., Peterboro, Ont.

SWITCHBOARDS
Northern Electric Co., Ltd., Montreal Que

SWITCHES, RAILWAY
Can. Steel Foundries, Ltd., Montreal.

TABLES, DRAWING
Economy Drawing Table Co., Adrian, Mich.

TABLES, SAND-BLAST
Pangborn Corporation, Hagerstown, Md.

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Can. John Wood Mfg. Co., Ltd., Toronto

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Can. John Wood Mfg. Co., Ltd., Toronto
Dominion Bridge Co., Montreal, Que.
Dom. Forge & Stamping Co., Walkerville.
MacKinnon Steel Co., Sherbrooke, Que.
Marshall, Son & Bunney, Toronto.

TANKS, LEAD LINED
Can. Hanson Van Winkle Co., Ltd.,

TANKS, LUBRICATING, OIL STORAGE
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Can. John Wood Mfg. Co., Ltd., Toronto

TANKS, PNEUMATIC AND CLOSET
Can. John Wood Mfg. Co., Ltd., Toronto

TANKS, RUBBER CEMENT
Bowser Co., Ltd., S. F., Toronto, Ont.

TANKS, STEEL, WATER PRESSURE
Bowser Co., Ltd., S. F., Toronto, Ont.
Dominion Bridge Co., Montreal, Quebec.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
MacGovern & Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Toronto Iron Works, Ltd, Toronto.

TANK WAGONS
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Toronto Iron Works, Ltd., Toronto.

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Can. Hanson Van Winkle Co., Ltd.,
Lincoln Electric Co. of Canada, Ltd., Toronto, Ont.

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Can. Ingersoll-Rand Co., Ltd., Sherbrooke
Elec. Steel & Metals, Welland, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
William Hamilton Co., Peterboro, Ont.

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Galt Machine Screw Co., Ltd., Galt, Ont.

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Rice Lewis & Son, Toronto, Ont.

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Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garvin Machine Co., New York.
The Geometric Tool Co., New Haven.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Niles-Bement-Pond Co., New York.
Rickert-Shafer Co., Erie, Pa.
National-Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto.
L. S. Starrett Co., Athol, Mass.
Strelinger, Chas. A. Co., Windsor, Ont.
Whitney Mfg. Co., Hartford, Conn.
Williams Tool Corp. of Can. Ltd., Brantford, Ont.

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Butterfield & Co., Rock Island, Que.
Geometric Tool Co., New Haven.
Ingersoll Mach. Co., Ingersoll, Ont.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Pilot Steel & Tool Co., Montreal, Que.
Victor Tool Co., Waynesboro, Pa.

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Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

TAPS, MACHINE RELIEVED
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

TAPS, MACHINE SCREW
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

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Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield.
Ingersoll Mach. Co., Ingersoll, Ont.
Marshall, Son & Bunney, Toronto.
Wells Bros. of Can., Galt, Ont.

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Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

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Cleveland Twist Drill Co., Cleveland.
Pose Mchy. & Sply. Co., G. F., Montreal.
Geometric Tool Co., New Haven.
Greenfield Tap & Die Corp., Greenfield.
Ingersoll Mach. Co., Ingersoll, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Morse Twist Drill & Mchy. Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Rice Lewis & Son, Toronto, Ont.
Starrett Co., L. S., Athol, Mass.
Strelinger, Chas. A. Co., Windsor, Ont.
Taylor, J. A. M., 318 Stair Bldg., Toronto.
Wells Bros. of Canada, Galt, Ont.

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Taylor Instrument Co., Rochester, N.Y.

THERMOMETERS, RECORDING AND INDEX
Bristol Co., Waterbury, Conn., U.S.A.
Taylor Instrument Co., Rochester, N.Y.

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Shore Instrument & Mfg. Co., New York.

TENOVERS
Oliver Machy. Co., Grand Rapids, Mich.

TESTING LABORATORIES
Toronto Testing Laboratory, Toronto.

THREAD-CUTTING MACHINES
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Garlock-Walker Mach. Co., Ltd., Toronto.
Geometric Tool Co., New Haven.
Jardine & Co., Ltd., A. B., Hespeler.
Landis Machine Co., Waynesboro, Pa.
National-Acme Co., Cleveland, Ohio.
National Machy. Co., Tiffin, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Wells Bros. Co. of Canada, Galt., Ont.

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Greenfield Tap & Die Corp., Greenfield.
Landis Machine Co., Waynesboro, Pa.
Pratt & Whitney Co., Dundas, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
Wells Bros. of Canada, Galt, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

THREADING MACHINES FOR BOLTS, NUTS AND PIPES
Greenfield Tap & Die Corp., Greenfield.
Petrie, Ltd., H. W., Toronto.
Wells Bros. Co. of Canada, Galt., Ont.

THREAD MILLING MACHINES
Taft-Pierce Mfg. Co., New York, N.Y.
Smalley-General Co., Bay City, Mich.

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See Screws.
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British Smelting & Refining Co., Ltd., Montreal, Que.
Hoyt Metal Co., Toronto, Ont.

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Brown, Boggs & Co., Hamilton, Can.
Petrie, Ltd., H. W., Toronto.

TIRE BENDERS
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Perrin, Ltd., William R., Toronto.
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Gisholt Machine Co., Madison, Wis.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

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Williams & Co., J. H., Brooklyn, N.Y.

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TOOL ROOM PARTITIONS
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TOOLS, BLACKSMITHS'
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Rice Lewis & Son Toronto, Ont.

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Petrie, Ltd., H. W., Toronto.

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Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool Co., Chicago
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Machy. Co., A. R., Toronto.
U. S. Electrical Tool Co., Cincinnati, O

TOOLS, FORMING
Davidson Tool Mfg. Co., New York, N.Y
Deloro Smelting & Refining Co., Ltd, Toronto, Ont.

TOOLS, LUMBERING
Thos. Pink & Co., Pembroke, Ont.

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Armstrong Bros. Tool Co., Chicago.
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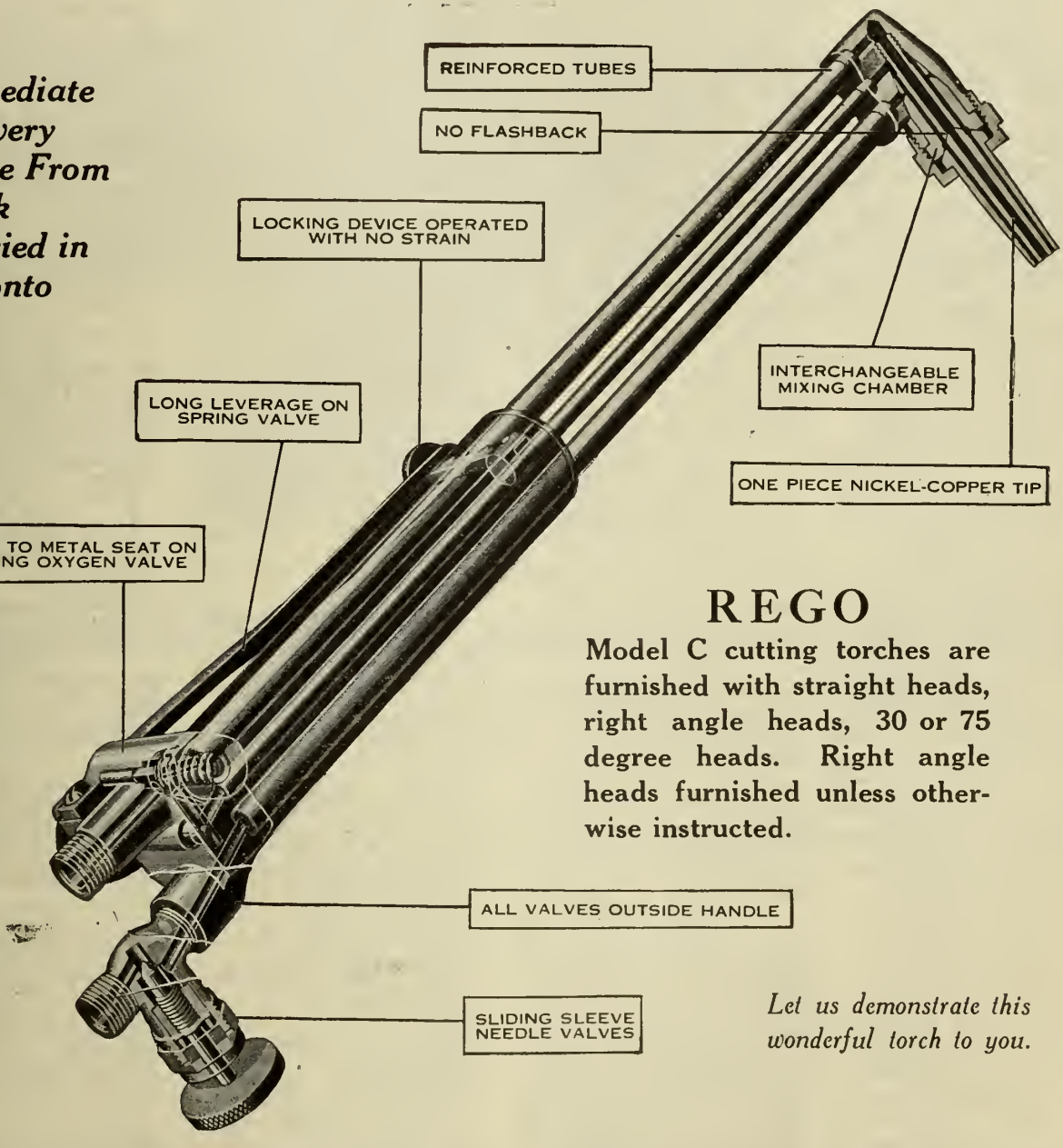
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McCrosky Tool Corp., Meadville, Pa., U. S. A.

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Brown Hoisting Machinery Co., Cleveland, Ohio.

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Northern Electric Co., Ltd., Montreal.

TRANSITS
Hughes, Owens Co., Ltd., Montreal, Que.

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Morris Chain Co., Ithaca, New York.
Renold of Canada Ltd., Montreal.

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Can. Link-Belt Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Coventry Chain Co., Coventry, England.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Hamilton Gear & Machine Co., Toronto.
Jones & Glassco, Montreal.
Kennedy & Sons, Wm., Owen Sound, Ont.
Morse Chain Co., Ithaca, N.Y.
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Renold of Canada Ltd., Montreal.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Machinery Co., A. R., Toronto.

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Northern Crane Works, Walkerville.
Tallman Brass & Metal Co., Hamilton.

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Cowan Truck Co., Holyoke, Mass.
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Cowan Truck Co., Holyoke, Mass.
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TRUCKS, HAND
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Cowan Truck Co., Holyoke, Mass.

TRUCKS, LUMBER AND KILN
Holyoke Truck Co., Holyoke, Mass.
Swedish Steel & Importing Co., Montreal
Northern Crane Works, Walkerville.

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Holyoke Truck Co., Holyoke, Mass.

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Tube Co. of Can., Ltd., Toronto, Ont.
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Hardings Bros., Chicago, Ill.
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Petrie, Ltd., H. W., Toronto.
Steinle Turret Mach. Co., Madison, Wis.
Strelinger, Chas. A. Co., Windsor, Ont.
Warner & Swasey Co., The, Cleveland, O

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Holden Co., Ltd., Montreal, Que.
MacGovern & Co., Montreal, Que.
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Canada Fdrs. & Forg. Ltd., Welland.
Morrow Screw & Nut Co., Ingersoll, Ont.
Rice Lewis & Son, Toronto, Ont.

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Can. Link-Belt Co., Toronto, Ont.
Dom. Bridge Co., Ltd., Montreal, P.Q
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Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

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Butterfield & Co., Inc., Rock Island, Que.

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Brown, Boggs Co., Ltd., Hamilton, Can.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Machinery Co., Toronto.
Jardine & Co., A. B., Hespeler, Ont.
National Machy. Co., Tiffin, O.
Canada Machinery Corp., Galt, Ont.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Williams Machy. Co., A. R., Toronto.

VACUUM PUMPS
Holden Co., Ltd., Montreal, Que.

VALVE LEATHERS
Graton & Knight Mfg. Co., Montreal.

VALVES, MIXING
Crane, Ltd., Montreal, Que.

VALVES (IRON) STANDARD AND EXTRA HEAVY
Crane, Ltd., Montreal, Que.

VALVE GRINDERS (PNEUMATIC)
Cleveland Pneumatic Tool Co., Toronto.

VALVES, HYDRAULIC
Metalwood Mfg. Co., Detroit, Mich.

VALVES, RUBBER PUMP
International Mach. Spls., Ltd., Montreal
Quaker City Rubber Co., Philadelphia

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Petrie, Ltd., H. W., Toronto.
Sturtevant Co., B. F., Galt, Ont.
Williams Machy. Co., A. R., Toronto.

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Williams & Co., J. H., Brooklyn, N.Y

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Becker Milling Machine Co., Boston, Mass.
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Petrie, Ltd., H. W., Toronto.
Chicago Flexible Shaft Co., Chicago, Ill.
Strelinger, Chas. A. Co., Windsor, Ont
Superior Machinery Co., London, Ont.

VISES, DRILL
Superior Machinery Co., London, Ont.

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Atkins & Co., Ltd., Wm., Sheffield, Eng.
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Rock Island, Que.
Marshall, Son & Bunney, Toronto.
Petrie, Ltd., H. W., Toronto.
Wells Bros. Co. of Canada, Galt, Ont.
Williams & Co., J. H., Brooklyn, N.Y.
Strelinger, Chas. A. Co., Windsor, Ont.

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CANADIAN MACHINERY AND MANUFACTURING NEWS
143 UNIVERSITY AVE., TORONTO, CANADA

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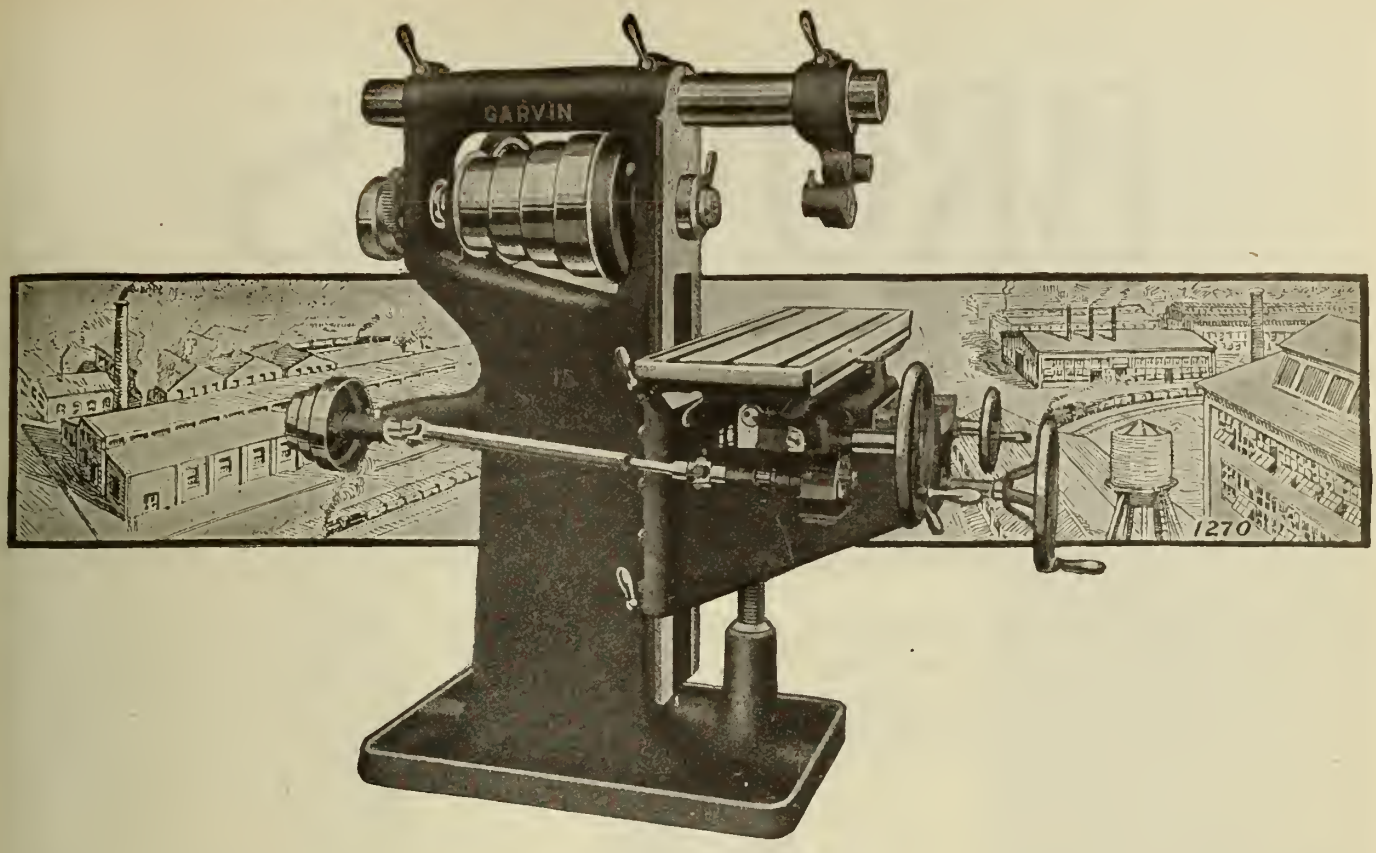

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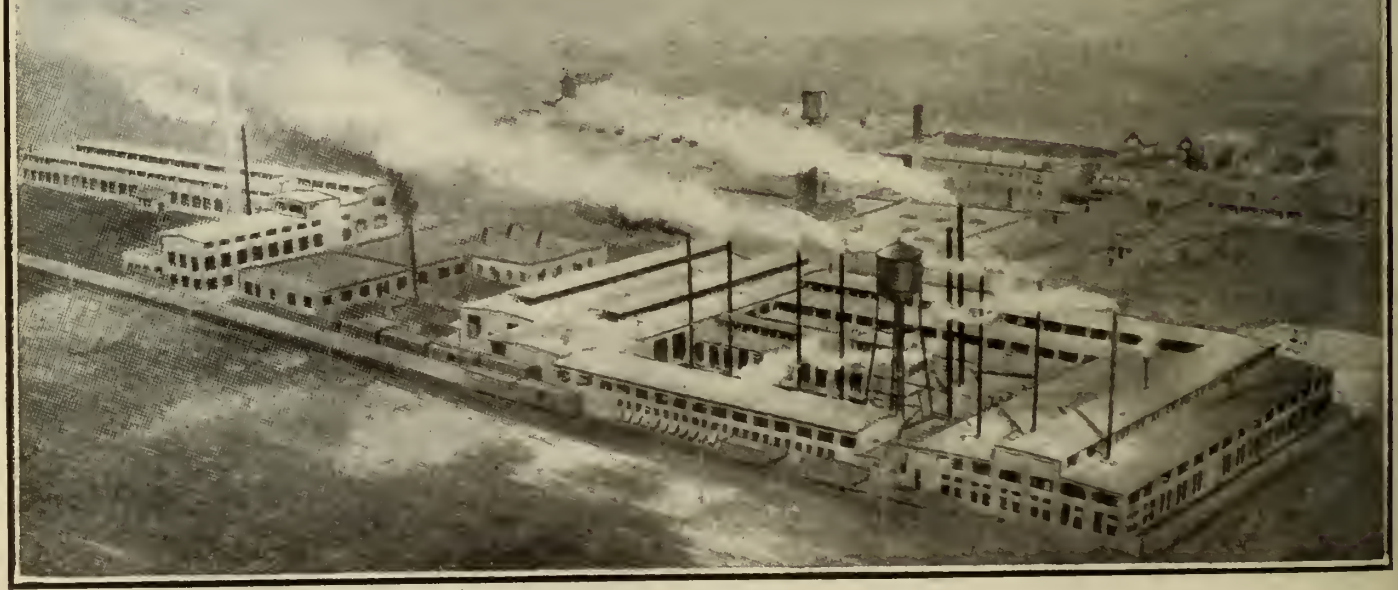

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143 UNIVERSITY AVE., TORONTO, CANADA

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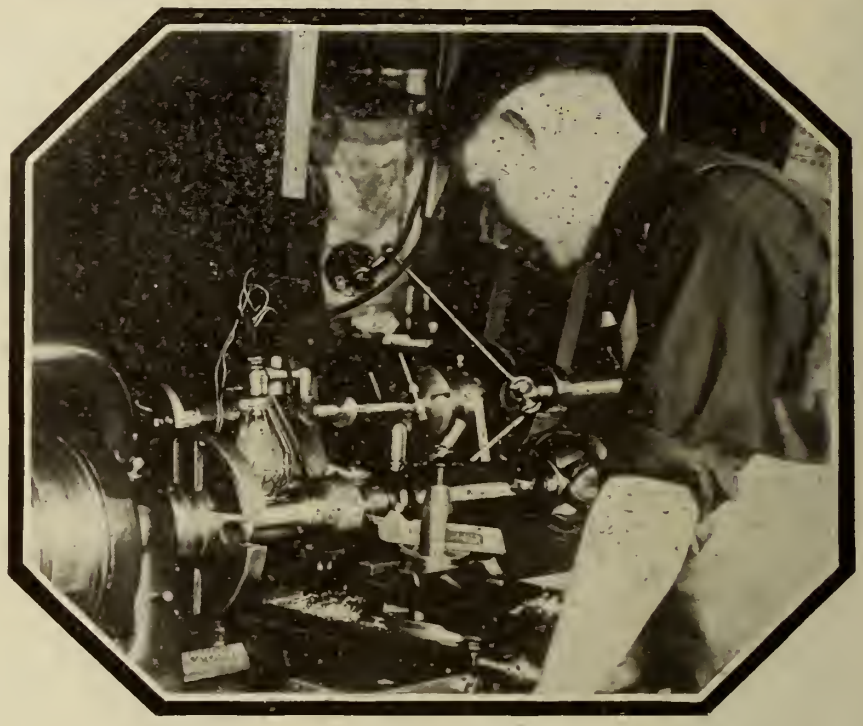
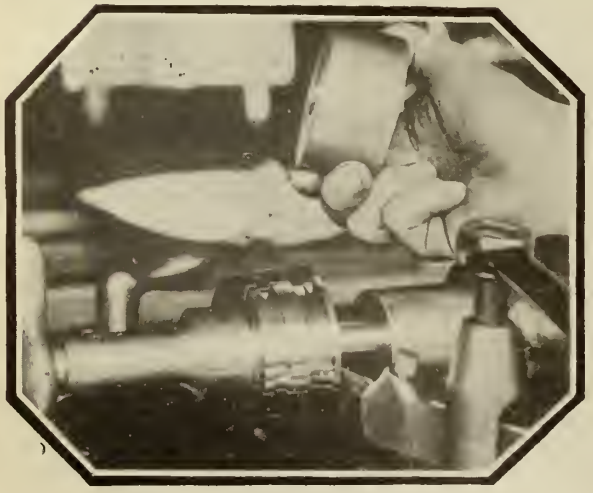


It is Essential that Time Records be Accurate



Production costs to be worth while require accurate time records. Inaccuracy would be unfair to the foreman and the men under him, and the cost would be only **approximate.**

Shops desiring dependable records install the Time Recording Company's products, for there are probably no better clocks made for this purpose.

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1—19" x 10' Sidney, 3-step cone, double back gear.
1—18" x 8' Perfect Machine, quick change gear and taper attachment.

LATHES—SECOND-HAND.

4—28" x 12' Boye & Emmes, 3-step cone and double back gear, quick change gear, rebuilt and guaranteed to be in first-class condition.
2—24" x 12' C.M.C. Lathes, 3-step cone and double back gear.
1—26" x 10' C.M.C. Lathe, 3-step cone and double back gear.
1—22" x 10' Milwaukee Lathe, semi-quick change.
2—20" x 8' American Lathes, all geared head, quick change gear.
1—24" x 8' Boye & Emmes.
1—18" x 8' Greaves Klusman Lathe, second-hand, 3-step cone and double back gear and standard change gear, taper attachment.
4—21" x 8' LeBlond Lathes, quick change gear, double back gear, complete with regular equipment.
4—21" x 10' LeBlond Lathes, quick change gear, double back gear, complete with regular equipment.
2—19" x 10' Sidney Lathes, 3-step cone, quick change gear and double back gear.
4—20" x 10' Walcott Lathes, 3-step cone, quick change gear and double back gear.

PLANERS

1—30" x 30" x 14' Putnam Planer, second-hand.
1—Preston Pony Planer, 16" x 8'.
1—16" Preston Buzz Planer.
1—12" Round Cylinder Buzz Planer, second-hand.

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1—25" Smith & Mills, cone pulley drive. New.
1—16" Smith & Mills cone pulley drive back geared crank shaper. New.
1—24" Back Geared Bertram Shaper, second-hand.
1—26" Back Geared Kelley Shaper, second-hand.

DRILLS—NEW

1—4' Mueller Single Pulley gear box drive radial drill.
2—12" Class "B" Henry & Wright high-speed ball-bearing drill presses.
1—18" Edlund High Speed ball-bearing drill press.

DRILLS—SECOND-HAND

1—30" American Tool Works Sliding Head Drill.
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2—21" x 10' LeBlond Lathes, 3-step cone, double back gear and quick change gear.
10—19" x 8' LeBlond Lathes, 3-step cone, double back gear and quick change gear.
6—20" x 8' Walcott Lathes, 3-step cone, double back gear and quick change gear.
3—20" x 10' Walcott Lathes, 3-step cone, double back gear and quick change gear.
2—20" x 10' Sidney Lathes, 3-step cone, double back gear and quick change gear.
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1—22" x 10' Milwaukee Lathe, semi-quick change.

All the above machines are fitted with 4-jaw Independent Chucks.

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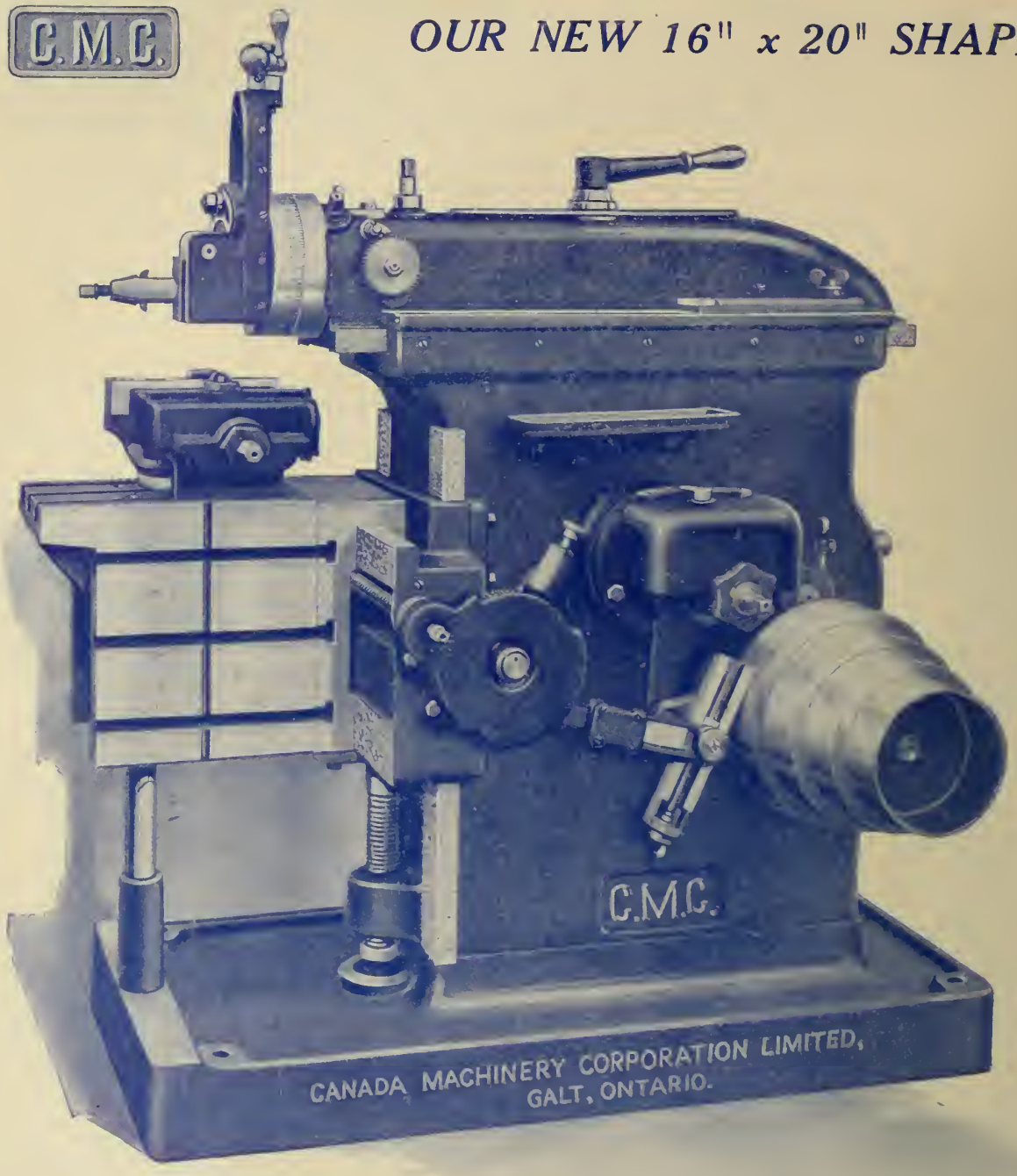

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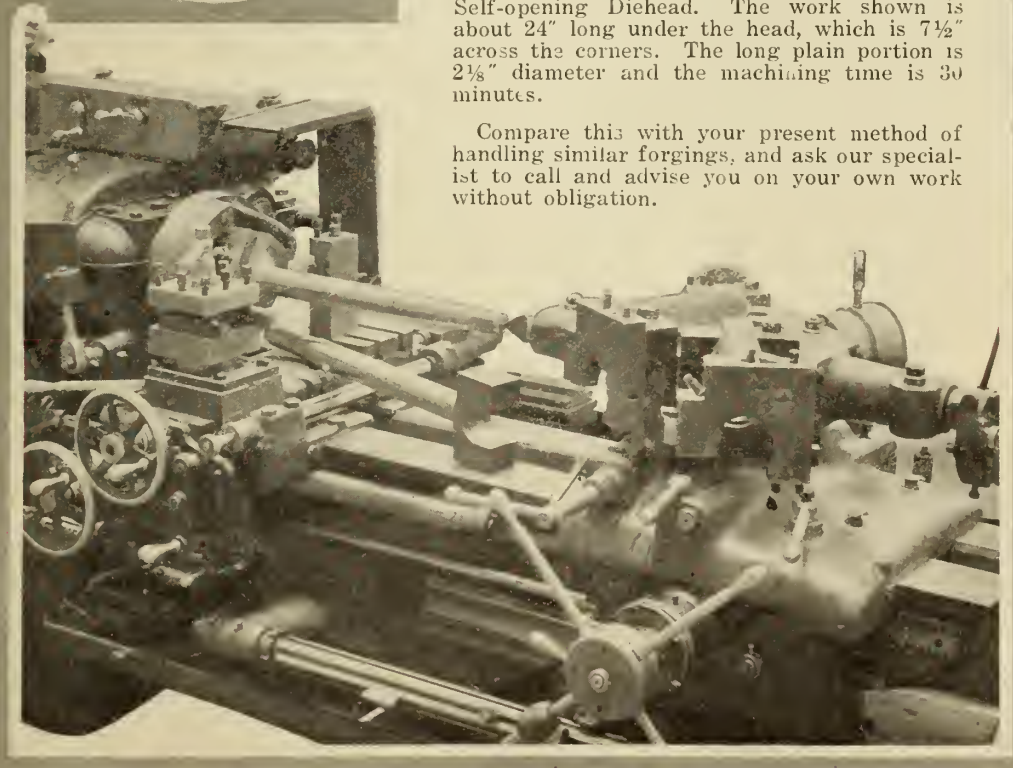
TURNED FORGINGS

like these Piston Rods, are often unthinkingly consigned to the Centre Lathe. Our Combination Turret Lathes suitably tooled will produce them far more rapidly and accurately. Turning is done with patent roller steady tools at one cut with coarse feeds and good finish. The threaded end is screwed with the Coventry Self-opening Diehead. The work shown is about 24" long under the head, which is 7½" across the corners. The long plain portion is 2⅛" diameter and the machining time is 30 minutes.

Compare this with your present method of handling similar forgings, and ask our specialist to call and advise you on your own work without obligation.



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Not only good when new, but heat treated and seasoned to maintain this goodness. Can be ground on face of cutting edge without affecting their size. That's why you'll find Pratt and Whitney Stay Bolt Taps on the job long after cheaper "just as good" tools are buried in the scrap pile.

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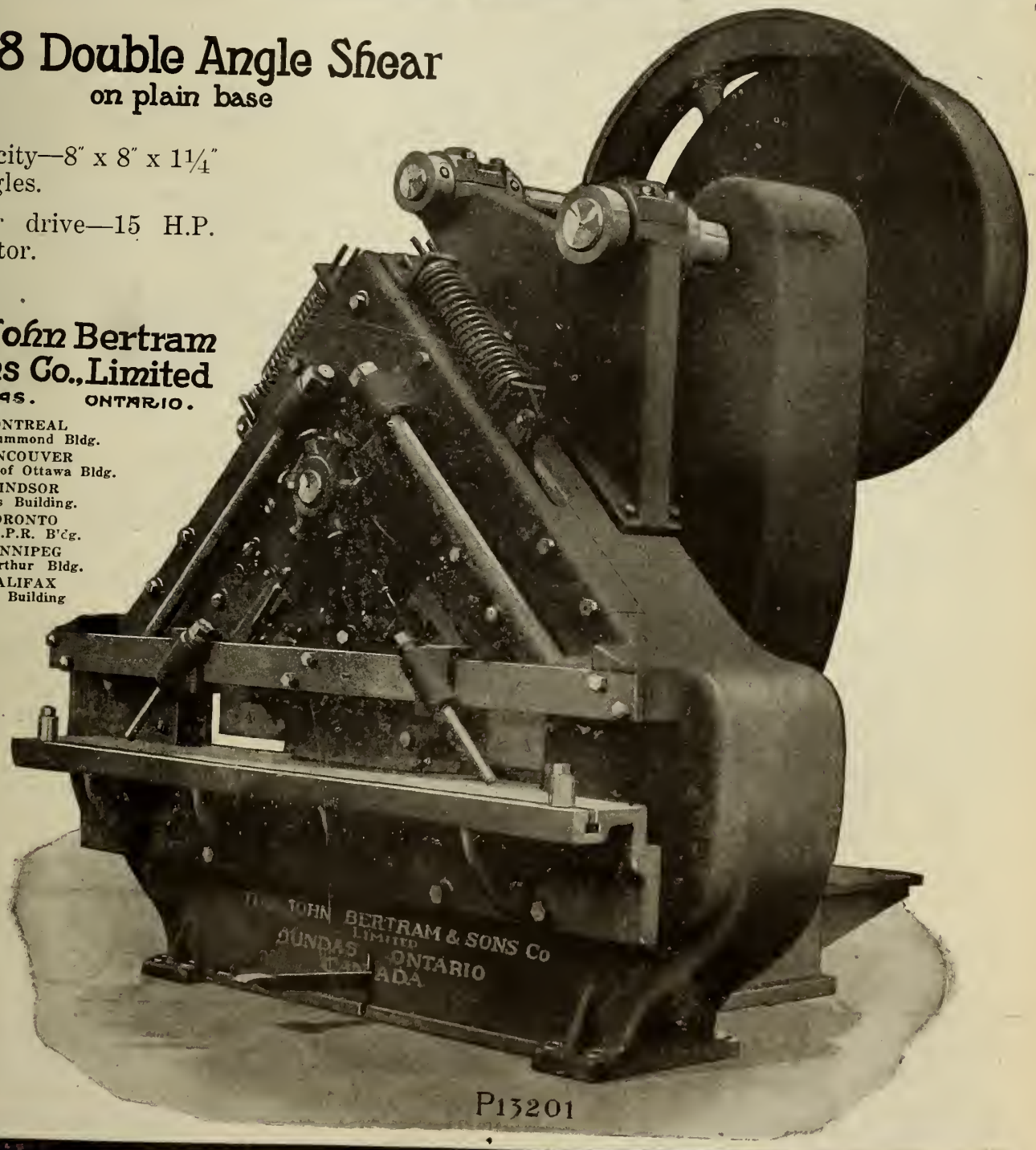
The BERTRAM Page

MACHINE TOOLS

No. 8 Double Angle Shear
on plain base

Capacity—8" x 8" x 1¼" angles.

Motor drive—15 H.P. Motor.



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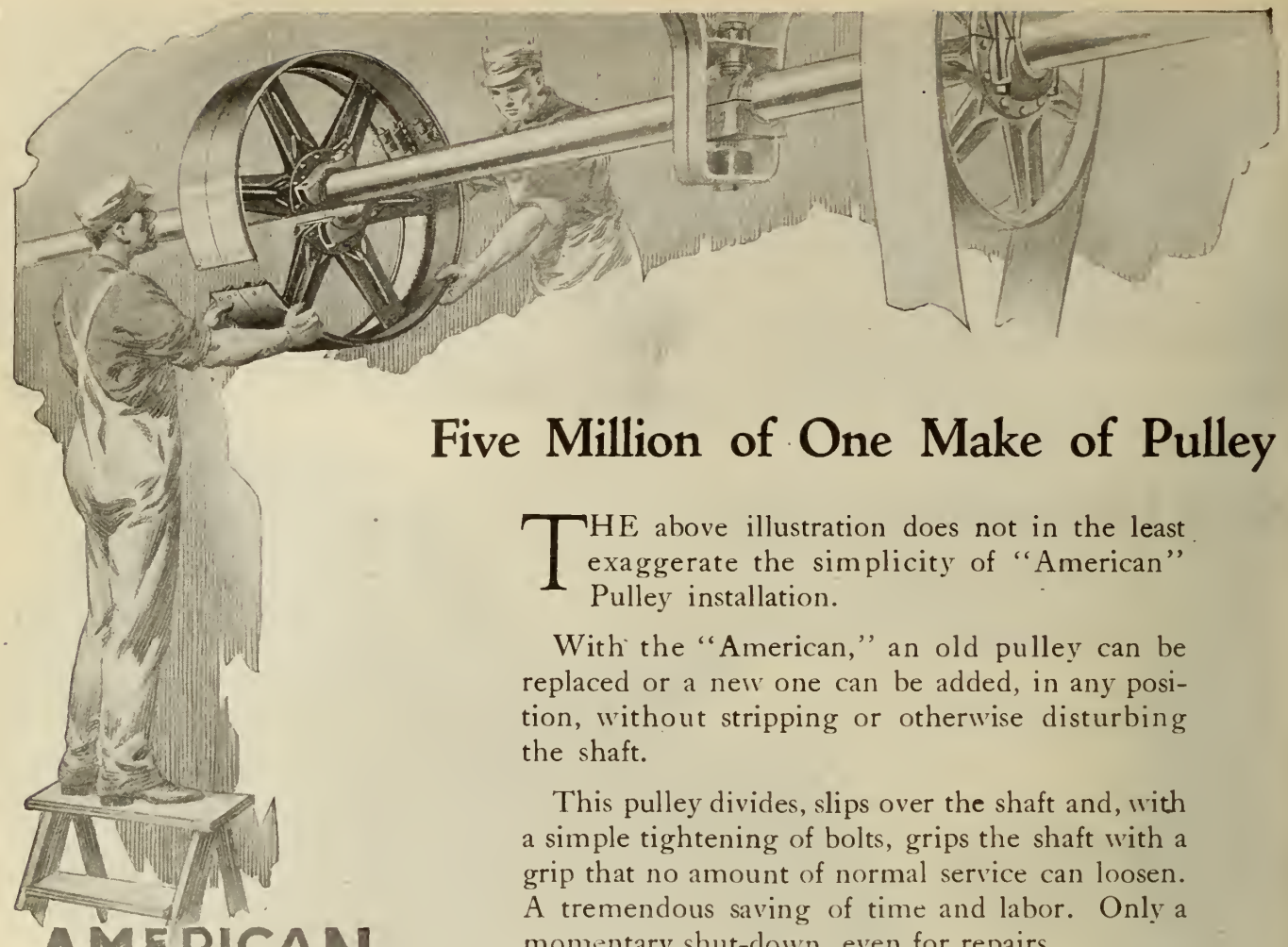

AMERICAN
STEEL SPLIT
PULLEYS

Five Million of One Make of Pulley

THE above illustration does not in the least exaggerate the simplicity of "American" Pulley installation.

With the "American," an old pulley can be replaced or a new one can be added, in any position, without stripping or otherwise disturbing the shaft.

This pulley divides, slips over the shaft and, with a simple tightening of bolts, grips the shaft with a grip that no amount of normal service can loosen. A tremendous saving of time and labor. Only a momentary shut-down, even for repairs.

When the first "Americans" were bought, the new user installed them on his faith in us and our claims for the pulley. But the power user today has the known, successful performance of more than five million other "American" Pulleys back of every one he installs.

"Getting Maximum Pulley Efficiency" is not a catalog, but a pulley book that will be useful to you. Will you advise us where to send you a copy?

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The AMERICAN PULLEY

"A wheel with a broad rim tranamitting power from or imparting power to machinery, or changing the direction of motion by means of a flat belt."

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HIGH SPEED AND CARBON TWIST DRILLS, REAMERS AND MILLING CUTTERS

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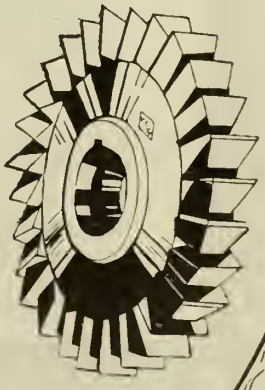

Exponents of shorter working hours claim that a man can produce as much work in eight hours as he can in nine, owing to the extra vim he puts into the shorter day's work. This claim is questionable. But here is a point beyond question. Give a workman tools which he can operate rapidly and smoothly, tools which he can push hard if necessary without breaking and dulling their cutting edge and he will easily do as much work in eight hours as he did in nine.

Is your plant working shorter hours? Demand Wilt High Speed and Carbon Twist Drills, Reamers and Milling Cutters. They possess that quality that makes shorter hours and greater production possible.

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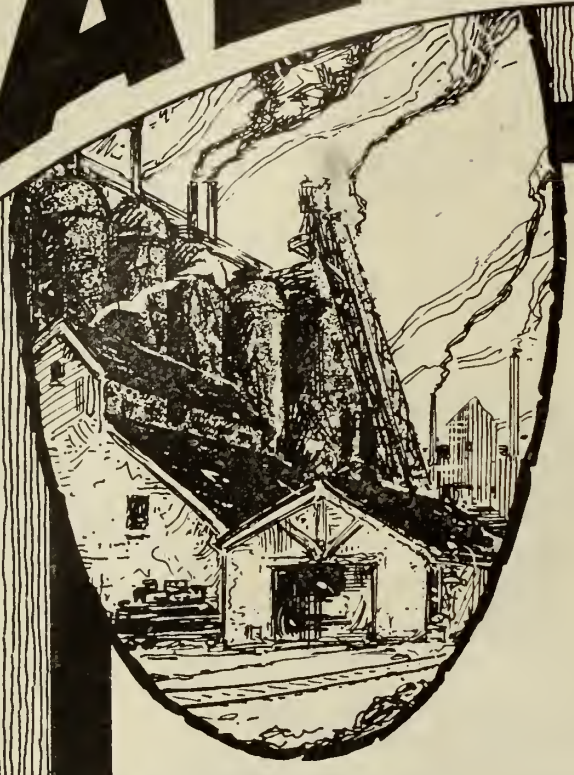

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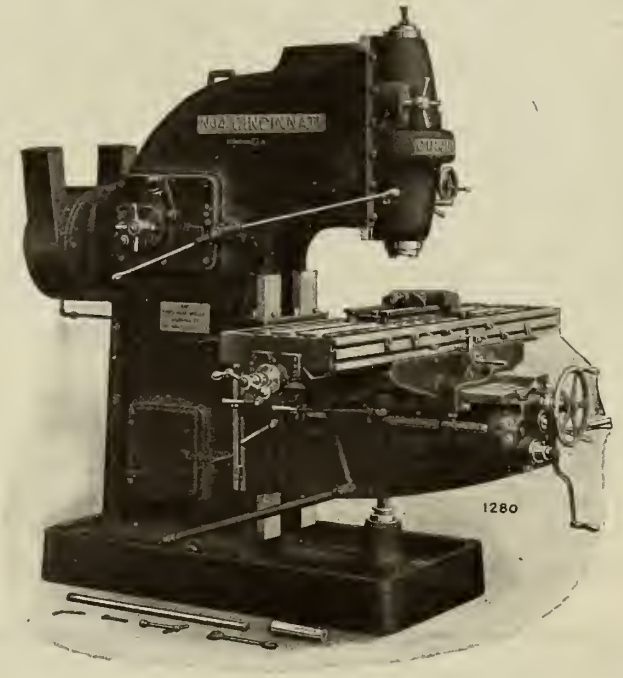

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Cincinnati standard flanged spindle end.

Spindle can run in either direction.

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Developed during the war and used for running down shell box cover screws the Little David Pneumatic Screw Driver will save time and money in the assembling and shipping departments of automobile, piano and furniture factories, machine tool plants or any other place where quantities of wood or machine screws have to be driven.

These tools do not break or bend the screws and are under the control of the operator at all times so that the screws may be set to just the right degree of tightness. Just the tool for plants in which piece work or premium rates are in force.

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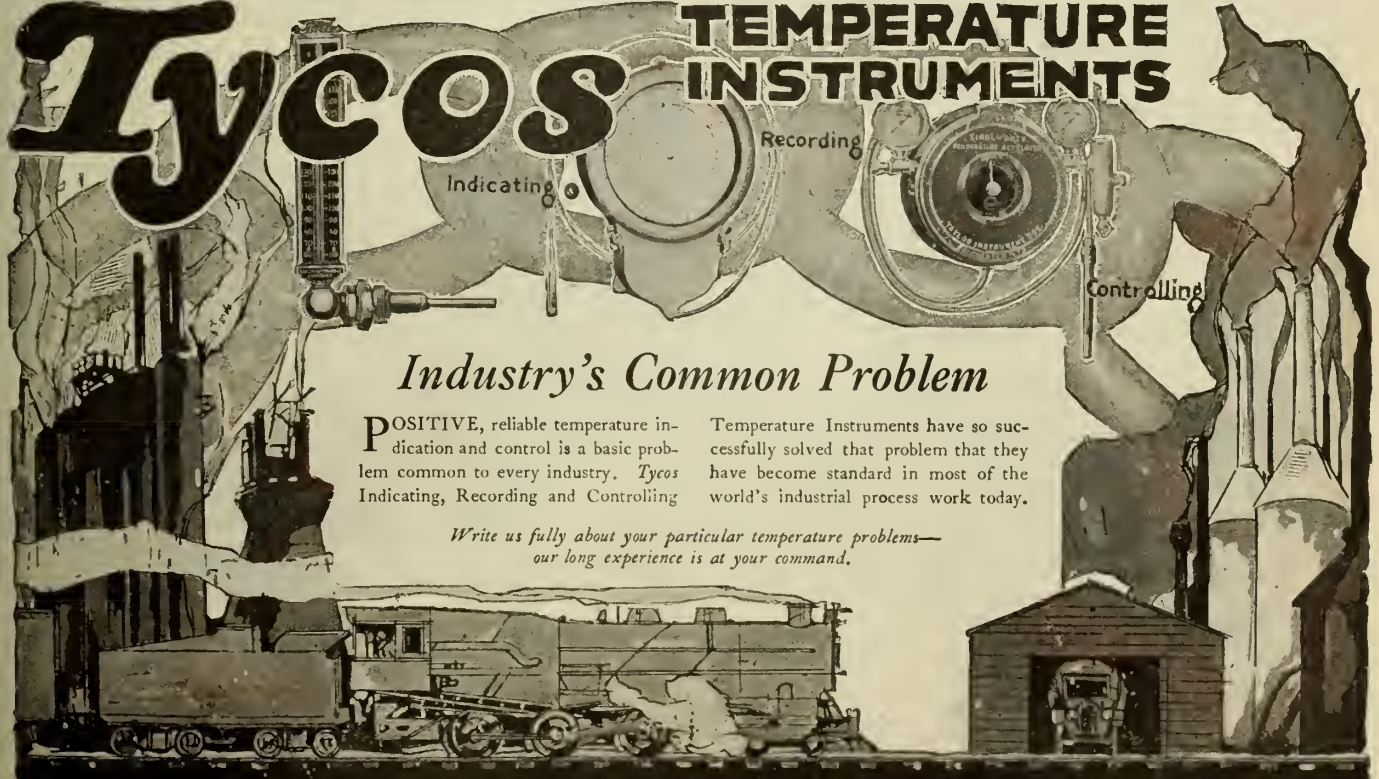

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There's a *Tycos* or *Taylor* Thermometer for Every Purpose DD-1

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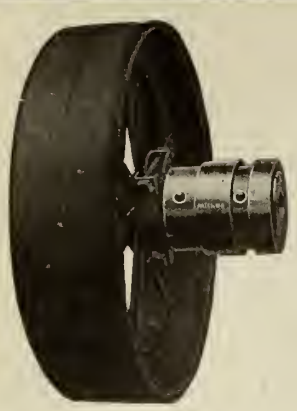

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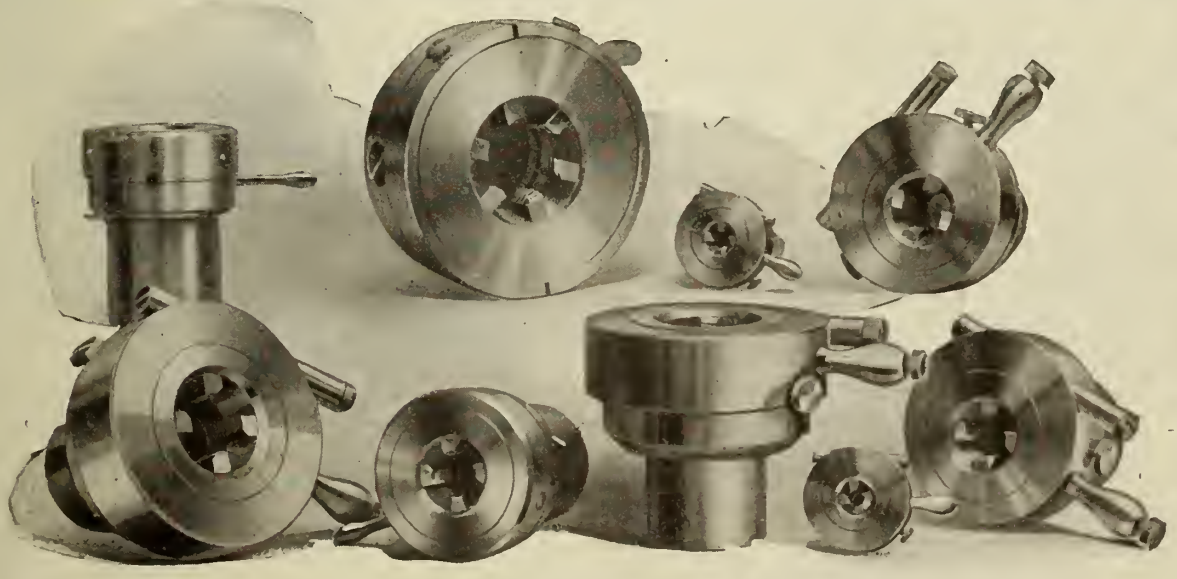

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The entire range from ¼ inch to 2¾ inch for standard threads, and to 3 inches for 8 pitch or finer, is covered by three sizes of dles, whose ranges overlap.

And any of these dies, even the large N. 9, will thread pitches as fine as 32 per inch on its largest diameter without danger of stripping.

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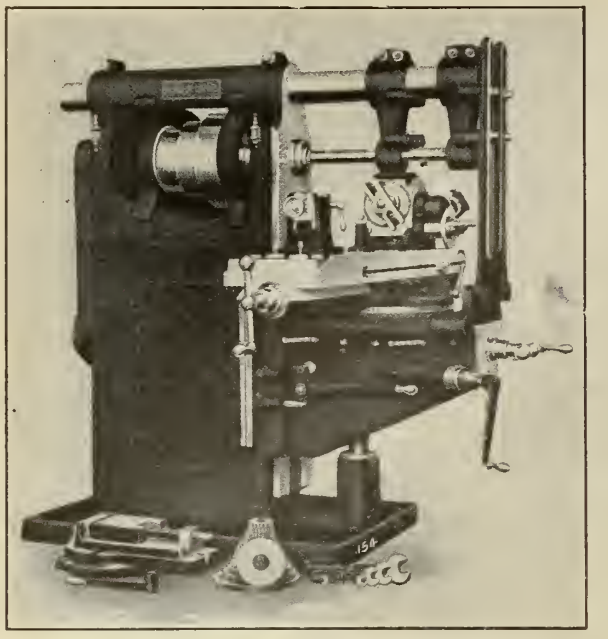

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Full particulars will be found in the Ford-Smith catalog. Shall we send you a copy?

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Ford-Smith Millers are high-grade machines, modern in every particular, designed for **quality** as well as **quantity** production.

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Thor

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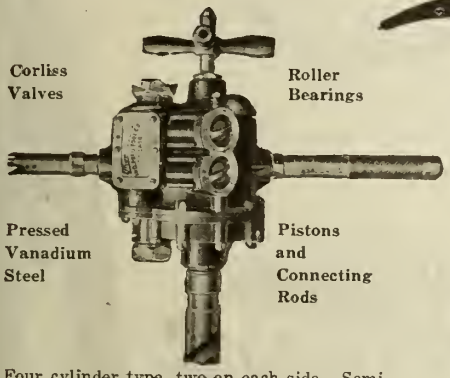

Four cylinder type, two on each side. Semi-Corliss valve close to each pair of cylinders gives greater efficiency and power, saves clearance losses and allows air to enter cylinder at full pressure of the pipe line.

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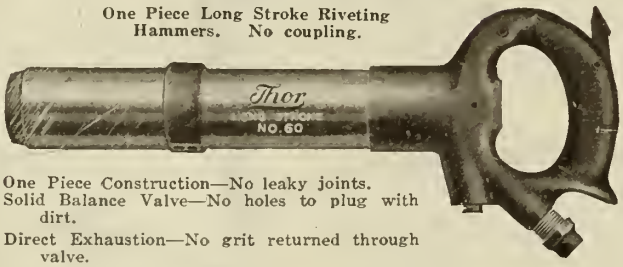

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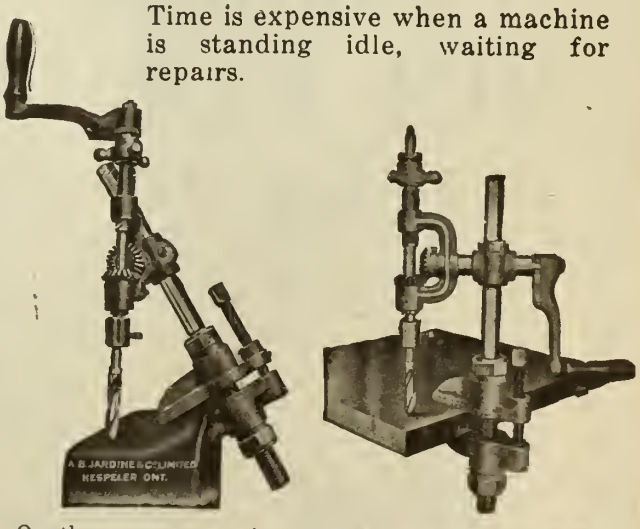
Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.



On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, $26.50 net.

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"CANADIAN" MILL EXHAUSTERS

Handle Any Material

The Canadian Standard Mill Exhauster will handle any kind of material efficiently — sawdust, shavings, cotton lint, or stringy material, gases, fumes, smoke, etc.

They are adjustable to any angle of discharge instantly —have universal type of wheel and carefully constructed self-aligning oil-ring bearings.

Catalog 410-77—gives technical data and prices. Write for a copy.

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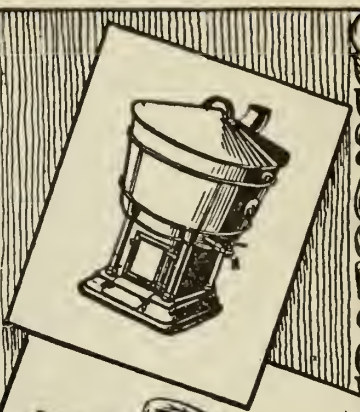
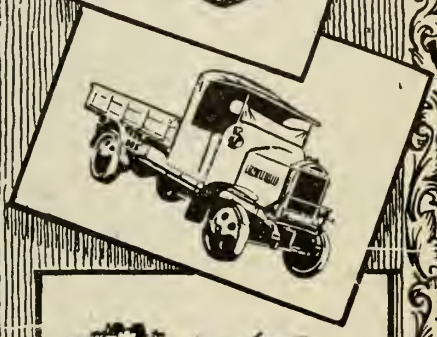
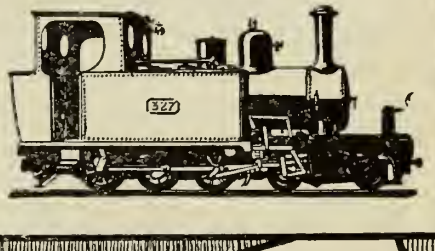
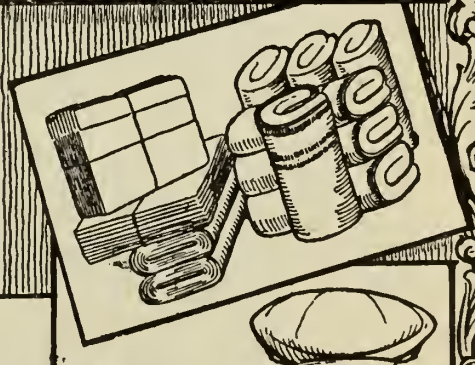
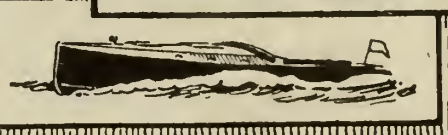
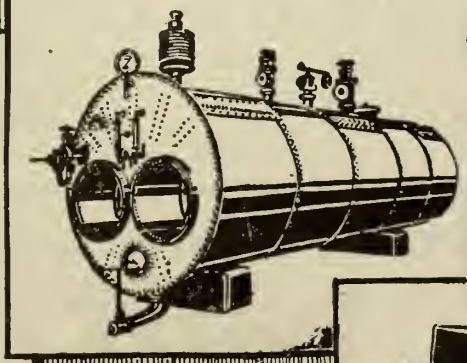
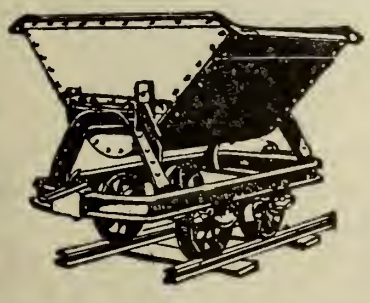



Pick the right blade for the job—

and then use it in the right way.

Regulate the pressure and cutting speed so as to get the greatest number of cuts possible without wearing out the blade too soon.

That's hack saw economy — the theme of "Hack Saws and Their Use," the latest Starrett book. See what it covers—hack saw steels, tempering effects of too much or too little pressure, cutting speeds, lubricants, materials, methods of figuring costs. Sixty-four pages of pointers on the proper use of hack saw blades.

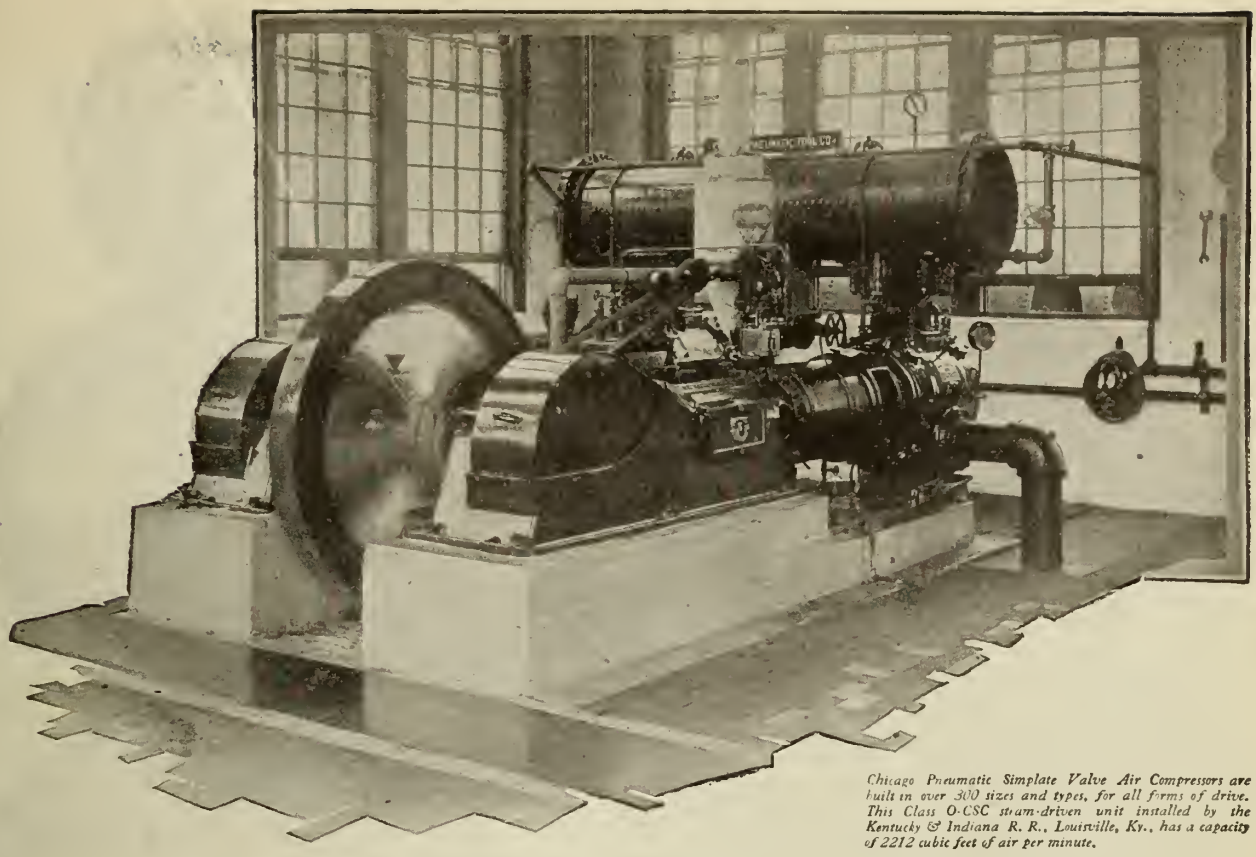
If you are interested in getting more value out of the blades you buy, write for a free copy of "Hack Saws and Their Use."

THE L. S. STARRETT COMPANY

The World's Greatest Toolmakers
Mfrs. of Hack Saws Unexcelled
ATHOL, MASS.

42-92

Use Starrett Blades



Chicago Pneumatic Simplate Valve Air Compressors are built in over 300 sizes and types, for all forms of drive. This Class O-CSC steam-driven unit installed by the Kentucky & Indiana R. R., Louisville, Ky., has a capacity of 2212 cubic feet of air per minute.

Another way in which Chicago Pneumatics save power

FROM no-load to full-load, Chicago Pneumatic Air Compressors economize power.

Under all load conditions the cylinder ratio of stage machines is unchanged. This insures highest power economy under variable air demands.

Under no load the inlet valves are automatically held open, permitting free passage of air.

Chicago Pneumatics thus save power over those compressors using a "choked intake" with its resultant losses.

Bulletin 400 tells about this and other Chicago Pneumatic economy features. May we send your copy?

Sales Representatives

The Holden Company, Limited

354-356 St. James Street, Montreal, Canada

Sales and Service Branches: TORONTO, 342 Adelaide Street, West WINNIPEG, 150 Princess Street VANCOUVER, 81 Pender Street

Canadian Factory: Canadian Pneumatic Tool Company, Montreal

C-69-H

BOYER PNEUMATIC HAMMERS · · LITTLE GIANT PNEUMATIC AND ELECTRIC TOOLS
CHICAGO PNEUMATIC AIR COMPRESSORS · · VACUUM PUMPS · · PNEUMATIC HOISTS,
GIANT OIL AND GAS ENGINES ROCK DRILLS · · COAL DRILLS

CHICAGO PNEUMATIC

The Compressor with the Simplate Valve

If interested tear out this page and place with letters to be answered.

Saving Time On Bench Work

CLIPPING off a few seconds here and there on difficult fitting or intricate assembling jobs soon amounts to minutes and hours. In just this way Columbian Vises and fittings are saving the seconds and speeding up production in shops throughout the country.

The removable jaw faces of Columbian Vises can be replaced by special jaw faces for holding unusual or complicated work. It takes only a few moments and a screw driver to detach the regular jaw faces and attach the special jaws—and vice versa. The special jaws hold the work more securely and prevent marring.

Columbian Extra Jaw Facings, made in lead, brass and copper, for holding work soft enough to be marred by steel jaws, are great time savers. They do away with pieces of leather, strips of wood and other makeshifts.

The Columbian Adjustable Jaw Vise will conform to any wedge-shaped piece and grip it quickly and securely. Where it would be necessary to remove, turn and replace a piece in a vise with stationary base, the Columbian swivel base vise will save this complete operation. The time saved in the first few thousand pieces will more than pay the extra cost of the swivel base.

Columbian Sledge-Tested Vises are the only vises made of malleable iron and are twice as strong as cast iron vises.

Columbian Hardware Division
of **The Consolidated Iron-Steel Mfg. Co.**
World's largest makers of vises and anvils
CLEVELAND

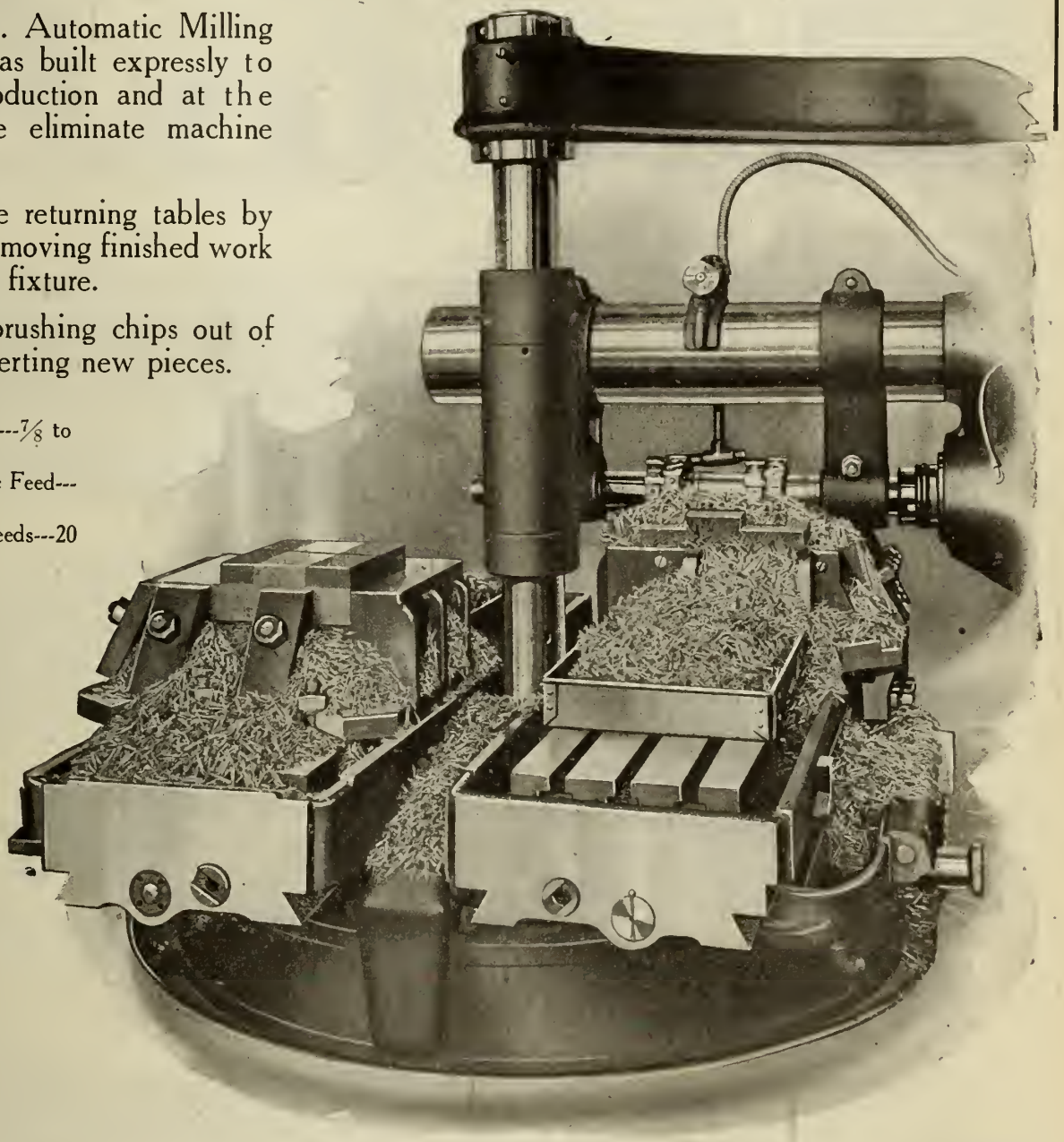
Increased Production

The P. & J. Automatic Milling Machine was built expressly to increase production and at the same time eliminate machine idleness.

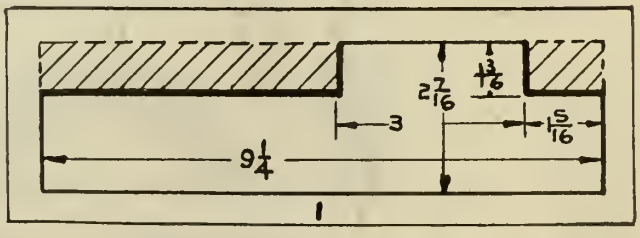
No lost time returning tables by hand and removing finished work from vise or fixture.

No delays brushing chips out of vise and inserting new pieces.

16 Table Feeds---7/8 to 12 5/16 inches.
Length of Table Feed---29 inches.
16 Spindle Speeds---20 to 180 R.P.M.



Bulletin 40



Canadian Offices: POTTER & JOHNSTON MACHINE CO.

ROELOFSON MACHINE & TOOL CO., LIMITED

Head Office and Show Rooms: 11 Wellington Street East, Toronto, Canada

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HANNA

IRON ORE - PIG IRON

Sales Agents:

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Dunbar

Springs *for* Every Use

We have been making springs of all kinds for 70 years. Let us advise you when in difficulty.

Tell us the purpose for which the spring is intended, and experts will gladly co-operate to see that you get the design best suited to the purpose.

Dunbar Springs are thoroughly tested for accuracy and quality. Send us specifications, for estimates.

THE DUNBAR BROS. CO.
BRISTOL, CONN.

TRAHERN PUMPS

TRAHERN

You Can Rely on the Trahern Rotary Geared Lubricating Pump to Give Superior Satisfaction.

Throws heavy stream of coolant at will of machine operator into deep cuts and bores. Has large capacity, low speed and long life—all superior essentials!

Tool manufacturers find that machines equipped with Trahern Rotary Geared Lubricating Pumps sell to better advantage. It's the ideal pump for speedy, economical and efficient production. **Write for full information.**

TRAHERN PUMP DIV.
Geo. D. Roper Corp.
ROCKFORD, ILLINOIS, U.S.A.

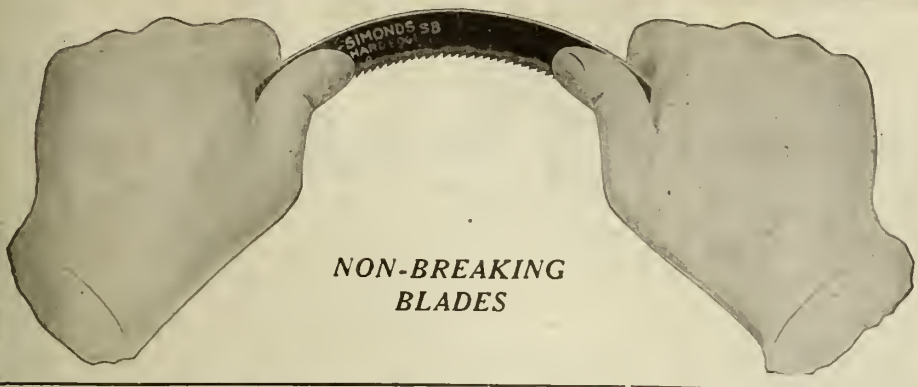
HOYT

BABBITTS—METALS—SOLDERS

HOYT METAL COMPANY

MONTREAL TORONTO WINNIPEG

SIMONDS HACK SAWS



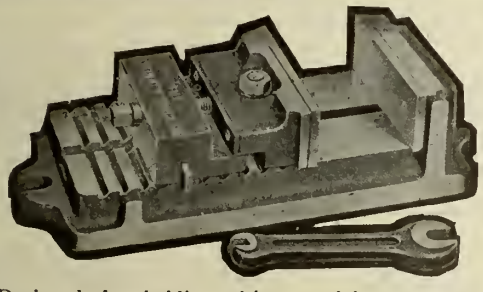
NON-BREAKING BLADES

CUT CUTTING COST

For Machine or Hand Use
Any Size or Length

Simonds Canada Saw Co. LIMITED
MONTREAL
St. John Vancouver

SKINNER DRILL PRESS VISES



Designed for holding either straight or taper work this vise is portable, convenient and durable.

It is truly **THE HANDY TOOL.**

It may be bolted to a drill, planer, miller or shaper by the ears at both ends, clamped as desired by the flange or used at right angles.

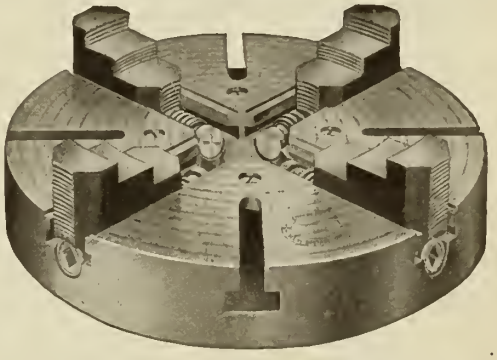
THE SKINNER CHUCK COMPANY
NEW BRITAIN, CONN.

New York Office: 94 Reade St.
San Francisco Office: Rialto Bldg.
London Office: 139 Queen Victoria St., London, E. C. 4.

ALL STEEL

INDEPENDENT CHUCKS

are not an experiment—they have come to stay. They are a necessity with the modern machinery and high-speed steel cutting tools.



THE UNION STEEL BODY CHUCKS

are well designed and have all the elements of strength and durability for which they are designed. We make other types in steel also, including the Geared Scroll Chucks and the Geared Scroll Combination—all designed for heavy work and hard usage.

UNION MANUFACTURING COMPANY
New Britain, Conn.
New York Office: 26 Cortlandt Street
Makers of a complete line of chucks

STEEL PLATE CONSTRUCTION

Oil Storage, Gasoline Tanks, Air Receivers, Pneumatic Water Supply Tanks, Smoke Stacks, Boiler Breeching, Riveted Steel Pipe, Bins and Hoppers.

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TORONTO IRON WORKS
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HEAD OFFICE: ROYAL BANK BLDG. TORONTO *WORKS: CHERRY STREET*

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STELLITE

Not Steel—but its Master

For "production work," where speed is of the utmost importance, a new epoch in cutting speeds arrives upon the introduction of *Stellite*.

Heat, generated by the friction of high speed cutting, up to 2,000 deg. F. but serves to make *Stellite* tougher, harder, capable of even deeper cuts than when cold.

Stellite tools increase the capacity of each machine and the shop as a whole in a truly remarkable manner.

Let us send a demonstrator and show you just what the possibilities of *Stellite* are in *your* shop.

Deloro Smelting & Refining Co., Limited

Head Office and Works :
DELORO CANADA

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STEEL CASTINGS

QUICK DELIVERIES

High Carbon Steel
Manganese Steel
Chrome Steel
Mild Steel

QUALITY GUARANTEED

Sizes—½ lb. to 5,000 lbs. each

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LIMITED
OWEN SOUND, ONTARIO
ESTABLISHED 1860

STRENGTH

Strength is a very essential quality in a wrench, but it does not depend entirely upon bulk or weight of metal. The strength and long-lasting qualities of Armstrong Wrenches are the result of skilled combination of the Best Steel, Expert Design, Accurate Machining, and Heat Treatment. All kinds and sizes.

Write for free catalogue.

Armstrong Bros. Tool Co.
"The Tool Holder People"
335 N. Francisco Ave., Chicago, U. S. A.

STEEL CASTINGS

We shall be glad to supply information on:

Galvanizing, Enamelled Signs, Stoves, Lithographed Ware, Wire Goods, Anchors, etc.

For Shipbuilding, cars, locomotives, and all classes of machinery.

Superior and reliable Steel Castings by the Acid Electric Process can be made up to fifteen tons.

The Thos. Davidson Mfg. Co. Limited

HEAD OFFICE: Montreal

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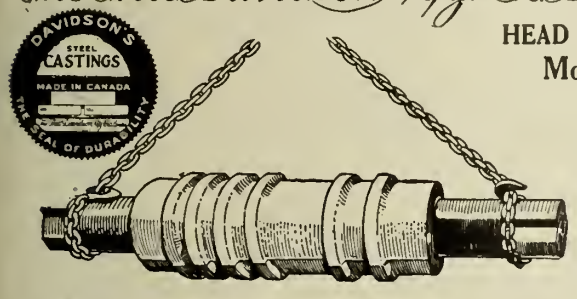

DAVIDSON

Dominion Grinding Wheels

Try a Dominion on quality basis. Put it to a hard test and watch results.

Dominion Grinding Wheels are made by expert workmen and every step in the process of manufacture is carefully inspected to insure a Standard Quality when the wheel leaves the Dominion Factory.

Our abrasive material is supplied by our own factory and a uniformity of quality is therefore assured. We are prepared to guarantee that Dominion Wheels will give equal service to the best imported wheels. Why not put them to the test?

Dominion Abrasive Wheel Co.
Limited
Mimico - Ontario

MADE IN CANADA

MESTA MACHINE COMPANY
General Office and Works: Pittsburgh, Pa., U.S.A.

GAS AND STEAM ENGINES

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Blast Furnaces, Rolling Mills
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Blooming Mills	Tin Plate Mills
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Large Engine Shafts—Piston Rods
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Carbon Steel—Alloy Steel—Bronze
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Write for Bulletins

MESTA MACHINE CO.

Pittsburgh, Pa. U. S. A.

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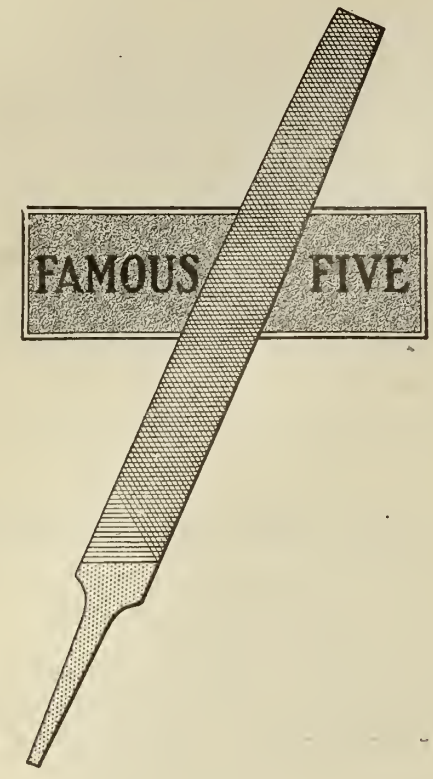

Each "Famous Five" Brand Has a Reputation

Each of the five brands of files listed below has earned separately a reputation for efficiency and reliability.

Each has passed a thousand exacting tests in the hands of practical file users over a period of fifty years.

So we call them the "Famous Five," and are proud of the fully-earned name.

When you buy any one of the Famous Five brands, you get special steel, teeth accurately cut, thorough hardening—in short, standard quality.

The Famous Five Brands are:

KEARNEY & FOOT **AMERICAN**
GREAT WESTERN **ARCADE**
GLOBE

Nicholson File Company

PORT HOPE - ONTARIO

Manufacturers:

The Sheffield Twist Drill & Steel Co.
LIMITED

Works: Summerfield St., Sheffield

Telephones:	*LONDON OFFICE:*	Telegraphic Address:
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HIGH TWIST SPEED DRILLS

High-class Drills with IRRESISTIBLE PIERCING FUNCTIONS that stand the WEAR and TEAR—in other words, the DRILLS that are EFFICIENT and ECONOMICAL—are the DRILLS with the "DORMER" Brand.

We are manufacturing SPECIALISTS—Carry large STOCKS—Give PROMPT deliveries, and rely upon our products for REPEATS.

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GENUINE EMERY

Sizes 180, 160, 140, 120, 110, 100, 90, 80, 70, 60, 54, 46, 40, 36, 30, 24, 20, 18, 16, 14, 12, 10, 9, 8, hole.

EMERY FLOUR AND WASHED FLOUR

Emery Glass Flint Garnet Corundum Carborundum	Paper and Cloth	In Sheets, Rolls, Discs, Bands, Strips and Tapes, &c.

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If a Bad "Nut" Gets Loose
—Use a Wrench

Endurance Brand

Never Wear Out
Ask Your Jobber

Canadian Billings & Spencer Plant
WELLAND, ONTARIO

Harris Heavy Pressure

The Babbitt Metal that's at the Front in Efficiency and Economy

Order a Box from our nearest Factory

Our Guarantee is Back of Every Pound of Babbitt Metal We Make

Manufactured by
The Canada Metal Company, Limited

TORONTO - CANADA
HAMILTON WINNIPEG
MONTREAL VANCOUVER

STAR TRADE MARK REGISTERED

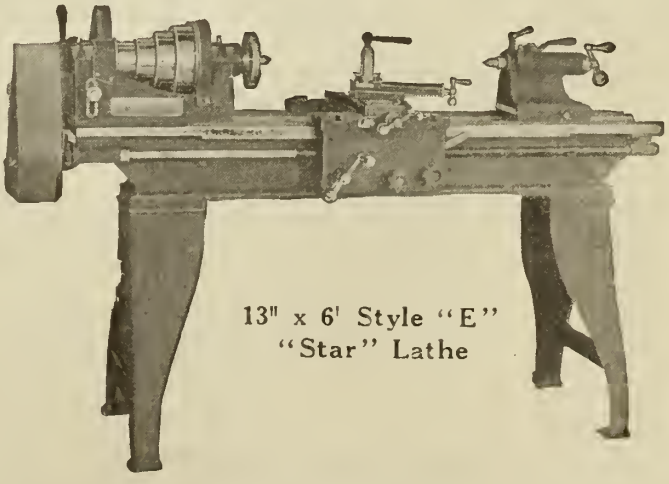
For Increased Production on

Small and Medium Work Use "STAR" Lathes

Manufacturers of small and medium work who require a lathe of simple, sturdy and accurate construction should investigate "Star" Lathes when considering additional equipment.

Keep your big lathes for the big jobs. The "Star" will ably replace them in the smaller work—"Stars" cost less to install, use less power and less floor space and insure increased production.

Send for the "Star" catalog. It explains the many short-cuts to increased production with economy through "Star" lathes.



13" x 6' Style "E" "Star" Lathe

Seneca Falls Mfg. Company, Inc., 366 W. Falls St., Seneca Falls, N.Y.

BY INVITATION MEMBER OF
NEW YORK, U.S.A.

SPRINGS, WIRE & STEEL
EST.
"BARNES-MADE" PRODUCTS
1857
SCREW MACHINE PRODUCTS

Specify *"Barnes-Made"*

Auto Clutch Springs

Get a spring of maximum flexibility and longevity.

The *"Barnes-Made"* Auto Clutch Spring is the result of diligent research and experiment. It is wound from full-size stock, has more working coils, yet meets a specified weight test and is guaranteed not to "set."

It is of standard type, tho' built in exact accord with customers' specifications. Of dependable quality, because of the specially tempered steel that's in it.

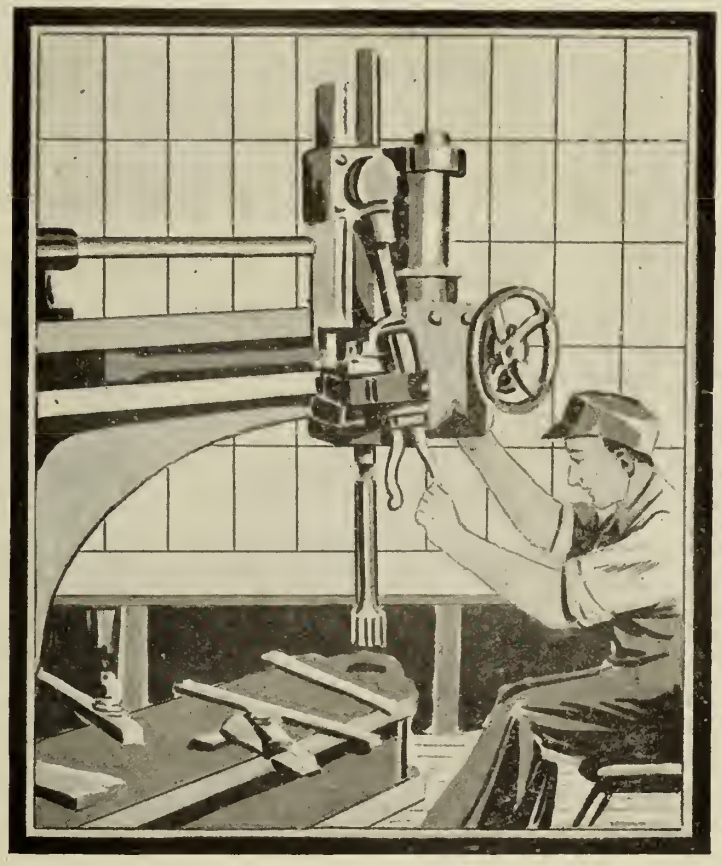
Prompt Deliveries

The Wallace Barnes Company

"Spring Makers for Three Generations"

Main Office and Works: Bristol, Conn.
Western Sales Division: Book Bldg., Detroit.

BUTTERFIELD



TAPS, DIES, DRILLS, REAMERS AND MILLING CUTTERS

A just reputation is not secured without proof of merit. Butterfield Tools would not enjoy their present distinction were it not for the quality of service they have always given their users.

Clean, accurate cuts, high speed and long life—these are features found in every Butterfield Tool.

A trial is convincing.

BUTTERFIELD & COMPANY DIVISION

UNION TWIST DRILL CO.

ROCK ISLAND - QUE., CANADA

Toronto Office: 220 King St. West

FOREIGN REPRESENTATIVES: Great Britain, Geo. H. Alexander, 83-84 Coleshill St., London, England; France, Italy, Belgium and Switzerland, Fenwick Freres, 8 Rue de Rocroy, Paris; Sweden, Norway and Denmark, Ab. Sigfr. Anderson & Co., Malmo; Spain, Casamitjana Hermanos, Barcelona; Japan, Abe-Kobei & Co., Yokohama; Greece, Stephen C. Stephanson, 11 Lycourgan St., Athens; Netherlands, Wynmalen & Hausman, Rotterdam; Australia, H. R. Richardson, 82 Pitt St., Vickery's Chambers, Sydney; South America, Charles Dreyfus, B. Mitre, 785 Buenos Aires, R.A.

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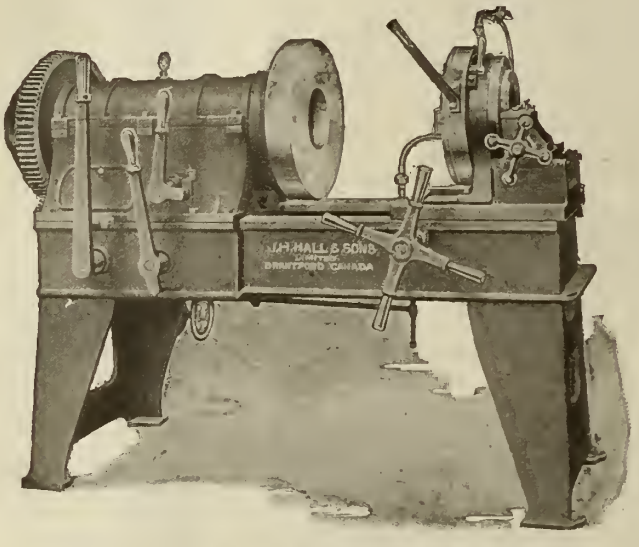
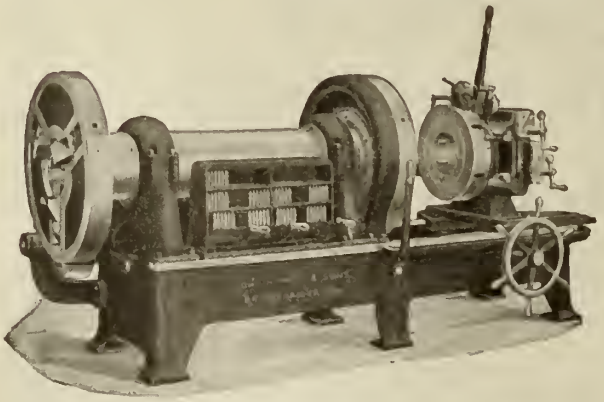
See Our Exhibit

Machinery Hall, National Exposition, Toronto

Pipe Threading Machinery ⅛ in. to 18 in.



The Hall No. 6 Pipe Machine



The Hall No. 8 Pipe Machine

THIS exhibit will demonstrate in a striking way the high standard of efficiency that has been attained in pipe threading machines. A practical man will be in attendance for consultation.

We extend a hearty welcome to all interested in such a display.

Give Us An Opportunity to Discuss Your Threading Problems

Williams Tool Corp. of Canada, Ltd.

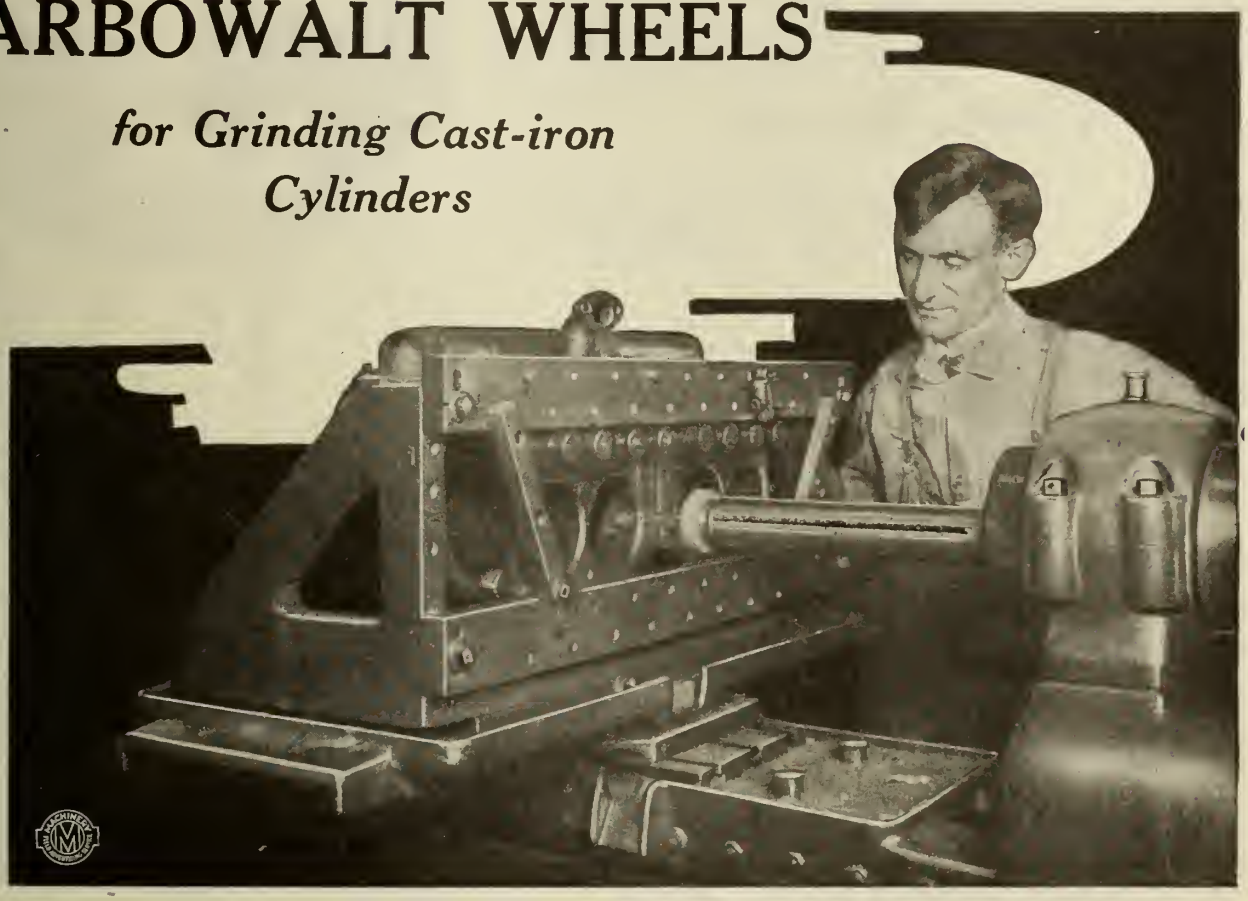
Brantford, Canada

Successors to John H. Hall & Sons, Limited

WALTHAM

CARBOWALT WHEELS

for Grinding Cast-iron Cylinders



State the details of your grinding requirements and we will show you what Waltham Grinding Wheels can do to speed up production in your plant.

In the grinding of cast-iron cylinders, fast work and high quality of finish are necessary. This was the problem that confronted the Wadell Motor Corporation, Newark, N.J. (where they repair anything from a motorcycle to a Packard, and keep four cylinder grinders busy).

They felt there must be a quicker method than the one they were using—and they found this quicker method by using Waltham Carbowalt Grinding Wheels.

A two months' trial of Waltham Wheels greatly increased cylinder grinding production without in any way lowering the quality of the finished work—and as a result, Waltham Grinding Wheels have been made "standard" for this work. It was found that a 3½" x ¾" x 1¼" 36s-J Carbowalt Wheel on a Heald machine was capable of removing more stock in a given time than any other grinding wheel this company had ever tried.

ALOWALT

RICHARDSON RUBBER WALTHAM GRINDING WHEEL COMPANY SILICATE VITRIFIED

CARBOWALT

WALTHAM GRINDING WHEEL CO.

WALTHAM, MASS., U.S.A.

Canadian Representatives:—Standard Machinery and Supplies, Ltd., Montreal, Canada.

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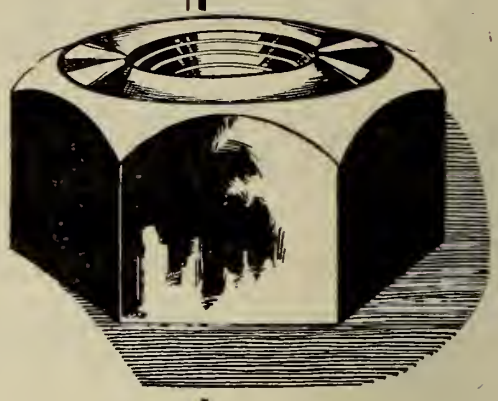
NUTS



Plain

Castellated

Semi-Finished

STANDARD

V., S.A.E. and U.S.S. Cap Screws

V., U.S.S. Semi-Finished Nuts

S.A.E. Plain and Castellated Nuts

V., U.S.S. Set Screws

SPECIAL

Special Screw Products

To Specifications

Capacities up to 2¼ in. diam.

"Owing to the market shortage of raw material, it is to the customers' advantage that they anticipate requirements as far ahead of use as possible."

THE NATIONAL ACME COMPANY

MONTREAL, P.Q.

De Courcelles G.T.R.R.

ST. JOHNS QUEBEC

Insure the future success of your new plant by locating there

To the manufacturer locating in St. Johns go all the advantages of a commanding geographical location, unequalled transportation facilities and a cheap and abundant power supply. These features assure every facility in manufacturing and allow him to successfully meet competition.

St. Johns is only 27 miles from Montreal and is directly connected by rail with the Montreal docks, providing unusual ocean shipping advantages. It is particularly suitable as a Canadian location for the American manufacturer wishing to trade within the British Empire.

Seven railroads, including the Canadian Pacific and Grand Trunk, pass through the city and are inter-connected in the St. Johns Yards by a terminal switching company at very low rates.

Skilled and unskilled labour is always plentiful, and owing to an unusually low cost of living labour troubles are practically unknown.

To the manufacturer seeking a location for his plant the following inducements offered by St. Johns are especially attractive: Exemption from taxes for a period of fifteen years, same being subject to extension; all public improvements required, such as street extensions, sidewalks, waterworks and sewage; five per cent. bonus on your payroll for five years. If you wish it this bonus will be advanced to you to be applied to the construction of any building suitable to your purpose.

For more detailed information write

The Secretary, City Council

ST. JOHNS, QUEBEC, CANADA

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Steelworks Plant and Hydraulic Machinery

ROLLING MILLS
FORGING PRESSES
BLOOM, SLAB, BILLET and PLATE SHEARS
HOT SAWS
HYDRAULIC PUMPS
ACCUMULATORS

800-Ton Forging Press with Intensifier

DUNCAN STEWART & CO. LTD.

LONDON ROAD IRON WORKS, GLASGOW

Tel. Address: Stewart, Glasgow. Established 1864

More Speed
Better Work
With—

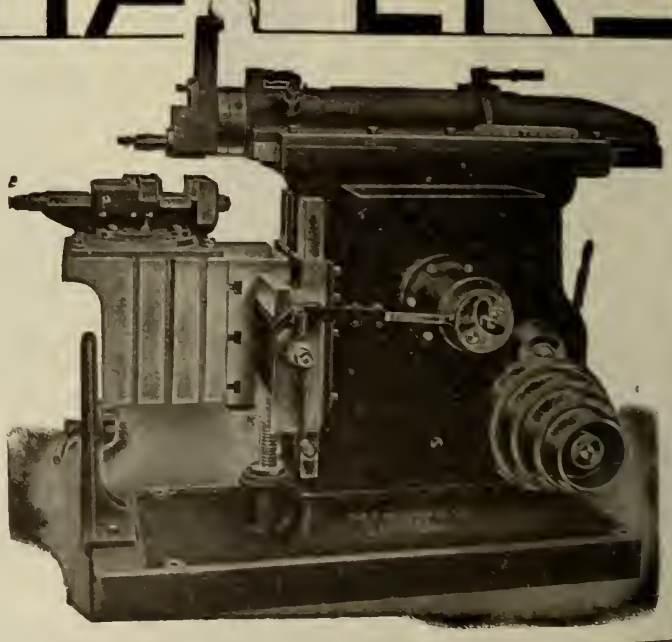
16 and 20 inch Crank

McDougall SHAPERS

Modern methods of manufacture require modern tools. McDougall 16 and 20 inch Shapers embody the best features of all machines which have been placed upon the market and can be depended upon to produce work accurately and fast.

An important feature is the column. It is massive in construction, well braced and reinforced internally. Has ample opening under ram for keyseating or other long work. Bearings for ram extend beyond vertical line of column both front and back. The ram is of exceptional strong construction.

McDougall shapers have other points of interest you should know about. Write for full description.



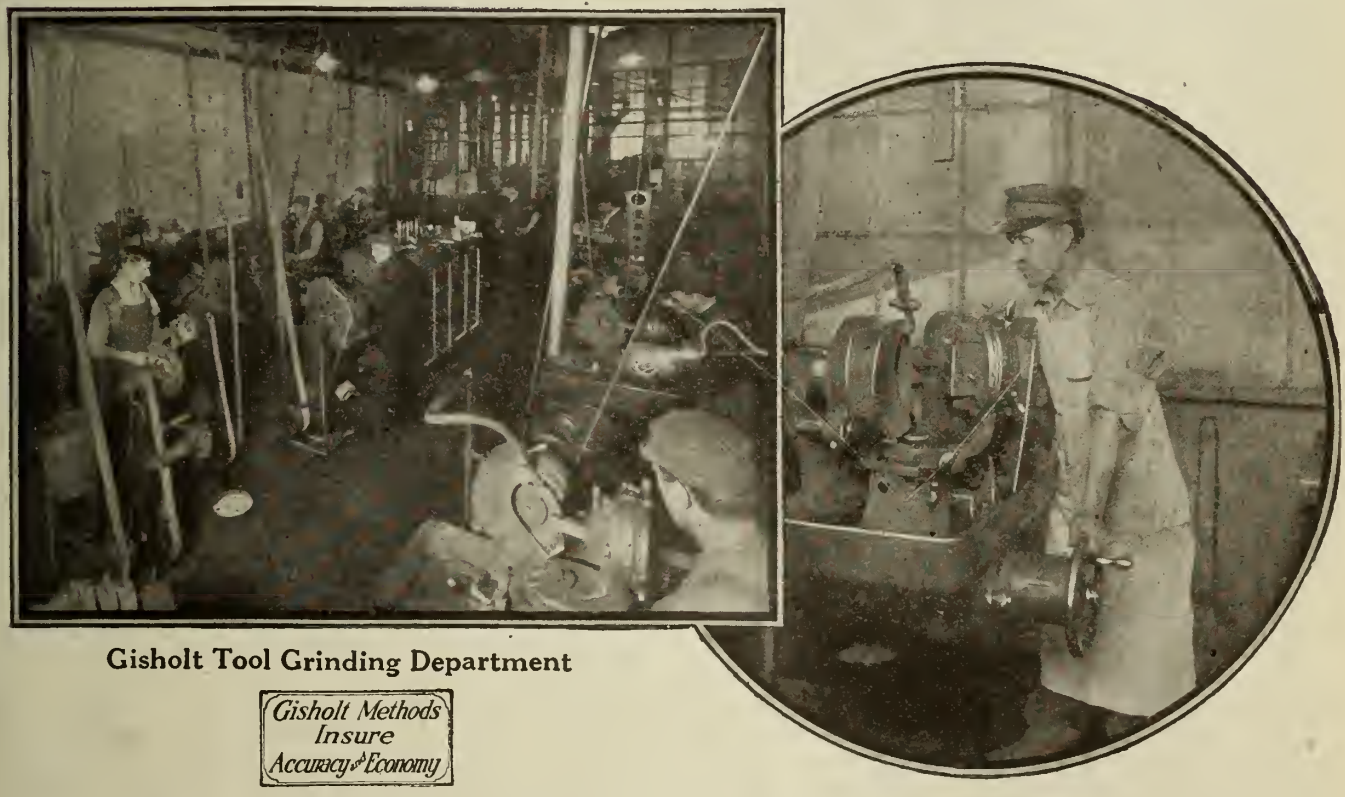
The R. McDougall Co., Limited

Galt, Ontario

THE CANADIAN FAIRBANKS-MORSE CO., LIMITED
Sales Agents

GISHOLT

What Is Profitable for Us Is Profitable for You



Gisholt Tool Grinding Department

Gisholt Methods Insure Accuracy & Economy

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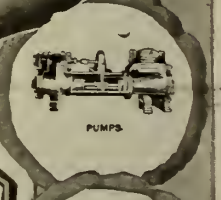

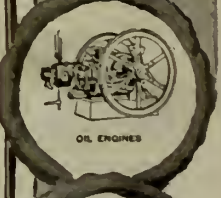

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CANADIAN MACHINERY
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Making 30,000 Nuts in 9 Hours on One Machine

Nut Tapping, Cold Nut Making, Bolt Heading, and Bolt Thread Rolling Are Discussed—Interesting Facts Are Also Given on How an Up-to-Date Bolt and Nut Department is Conducted

By J. H. MOORE

THE work entailed in conducting a large nut and bolt department is more than appears on the urface, and we feel that the descrip-ion, dealing with such a department t the plant of the International Har-ester Co., Ltd., Hamilton, Canada, ill be of particular interest to our eaders.

When one considers the numerous olts, nuts, etc, used on the various tyles of harvesting implements made y this concern, they can readily see hat not only will the number be great, ut the varieties many. We need not o into the clerical work, although this s a large item in itself, but will con-ne ourselves strictly to the routine and mechanical features involved. Every conceivable size, length and style of bolts and nuts are used. In some cases the threads are cut by means of the regular bolt cutter, while for other purposes they are rolled.

Before going into the actual thread rolling, let us dwell on other features of interest. Certain bolts are made by the cold heading process, others by the hot method. This latter course means that suitable furnaces are installed, and with all the foregoing, plus nut tappers in batteries, etc., etc., the department presents a very busy appearance indeed.

The storing facilities are of special interest, large bins arranged, tier upon tier, and plainly labeled as to their contents. All bolts and nuts upon completion reach this storing and shipping section, and are weighed on a ratio pan or counting scale.

Some of our readers may be familiar with this type of scale, but for the benefit of those who are not, we might explain that apart from the ratio pan, it presents a very similar appearance to any standard portable, or floor scale.

A special counting beam is installed, and it is this feature that allows the accurate and quick method of obtaining the total number of the product. For example, suppose you have a truck filled with bolts and you wish to know

FIG. 1—ILLUSTRATING THE MAKING OF COLD PRESSED NUTS.

FIG. 2—THIS SHOWS THE BOLT HEADER IN ACTION.

FIG. 3—NOTE THE DETAILS OF THIS THREAD ROLLING MACHINE.

the number contained in the truck. To secure the count you first set out the tare weight of the truck on one of the verifying beams, place the number of pieces in the ratio pan as required by the particular size of the weighing bar in use. This number may be two, ten, and so on depending upon the size of the scale, and how it is arranged.

Having placed the pieces in the ratio pan, you move it along the bar until the beam is in balance. Upon reaching this position the indicator above the pan will rest upon the figure corresponding with the exact number of pieces contained in the truck. This scheme does away with counting, thus overcoming the possibility of error. When weight is required in addition to the count, it is obtained in the same manner as on any other scale.

All materials are weighed in, and weighed out at this department, and entries made in the ledger accordingly. Absolute tab is kept on all stock, and every deduction from the same is entered in the ledger in red ink, thus clearly separating the entries from the parts deducted. By this method they can tell at a glance the stock on hand.

Nut Making Machines

Leaving the routine, and entering upon the actual manufacturing itself, let us refer to Fig. 1 which illustrates a machine busily engaged in turning out cold pressed nuts. Making nuts by the hot process method is also adopted at this plant, but the cold pressed machine is by far the most interesting.

The first thing that impresses one on viewing a cold nut presser is its solidity. It is a heavy massive affair and built for strength, as it might well be, owing to the work it must perform. Briefly, the procedure is as follows on the type of machine shown: The stock is fed in from the side by means of a series of rolls. These not only guide, but straighten the stock. From this point the stock is carried in by a grip feed which holds it securely by the aid of springs. This is previous to shearing off.

It next goes between two guides, the centre hole is punched, the nut is sheared, crowned, trimmed and pushed out, all these movements being automatic.

The completed nut, as far as the machine is concerned, drops out while the slugs are separated and drop out at another part of machine. The dies used for this class of work are made from the very best of steel, and we saw one set of trimming dies which had trimmed 330,000 nuts without regrinding and was still going strong. The punches are provided with pilots to prevent any spring, undue strain, etc.

The die box on one of these machines is especially interesting, it having all facilities for clamping the dies tightly, yet so arranged that adjustment can be made at a moment's notice. Cams play an important part in the operation of these machines as the various slides receive their action by such means. Some of these cams can be noted in the photograph. Note the box of nuts to the right of picture. This is where they are ejected from the machine, and as one nut is made per revolution, they come out at a great rate of speed. An average day's run is approximately 30,000.

The next illustration Fig. 2 depicts a bolt header in action, and in this case also, the stock is used in its cold condition. Once more weight plays an important part in obtaining rigidity and all ways, slides, etc., are made as long and as wide as possible. In this example the ram of the machine has a double motion, the first gathering the

FIG. 4—THERE IS NO WASTE MOVEMENTS ON A MACHINE OF THIS NATURE.

stock, and the second finishing the head of bolt. As can be noted the stock is placed on reels and enters the machine through the two guide wheels, clearly noted in the picture. These rolls acts as straighteners as well as guides.

After entering the machine a predetermined distance, the blank is sheared off, the gathering die prepares the stock for head, and on the second motion of the ram the bolt is completed, brought to a chute, and ejected. Watching a bolt being headed on this type of machine is very interesting, the work being accomplished very rapidly. The use of cams is again resorted to in this class of machine.

Thread Rolling

Readers of course are well aware of the regular method of threading by means of revolving dies, but are they familiar with the thread rolling process? Believing there are many who are not acquainted with this operation we show Fig. 3 as a good example of such work being performed.

The bolts after heading (if thread is to be rolled) are taken to these machines and placed in the hopper A. In this hopper is a revolving dog or bolt catcher which not only leads the bolts into the chute B, but will allow them to enter in the correct manner. Down goes the bolts until a feed plunger engages with them one at a time, carries them through to the dies, rolls the thread, and ejects them.

A description of both the machine and the dies employed will be worth while. Rigidity is again an absolute necessity, and the parts are proportioned accordingly. Two dies are used, one being stationary, the other moving in a horizontal direction, and with a reciprocating motion. Depending upon the pitch of thread to be cut, the dies are made accordingly. Imagine one die 7 inches long, the other 6 inches, each about 1½ inches wide by 1 inch thick. On the die is cut a thread of proper pitch, depth, etc., and this concern cuts their dies on both sides, so that when one side is worn, they merely reverse it and use the other. The writer saw one set of dies, used on one side only, which had rolled the thread on 300,000 bolts and was still going strong. These figures speak for the class of steel used in these dies.

The bolts, or blanks as they are called, are introduced at the proper moment by a slide, or starting tool as it is termed. This portion is so arranged that a bolt must enter the die straight. As soon as the work has passed through the dies, it drops from the machine into a waiting box. The dies are carefully adjusted to produce a perfectly formed thread, and the design is such that adjustment can be made very easily. To speed up the return of the moving die a quick return motion is provided.

Nut Tappers

Leaving the bolts and referring once more to the nuts we see at Fig. 5 a multi-spindle nut tapper busily engaged at work. For those not familiar with such machines we append the following:

The action is secured by means of cams in the rear of the machine, and as can be noted from the illustration, the tool shown is equipped with eight spindles. This means that at the rear, and near the top of each spindle, is a set of cams so located that each spindle completes its downward motion at a little different time from its neighbour. The one operator attends to the eight spindles, and in fact attends to two machines in some cases. The nuts being tapped in the photograph are for ⅝-inch bolts, and 10,000 nuts are completed by the operator every nine hours. A constant stream of lubricant flows on the taps at all times, and as can be noted these are of long stem design to allow numerous nuts being tapped before removal of the tap. Quick action holders are used in gripping the taps, so that it is the work of a moment to remove or insert the same.

The remaining illustration Fig. 5 shows another style of nut tapper, the work in this case being performed automatically. The nuts are placed in the hopper A, and by means of a revolving guide inside this hopper they find their way to the four chutes as shown.

On arriving at the end of these chutes they are directly above four automatically operated tapping spindles. To further illustrate this feature we have opened the door B to show these four spindles. On the nuts coming above the spindles the taps rise and enter them, complete their work, then an ejector pushes the nuts out of machine into a convenient box. By using this automatic feature a small battery of these machines can turn out 50,000 nuts per nine hour day, one operator attending to all machines.

Although we have by no means gone into details regarding this nut and bolt department we have at least given readers a fair idea of the methods involved, and the magnitude of the task of providing a large manufacturing plant with all necessary bolts, nuts, washers, etc.

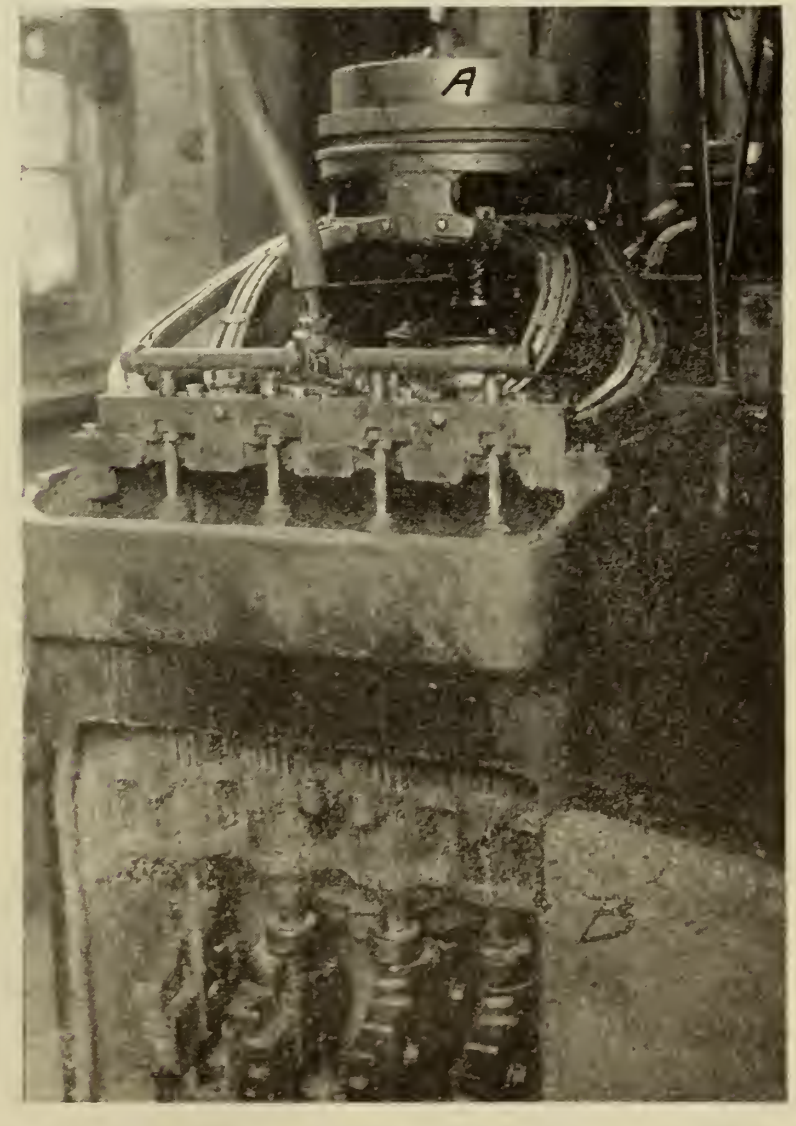


FIG. 5—THE OPERATOR OF SUCH NUT MACHINES AS ILLUSTRATED ATTENDS TO A BATTERY OF MACHINES.

Two Practical Ideas of Decided Interest

A Jig for Drilling of Boxes of Wheels Previous to Operation of Reaming is Described, Also a Discussion on the Application of the Inverted Tool for Use on Lathes.

TWO very interesting views of machine shop practice appeared in a recent issue of Mechanical World, and believing our readers will appreciate a reading of these experiences, we reprint them in their entirety. The first of the schemes is shown at Fig. 1, 2 and 3, and represents a drill jig for taper-pin holes. The author quotes as follows:

When drilling bosses of wheels, etc., previous to the operation of reaming, for the reception of taper pins, it is well to keep in mind several points. One method of procedure is as follows: First, drill through the boss — that is, at right angles to the axis of the bore—with a drill slightly smaller than the small end of the taper pin. With a drill slightly less in diameter than the large end of the taper pin open out the hole on one side of the boss—that is, by just drilling until the drill enters the bore. The shaft which is to go through the boss is pierced with a drill, the diameter of which is midway between the large and small ones with which the boss has been drilled.

On the two parts, the shaft and the component to be mounted thereon, reaching the assembler, he fits them together, and with the drilled holes in alignment proceeds to reamer out until the taper pin, which is to secure the two parts together, is a good drive fit. The taper pin should not fit too tightly, or the boss may be fractured when the pin is driven home, especially if the surrounding metal is thin.

Our intention is to consider a method of accomplishing the double drilling of the boss in an expeditious manner, and leaving the shaft to be dealt with by a separate jig, which could advantageously be one of the universal type employed extensively for various shaft work.

We will take, for a concrete example, a piece of work as illustrated in Fig. 1, which is a light grey-iron casting. The boss diameter is 1⅜ in., and has a 11-16 in. stud-hole bored through, the outer ends also being faced. Upon looking up a table of taper pins, the correct size for such a shaft and boss diameter we find to be: Taper pin, 0.219 in. large end; ¼ in. taper per foot. Use Nos. 13 (0.185 in.) and 4 (0.209 in.) drills.

In considering the class of jig most suitable for dealing with this job one or two factors had to be considered, as several methods are available, one being that previously described, first drilling the small hole right through and afterwards opening it out with the larger drill. This, to attain accurate results, would necessitate slip-bushings, and as the boss through which the taper pin was to pass was so short it would be difficult to provide these to be of sensible size on account of there not being sufficient room, as will be seen on referring to the drawing. Again, opening out holes with twist drills, when only a small amount of metal is to be removed, imposes heavy strains upon the cutting lips, frequently causing breakages, especially if the feed is not absolutely rigid, as twist drills possess a decided tendency in the case under consideration to feed themselves rapidly forward on account of their helical construction forming through the hole a kind of thread, so reaching a point where jamming takes place, with the result that the drill is broken. Therefore, the method used was to drill either hole first, index round, 180 deg. and drill the other hole, the work-holding cup containing the guide holes and the index holes within itself, as will be described later.

Fig. 2 shows the jig complete, the ribbed angle-plate A being an iron casting bored to receive the main spindle and spring plunger. The work B is shown mounted in readiness for drilling.

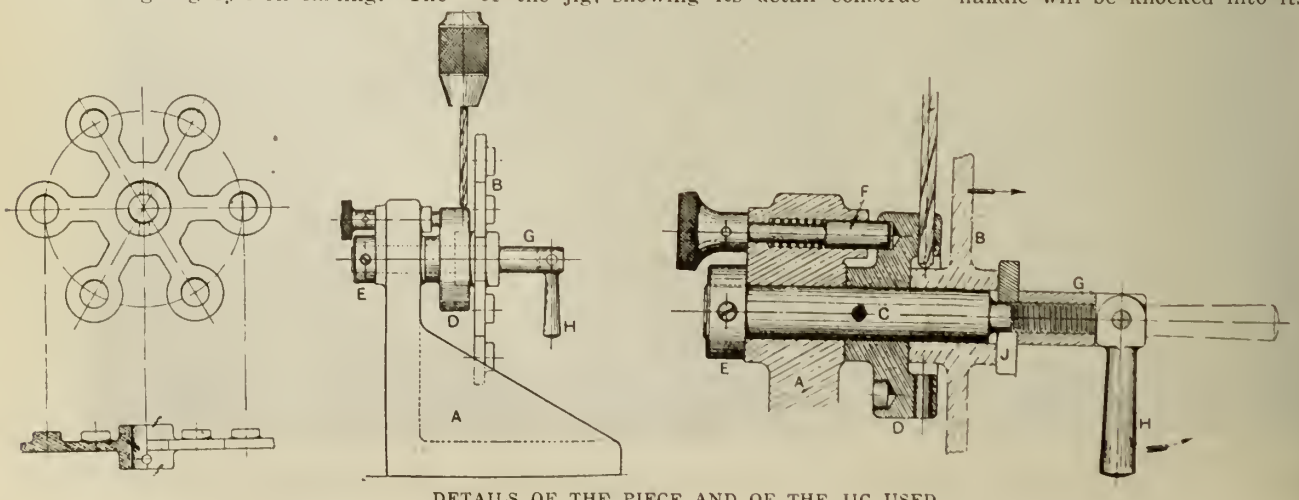
Fig. 3 is a section through the head of the jig, showing its detail construction. The ribbed angle-plate A is provided with suitable projecting bosses, bored and reamed to make the spindle C a good fit, not light, but so that it may be readily revolved by hand. On this spindle, by means of a taper pin, is attached a cup D, made from tool steel hardened throughout.

This cup serves quite a number of purposes. The work B is clamped to this, and it also contains the drill guide holes and serves as the index plate. At the rear end of the spindle a collar E is fixed which keeps the end-play out of the spindle, the boss of the cup running up against the casting on the front side, as seen in the illustration. The spring-plunger F, controlled by the knurled knob, engages the holes in the back of the cup, these being spaced 180 deg. apart and in line with the drill guide holes.

Clamping of Work

The clamping of the work is accomplished through the medium of a quick-acting device now to be described. The end of the spindle C is threaded, and upon this is screwed a circular piece G, slightly less in outside diameter than the bore of the work, to facilitate the removal of the latter over the former. This piece G contains, at its outer end, a slot into which the swing handle H is fitted. J is an ordinary U or slip washer. To load the work on the jig the slip washer, which should be chained to the jig to prevent its loss, is removed and the work passed over the swing-handle, shown in the dotted line position, and up to its locating face in the cup D. The slip-washer is inserted and the swing-handle brought to the position shown in full lines and given a turn to clamp the work. After it is drilled the handle is turned back to release the work and the slip-washer removed.

By pulling off the work the swing handle will be knocked into its horizon



DETAILS OF THE PIECE AND OF THE JIG USED.

tal position, thus allowing the work to pass over it. It will be found to be very rapid in use, apart from the impracticability of using an ordinary nut on the spindle-end on account of the small bore of the work. The need for providing a loose spanner is also avoided.

The jig should be used on a two-spindle drilling machine, and guide strips should be bolted to the table between which the jig should be arranged to slide, the operations then being as follows: (1) Load and clamp work in jig; (2) drill either hole—say, small one first, for example; (3) slide jig along table to under next spindle; (4) pull out plunger, swing work through 180 deg. (when plunger will enter the opposite hole) and drill the other hole; (5) unload jig. Finish.

Load up again and with jig still under the same spindle, drill the large hole first (as this was the last to be drilled in the other piece), slide jig along, index round and drill small hole, etc.

It has been found that by a little care and forethought many parts can be designed to have the same boss diameter, etc., and shaft, and thus the jig may be used for quite a number of similar components. Also, by a little modification, the jig could be made to have interchangeable, work-holding cups, etc., used for various jobs.

An Inverted Tool

The second idea deals with the inverted tool position in turning operations, and here is what the author has to say:

The application of tools in lathes, semi-automatic and full-automatic machines, occurs either in the normal position, with the top face of the tool standing upwards, or in the reverse attitude. The latter setting becomes necessary for several reasons, the chief being the necessity for multiple cutting operations. Sufficient tooling capacity cannot always be obtained by the employment of what for convenience sake may be termed front-cutting tools. This applies not merely to cross-slides or double slide-rests, but also to certain turret tools, to boring, recessing, or threading tools, and to some special forms of swing arms utilised in the semi-automatic turning machines. The effects upon the working conditions are several in number, the principal being differences produced in the mode of holding the tools, questions of chatter or vibration, the access of lubricant, and the escape of cuttings. Some classes of operations are better accomplished with inverted tools, quite apart from any points of convenience in planning the tool layout. It is also easier in many instances to maintain the tools in efficient condition under difficult circumstances by the adoption of the inverted method for some of the processes.

By curbing one's natural wish to adopt bold methods, which appear at first to be the most economical and productive, a really greater output may be secured. Thus, instead of going the whole way when forming the contour of a certain shape, and putting the profile along the edge of a single tool, the operation might be divided up with advantage, a portion of the shape being tooled with a separate tool on the opposite side of the work.

An example of this may be specified in a contour which has one or more specially deep grooves; these are obviously more destructive and wearing to the tool edge than a normal depth of cut, and incorporating the complete shape in one tool is likely to give rise to trouble in keeping the cutting edges in good condition. Using separate tools as the rear for the grooving, these can perhaps be made of stronger shape to resist the special stresses, or at any rate be ground more often than is necessary with the main tool. A more drastic subdivision is sometimes beneficial, as when a row of ribs has to be turned, with interspersed valleys between.

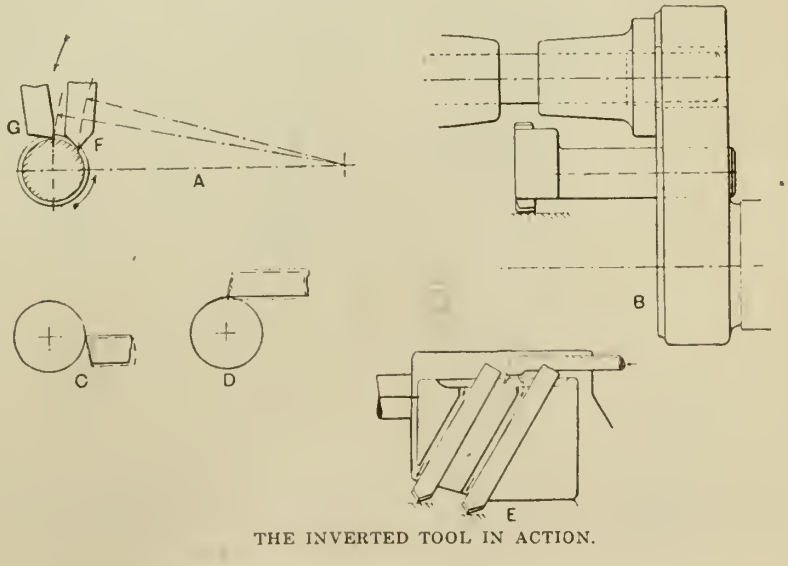
A form tool made solidly is then frequently dispensed with, the valleys machined with a set of separate points — say, at the front,—and the ribs with another set lying at the rear. This mode of procedure offers an advantage in that lateral feed can be imparted to one set of tools without affecting the others, and the consequent relief experienced from such side movement assists the cutting process, and is less distressing to the work when it is thin and liable to distortion.

Two other reasons for division of tasks may be instanced. One is that cuts proceeding at right angles (such as turning the diameter of a pulley, and facing the sides of each step) are readily done simultaneously in suitable machines, there being no interference of slides or tools. The other is that double tapers, converging from the ends to the middle, may be carried on simultaneously, the respective tools starting at their ends and travelling towards the middle of the piece, being controlled by their separate taper attachments. This general principle of multiple tool operation, which has been vastly extended by the several designs of automatic lathes, realises the highest present possibilities in output, and differs from ordinary turret lathe practice in bringing, as a rule, all the tools into play simultaneously, instead of batches of them successively. When longitudinal space allows, two or three articles can be chucked at one setting and finished with respective gangs of tools at front and back, a great increase of output per machine and tooling period.

A lesser advantage of subdividing operations lies in the disposal of chips, which may accumulate to an awkward degree and impede the working if all cutting is done from one side; whereas, a proportion of the tools being inverted, the chip problem is simplified, especially as the cuttings fall from the underside of inverted tools, instead of piling up on them.

In some types of automatics the inverted tools occur in multiple, there being a swing arm in addition to the ordinary cross-slide moved across in a linear direction. The swing arm comes down over the back toolpost at the appropriate time and cuts into the work with a forming, or a cut-off, or a chamfering tool. A special application of the path of movement of a swing arm is that utilised for successive roughing and finishing by superimposed tools. This interesting principle (from an example of tooling in the Fay lathe) is shown in end view at A, the operation done with the rear tools being the roughing and finishing of a pair of ball-bearing inner races, tooling the concave surfaces, and facing down one shoulder. The lower and roughing tool F is set to encounter the work first, and after an interval of travelling, when it has reached nearly to the finished depth, the upper finishing tool G comes into operation and smooths out the race, reaching the position indicated in the sketch.

The question of chatter, induced by looseness or vibration of slide parts, is affected by the inverted position of a tool under certain circumstances. The presumable opinion that a tool should work better when the pressure is in such a direction that it forces the slide faces down tightly together does not seem correct in regard to forming tools, particularly the broad ones. The principle which is found to work well with broad turning tools for finishing in the ordin-



THE INVERTED TOOL IN ACTION.

ary lathe—i.e., that of the goose-neck or spring shape—is naturally good also for broad forming tools fed in radially in cross-slides.

The inverted position consequently furnishes this desirable action from the slight slackness of the slides and the upward spring of the holder. Instead of digging in, therefore, the forming tool is allowed a small degree of latitude to spring the edge away, and this movement, combined with faint give of the work or the spindle, results in a sweet cutting effect and a nice finish. It is not necessarily the placing of the tool at the back of the work which ensures this smooth cutting; the same would happen if the tool were inverted at the front and the spindle run backwards: in fact, this is frequently done when for some reason of convenience the form tools are mounted at the front of a cross-slide. If there should happen to be a roughing operation, the tool or tools for this are located at the outer side of the work, the completion of the shape and the smooth finishing being reserved for the inverted tool.

A Special Case

A special case which may be noted, where a smooth and springing action occurs, although the tool is not inverted and the work runs towards its top, is that of the combined cut-off and forming rests which are bolted to turret faces. These fittings carry tools in posts opposite to one another, and either is racked towards the centre by a long handle. Owing to the elasticity present in the body and derived from the turret and its slides, it is a matter of indifference whether a forming tool is used inverted or otherwise.

A class of forming holder—the vertical slide design—used largely in American practice has a bearing upon the question of finish. When a form tool of the radial type is fed in it has to stop at the required diameter, and the finish then existing on the work depends on the sweet cutting of the tool. But in regard to the vertically fed tool, which cuts tangentially, this can be fed past the work again after the first pass; at this second smoothing-out the elasticity of the parts asserts itself and sends the cutting edge a shade farther in towards the central axis of the work, thus proving a fine finishing cut without disturbing the adjustment.

On the automatic turning machines a commonly used kind of tool — the one which projects from a knee casting secured on the turret—comes under the classification of inverted, since the front face does not lie in a horizontal plane. It may be termed a semi-inverted tool, but is subject to rather peculiar influences, from its unsupported nature, by comparison with the standard front and rear holders of the cross-slide. Extending out in the air, as it were, and depending for its accuracy of movement upon the stiffness of the holder and of the turret elements, there is a risk of deviations from the proper path of movement, especially as the cutting edge is influenced by inequalities on the work surface. This disability in contrast to the solid support of a traversing slide on the bed renders it imperative to provide suitable means of steadying, unless the cut is so light or the surface in such good condition that no trouble with springing may be anticipated. In the ordinary types of turret lathes, as well as in the automatic turning machines, a usual practice is to provide a central pilot bar, sliding through a bush in the chuck or the spindle, and often holding one or two boring cutters to serve a double function.

Such a central bar cannot always be employed—where the work has no opening, or one of too small diameter to be of any value. Then the overhead support is brought into use, this being really a more effective device than the central bar; the latter does not take care of the backward or the torsional spring of the holder away from the centre, whereas the overhead support B resists these deflections at the best possible place—that is, beyond the radius of action of the tool,—thereby confining the spring of the same between two binding points — the overhead support, and the stem of the holder which is gripped in the turret. The amount of such spring may be only but slight, given a stiff holder, but it is still to be reckoned with, and when tooling a rough casting or forging may interfere with the accuracy of travel of the tool, or at any rate produce chatter marks on the surface.

Inverted tools, as fitted to some classes of box tools, called the "overshot" type, are subject to one fault in working that does not apply to the common horizontally set cutter C. A little downward wear of the bed exercises practically no influence upon the diameter turned, as the saddle reaches the lowered part. The effect upon an overshot tool is more marked, as revealed by a comparison of the dotted lines in C and D, the edge in the second instance moving in a direct radial line towards the work centre, and consequently modifying the cut diameter more quickly.

As regards the relative effectiveness of lubricant with ordinary and with inverted tools, there is usually a balance in favor of the latter, whether they are set at the back or at the top of the curve. The stream can be directed full upon the scene of cutting, it floods perfectly over the tool, and as the chips instantly fall away from the spot, there is no encumbrance to the coolant immediately and constantly reaching the surfaces of work and tool. The only difficulty that may be encountered with overhead tools arises when they are of a complex nature, and the box holding them occupies such an amount of space that the stream cannot gain access to the cutting edges with certainty because the shape of the box and its clamps and screws is such that the lubricant is deflected and largely washed away from the location where it is wanted. Here some special provision may be desirable, such as illustrated at E for example, comprising pipe supply and grooves

Chasing tools are very often used in inverted fashion in turret lathe practice, the object being to run the chaser away from the headstock. In producing external threads this prevents the tool from running into the shoulder of the work through accidental over-running, and enables a full thread to be cut up as far as possible without risk of danger. As regards internal threads, the inversion avoids any chance of the nose of the chaser from striking against any interior projections—those on the work, or objects such as chuck jaws, collet ends, or pilot bushes. It is, of course, unnecessary to invert a tool for left-hand threads, the spindle being run as usual—forwards,—which causes the chaser to be traversed from left to right.

STERILISATION OF SOLUTIONS

Many ideas have been tried out relative to the sterilisation of cutting solutions, but the most successful one for the average industry, according to "Safety Engineering," is to have a set of drains running from the machine to a large pit consisting of two large tanks. The solution is run into one tank, which collects a great deal of the sediment, and then over to the other tank to be used again. Each week, and sometimes twice a week, the solution is taken out and the pit cleansed thoroughly. The solution is then returned to the pit, if it is not broken down, and is heated up to 148 deg. by steam pipes running through the pits, and maintained at that temperature for a half-hour. This process has been in successful operation at the plant of the Ford Motor Company. Examination with the microscope of the solution at the Ford plant showed from 10,000,000 to 15,000,000 bacteria per cubic centimetre in the infected solution, whereas but 400,000 to 600,000 bacteria per cubic centimetre appeared in the sterilised solution.

NEW PAMPHLETS

The Barber-Colman Co., Rockford, Ill., have issued a series of pamphlets dealing with their line of hobbing machines. The No. 2 to No. 12 size are included, and a detailed description of these machines, their action and principle, are given. Anyone interested in this line can procure a set of these pamphlets by mentioning Canadian Machinery.

AN INFORMATION CATALOGUE

The Williams Tool Corporation, Brantford, Ont., will issue, in about two months, a 100-page catalogue on pipe threading machinery. This will not only be fully descriptive of their entire line but will deal with the history of pipe threading machinery from days when threads were cut by means of hand tools down to the present time, when the operation has been reduced to a simple process by means of highly efficient equipment. In addition to this some pages will be devoted to the care of machinery, dies, gauges, etc., and to a discussion of best practice in the operation of pipe machinery.

The Williams Tool Corporation are making a display in the Machinery Hall at the National Exposition, Toronto.

Proper Railway Operation and Maintenance

This Refers to Operation and Maintenance Under a Divisional Organization—The Author Who Presented This Talk Before the Central Railway Club at Buffalo Knows His Subject Well.

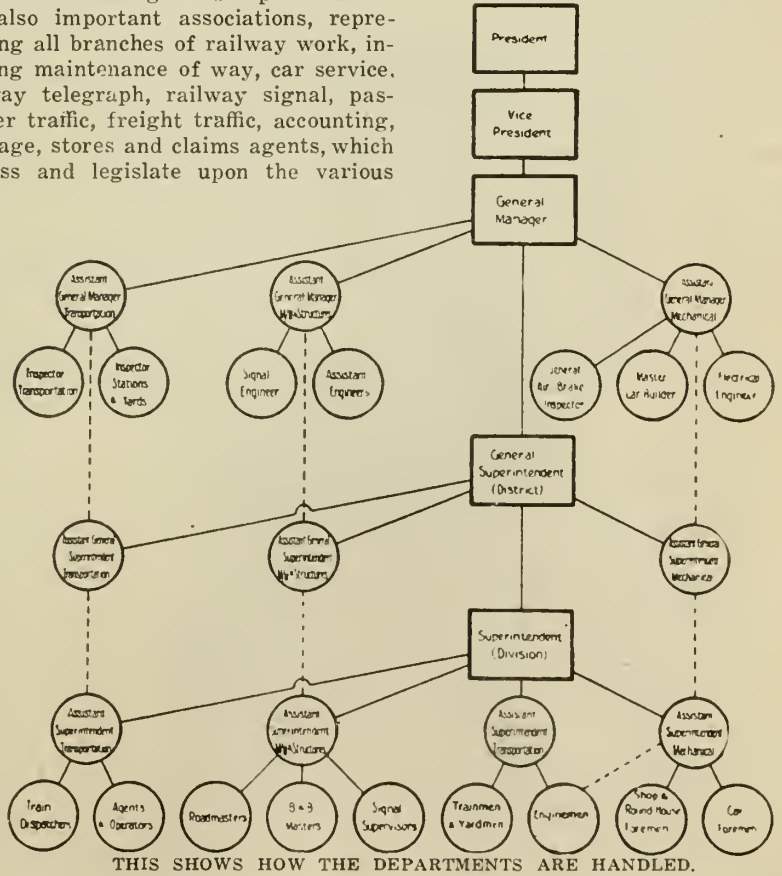
By ALFRED PRICE, General Manager Eastern Lines, C.P.R.

IN the very early days of railroading on this continent there was no necessity for an elaborate official organization. One can imagine that the rules and methods of operation first adopted were somewhat similar to those now in effect on rural electric lines. The trains were then few in number; they cannot now be satisfactorily handled on single track lines. The locomotives weighed from 4 to 6 tons; the latest achievement weighs 427 tons. The passenger cars were simply stage coaches coupled together; they are now elegant palaces on wheels. The rails were short wooden beams, covered with strap iron, and after a short use failed mechanically under 6 ton locomotives; they are now from 30 to 41 ft. long, and are made of steel by the Bessemer, open hearth or other processes. In those good old days the trains were known as accommodation trains. The passengers were accommodating, for it is recorded that they habitually alighted from trains on steep ascending grades and climbed to the summits on foot; the modern passengers object to climb even into upper berths. But as traffic increased, trains multiplied, locomotives and cars were enlarged, and all railway facilities, equipment and appurtenances, which at the beginning were exceedingly crude, by a continuous series of improvements reached their present degree of excellence. Co-incident with this great physical change there was naturally and necessarily a development in methods of operation, varying from time to time as traffic increased and conditions altered.

As one surveys today the whole railway field on this continent, and considers the number of miles of railway under operation, the extent of the territory served, and the prodigious sums of money invested in property, material and equipment, it is almost impossible to realize that the first railroad in the United States was built only about 90 years ago. Since then, not only have the achievements in railway building been stupendous, and the improvement in equipment and facilities marvelous, but the organization which has been developed to handle the immense traffic over an interlaced system of rails, with its complicated movements, has been amazing. In this development each railway company was at first a law unto itself and worked independently. All roads were not built to the same gauge, and the interchange of cars was thereby rendered impossible. The necessity of standardizing the gauge was therefore recognized. Every railway ran its trains according to the local time of the city in which its head offices were located, or on some other arbitrary time. The various railways had their own system of operating rules; and in giving signals by hand or lamp what was a "stop" signal on some roads was a "proceed" or "back-up" signal on others.

The need for reaching agreements on many matters and the desirability of standardizing methods brought railway officials together for an exchange of ideas and railway associations were the outgrowth of these meetings. Of the many railway associations in existence to-day the most important, although not the oldest, is the American Railroad Association, which was organized in 1872, its object being the discussion and recommendation of methods for the management of American railways. Probably the oldest organization of the kind is the Master Car Builders' Association, formed in 1867. Its objects are the advancement of knowledge concerning the construction, repair and service of railway cars, to bring about uniformity and interchangeability in their parts, and to adjust the mutual interests growing out of their interchange and repair. There are also important associations, representing all branches of railway work, including maintenance of way, car service, railway telegraph, railway signal, passenger traffic, freight traffic, accounting, baggage, stores and claims agents, which discuss and legislate upon the various matters over which they respectively have jurisdiction. Through the recommendations and decisions of these associations, agreements have been reached on almost every known railway subject and almost every article used in connection with railway construction, maintenance and operation.

Upon one subject, however, no agreement has ever been arrived at. Both the divisional and the departmental organizations are in effect upon railways that are known to be efficiently and economically managed and neither system is without its champions. It is believed by some successful railway executives that the maintenance of way department should be under the direct supervision and sole control of men who are technically trained engineers, and that the track and bridge maintenance should be something entirely separate from the operation of the railway. Similarly it is their opinion that the mechanical department should be managed exclusively by men having had a thorough mechanical training and that there should be a well defined line of demarcation between it and the operating department.



THIS SHOWS HOW THE DEPARTMENTS ARE HANDLED.

The theory is that, in this day of specialization, the right principle is to have experts in sole charge of the three important departments, operating, maintenance of way and mechanical, and that they should be handled as separate entities.

What is Organization?

Organization has been defined as "the systematic union of individuals in a body whose officers, agents and members work together for a common end," Those who favor the divisional organization believe that better results are obtainable by a fusion, under one head, of the three important departments referred to above and that by such an organization "the officers, agents and members" are much more likely to "work together for a common end" than if the departments are kept separate.

The departmental idea is carried a great deal higher up on some roads than on others. In some cases the general superintendent, besides being in charge of operation, controls all maintenance and mechanical work on his district, the officers of these departments reporting direct to him. In other cases the departments are kept entirely separate on districts, as well as on divisions, and the departmental officers report direct to the general manager. Again on other roads a great gulf is fixed between the working forces in the different departments, the general manager having no control of maintenance of way and mechanical matters. Instead the department officers have supreme authority over their respective departments and report direct to the vice-president in charge of operation and maintenance.

The absolute necessity of having highly trained experts supervise these two technical departments is fully appreciated, but this is quite possible under a system that will co-relate under the divisional superintendent all the forces of the operating, maintenance of way and mechanical departments, so as to make them complementary to one another. The plan recommended is clearly shown on the accompanying diagram. The solid lines indicate direct jurisdiction and control, whereas the dotted lines indicate a medium of communication between men engaged in the same department, so that the benefit of the technical knowledge and expert training of those at the top may be transmitted to those who are directly in charge of the work.

Instead of designating the departmental officers as "assistants," some would prefer to use the old familiar titles, such as superintendent of transportation, district master mechanic, division engineer, trainmaster, chief dispatcher, etc., but this is not material. By a reference to the diagram, it will be seen that the general manager, general superintendent and superintendent each has assisting him men who may be regarded as specialists in maintenance of way, transportation and mechanical work, respectively. The assistant general manager (maintenance of way) prescribes standards in connection with track, bridges and buildings; allocates new rails supplied for replacement; passes upon all plans submitted to the general manager by general superintendents for approval; criticizes maintenance of way expenditures, etc., etc. The assistant general manager (transportation) is responsible for the distribution of cars as between districts; the preparation of timetables, fixing the time of through trains at inter-district points; the issuance of instructions about preference and special passenger train movements; notices of embargoes; criticises transportation expenses, etc., etc. The assistant general manager (mechanical) is responsible for the distribution of power as between districts; he prescribes locomotive shop, car shop and roundhouse practices; controls the movement of air brake inspection cars; supplies of dynamometer car and attendants for the making of tonnage rating tests; criticizes mechanical department expenses, etc., etc. All three officers report to the general manager and all instructions to district officers are addressed to the general superintendents over the signature of the general manager.

Their Respective Duties

The three assistant general superintendents bear pretty much the same relation to their general superintendent as the three assistant general managers bear to the general manager, communications and instructions being sent out over the signature of the general superintendent. They confer with officers of higher rank on work in which they are especially concerned, and guide those of lower rank so as to ensure the work being prosecuted in accordance with the prescribed standards and practices. The assistant superintendents report direct to their superintendent. They bear pretty much the same relation to him as corresponding officers of higher grades bear to the general manager and to the general superintendents. They are held directly responsible to him for the work of the men under them and have the advantage of the assistance and advice of the district officers in the same departments.

The above gives in brief outline a general idea of a divisional organization, but does not show in any definite way the advantages to be derived from it. Time will not permit of more than a mention of a few of these. Such a system absolutely removes any departmental friction, and tends to promote harmony throughout all branches of the service. If passenger trains fail to maintain their schedules, the superintendent is not in a position to blame the engineering department for not keeping the track in proper condition for high speed trains, nor the mechanical department for not maintaining locomotives in condition to make time. He is responsible for the condition of both the track and the power.

When there is an abnormal demand power should be provided for each class of service. Locomotives turned out for traffic can, when necessary, be utilized to do odd jobs of maintenance of way work, such as loading cinders or ties en route and likewise locomotives, supplied for work train service, can often be utilized to handle revenue traffic before reaching working limits or beyond them.

When a division of railway is required to take care of some extraordinary rush of traffic, so that the facilities and power are taxed to their utmost, if the superintendent finds that a few extra men in the locomotive house, or at the ash pit, or coaling plant, would result in a quicker outturn of locomotives he is in a position to authorize their employment or to transfer them from some other class of work. When there is an accident—and no railway is immune from such unfortunate occurrences—it is very much better to have one man responsible for clearing the line, repairing the track, picking up the wreckage and resuming the running of trains, than to place the responsibility of clearing the line and picking up the wreckage upon the mechanical department, and for repairing the track upon the maintenance of way department, while the superintendent's forces stand aside waiting for the other departments to repair the damage and make the line passable for the resumption of traffic. In an investigation to determine upon whom to place responsibility for an accident, the superintendent can have no object in attempting to fix the blame, except where it belongs. Under a departmental organization, all departments interested are represented and every representative naturally desires to escape the necessity of admitting responsibility. This is unfortunate, but as human nature is constituted, it is inevitable.

A superintendent has a greater number of officers available for special emergencies. If it is suspected that men engaged in train service are becoming lax in the observance of any of the important general rules, or if it is considered advisable to check up any feature of track work, he is in a position to use all his assistants for checking or efficiency testing. There is an added advantage in that so many assistants obtain a general all-around knowledge of and experience in the operation and maintenance of a division, fitting them for greater responsibilities. Not the least important benefit to be derived from a divisional organization is the broader training which officers in the lower positions receive. A man occupying the position of general manager, or general superintendent, should not only know something theoretically, but a great deal practically, about the maintenance of track, buildings, bridges, signals, cars and locomo-

(Continued on page 59)

WELDING AND CUTTING

Lessons on the A B C of Good Welding

A Digest of Text Book Information on Cast Iron, and Its Application to Correct Oxy-Acetylene Welding Practice.

By W. B. PERDUE,

Director Welding Dept. Healds Engineering School, San Francisco, Cal.

THE welding of cast iron is not as difficult to accomplish as the welding of wrought iron or steel, but offers a little more difficulty to the beginner because the metal flows so much more freely and some difficulty is experienced in controlling the molten metal. The two principal difficulties experienced by the beginner, however, are the overcoming of hard, brittle metal in the weld and the casting cracking either in the weld or adjacent to the weld, owing to internal strains set up by unequal contraction.

The melting point of cast iron is approximately 2,100 deg. Fahrenheit, while iron oxide has a melting point of about 2,400 deg. A bright red heat is sufficient to cause the combination of the oxygen of the air with the iron of the casting, thus forming iron oxide. It is not possible to melt this iron oxide and flow it from the weld, so it remains in the casting in the form of thin flakes or cakes. This not only prevents the alloying of the molten metal, but also combines with the free carbon. It is consequently conducive to the formation of white iron, therefore this oxide must be removed or destroyed.

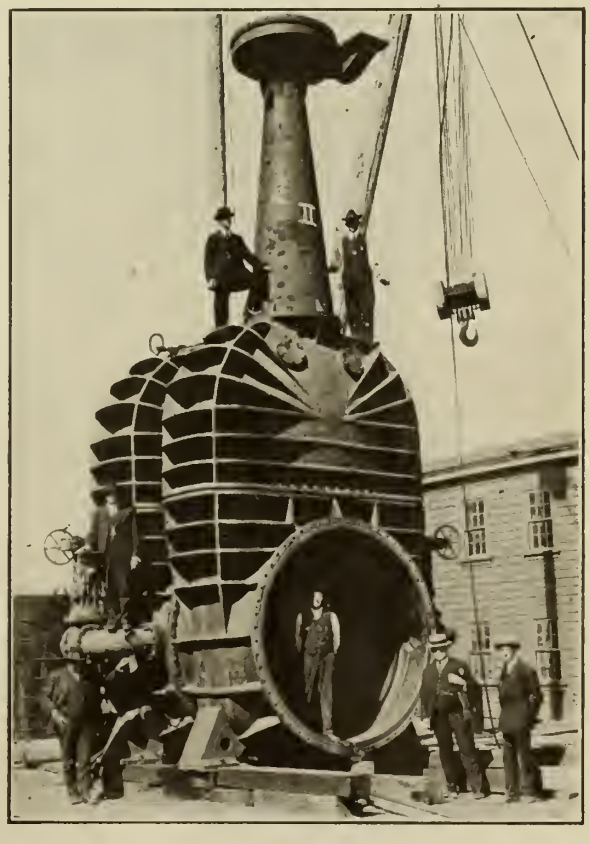
The proper method of doing this is to puddle the molten metal with a filling rod, using the motion described in Chapter 1 of this series, causing the oxides to float to the top and out of the weld. In the same way blow-holes can be worked out which are formed by gases being pocketed in the molten metal.

Carbon exists in cast iron in different states. In what is called white iron, which is very hard, the carbon is combined with or dissolved in the iron. In the grey iron, which is soft and easy to work, most of the carbon is in a free state in the form of graphite. Since it is generally necessary to machine or file a weld in cast iron, it is indispensable that the line of weld be constituted of soft grey iron. Thus in welding cast iron always remember that too rapid cooling brings about a combination of carbon and iron, forming hard, brittle white iron, while slow cooling, or reheating after the weld is completed, keeps the carbon in a free state, resulting in a softer and more workable material.

Expansion and Contraction

Expansion and contraction should be treated with more importance in the welding of cast iron than in any other metal. Cast iron is absolutely lacking in elasticity and its tensile strength is very low. In preparing work for welding it is always necessary to take fullest precautions against the effects of expansion and contraction where the part to be welded is not free to expand and contract, such as cylindrical or box-shaped castings or any shaped casting where the expansion of the metal and subsequent contraction would be restrained due to the shape. Where the internal strain produced by contraction is greater than the tensile strength of the section to which it is confined, cracking or breaking will occur; but, where a strain not so great, still exists, internal strains are set up which may cause a break later when subjected to shock, and for this reason the importance of properly taking care of the forces of expansion and contraction will be apparent.

There are three general methods of coping with the forces of expansion and contraction. One method is to preheat the entire casting with some cheaper fuel agency than an oxy-acetylene flame, such as a gasoline, kerosene, or crude oil preheating torch or a charcoal fire, depending on the size of the casting and the importance of getting a very even heating. In some cases this is not necessary and oftentimes not possible. In



THIS ILLUSTRATES THE GATE VALVE SPOKEN OF.

such cases it is only necessary at the time of welding to heat simultaneously similar parts to a good red heat in order that the stiffness of the frame may be overcome and thus take care of the contraction.

As a good example of this take the case of a fly-wheel which has a cracked spoke. It will be found advantageous to heat adjacent spokes on both sides of the broken one. After the weld is completed these spokes will contract proportionately with the welded one. In some shops a different practice is followed. Instead of heating the adjacent spokes the spoke to be welded is covered with wet asbestos within a few inches of the weld and water is allowed to drip on the asbestos while the welding is going on. By this means very little of the spoke is heated up, with the result that the contraction at the completion of the work amounts to practically nothing. This method, however, is not in general favor.

Wherever complete preheating is possible it should be done. In the case of a large casting which has to be repaired in position, without dismantling, it is generally impossible to preheat the whole casting, but it is safer and more economical to build a coke fire or apply gas or oil preheating torches around the immediate vicinity of the break. While the welding operation is in progress, and also after its completion, it is often advisable to apply a blow torch or light a fire under some other part of the casting away from the weld to counteract the effects of expansion and contraction at the welded part.

If it is impossible to apply preheating, another method may be used. By the use of jackets, wedges or similar devices a casting may be sprung or bent out of shape and the edges of the part to be welded may be thus separated, and after the weld is executed and contraction sets in the jackets or wedges, etc., may be withdrawn. The return of the sprung parts to their original position will compensate the contracting strains. It is important, however, to be able to judge just how much to pry the edges apart in order that the contraction will bring them back to proper alignment. This depends upon the bulk of the metal being added and is usually not over a small fraction of an inch, say from 1-64 to 1-32 inch.

Filling Material

Owing to the fact that iron combines more readily with silicon than with carbon, a special welding rod for cast iron should be used containing a percentage of silicon. Thus the carbon in the iron being welded is prevented from combining with the iron and remains in a free or graphite state, insuring a soft grey iron weld. The silicon also tends to prevent oxidization. It will, therefore, be seen that the use of the proper filling rod will help in overcoming the hard spots previously mentioned as one of the difficulties met with by the beginner, especially when he is using low-priced cast iron rods, which really are not economical because they jeopardize the success of the weld. Manganese in the filling rod has exactly the opposite effect of silicon. At best it will be seen that in order to get soft, workable welds a special filling rod for cast iron must be used. This rod must contain a percentage of silicon, there must be no manganese present. The percentage of phosphorus must be very low, and there must be slow cooling after the welding is completed.

Use of Flux

As shown by the figures previously given, the melting point of ordinary cast iron is much lower than that of wrought iron or mild steel, and considerably lower than the melting point of iron oxide. As previously stated in this chapter, therefore, if any oxides are formed during the welding process they cannot be melted and blown away by the flame, as is the case where iron or steel is used. In the cases of wrought iron and steel the melting point is higher than that of the oxide. It will, therefore, be seen that when welding cast iron a proper flux is necessary to prevent the formation of oxides and to break down oxides when formed. It is only necessary to use flux sparingly, and in view of the small amount that is used it is unwise to endeavor to use cheap substitutes, such as borax, which will not give the proper results in the weld.

With the proper flux the metal flows readily and the resulting joint will be as strong as the original metal. The heated filling rod should be dipped into the flux and then plunged into the bevel and melted on the blowpipe frame, the inner cone of which is held about a quarter of an inch away from the metal. The molten metal is gradually produced, which must be puddled or stirred with the filling rod. This stirring helps to bring the oxides, slags and impurities to the surface. However, care should be used not to go over the work any more than absolutely necessary. In the case of a poor weld, it is better not to reweld without first rebeveling and cutting out the metal previously added.

After welding, the whole piece, if possible, should be reheated and allowed to cool slowly. Reheating as well as preheating is best performed in a furnace, in which the work should be allowed to cool, if possible. If not, cover the casting with hot sand or lime, or for smaller castings provide a bin of asbestos pulp. Avoid all drafts while cooling, as this will cause unequal strains in cooling, which may cause distortion or cracking.

27-Ton Gate Valve Saved by Welding

We do not wish to go on record with the statement that our Canadian readers can become proficient welders by merely reading these articles. To become proficient in the art of welding requires much practice, preferably under the tutorship of a competent instructor. We do wish to state, however, that there is nothing to prevent the intelligent welder who gives these articles careful study from duplicating the results here shown.

Mr. R. E. Travis, of 224 North Ninth Street, San Jose, Cal., who welded this gate valve through the bottom of the body (at the foot of the man standing inside), and for a considerable distance on the rim, had never handled a torch when he entered as a welding student in January, 1919. After leaving school he did not seek the easy things, neither did he forget the careful study of such trade journals as might give him a wider vision of his calling.

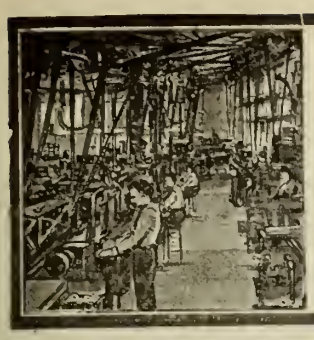
When the industries of San Francisco were brought to a standstill by a disagreement between capital and labor, he sought employment with the Joshua Hendy Iron Works (which concern had previously considered the oxy-acetylene process an impractical experiment). The welding of this enormous gate valve, after several previous months of satisfactory service with that concern has demonstrated that the man who has the initiative, technical training, confidence and ability need not be hampered by local labor troubles, or by the prejudices created by incompetents.

The applications of this process are being steadily extended, probably more rapidly in the Canadian field than any other portion of the globe. Since the commencement of this series in the April 22nd issue upward of 40 inquiries have been received from Canadian manufacturers and operators. The author, whose address is given under the title of this article, will gladly continue to answer such inquiries as may be addressed to him, and will in the very near future boil down much of the information given into a chapter on "Kinks for the Welder."

VIEW FOR AEROPLANE PILOTS

A most ingenious invention is the "clear-view screen" which a British firm has produced for the benefit of navigators. Rain, spray, or snow renders it difficult or impossible to see through an ordinary port hole or other glass screen. The invention consists simply of a glass disc, which forms part of the screen and is rotated at so high a speed that any water or snow falling upon it is immediately spun off. The glass remains so clear that its rotation is extremely difficult to detect. This device has now been introduced on aeroplanes in order to asisst the pilot when rain or snow is encountered. The disc is driven either by a small windmill fixed on one of the struts, or by vanes fixed to the edges of the disc itself. When the aeroplane is travelling at 75 miles per hour the disc spins at 1,200 revolutions per minute. At anything over 800 revolutions the glass will keep clear in all weathers.

Notice is received of the incorporation of the "Jumbo Metal Works, Ltd.," for the purpose of dealing in metal products and the manufacture and dealing in farm implements. Authorized capital $300,000 divided into 3,000 shares of $100 each. Chief place of business to be at the City of Winnipeg.



DEVELOPMENTS IN SHOP EQUIPMENT

GEAR HOBBING MACHINE

The Cincinnati Gear Cutting Machine Co., subsidiary of the Cincinnati Shaper Co., Cincinnati, Ohio, have placed on the market what is known as their 16-inch gear hobbing machine.

These machines are designed for strength, accuracy, speed, and convenience of operation. The machine is adapted for all spur gears within its range, but in cutting spiral gears, however, data must be furnished so that proper change gears can be supplied.

The machine as supplied with standard parts is for spur gear cutting only. The gears for spirals can be supplied however wherever requested. The specifications given at the conclusion of this data will show the machines range and capacity. Both right and left hand spirals can be cut to approximately 45 degrees angularity.

The bed and housing are of box section and heavily ribbed throughout, while the work spindle is horizontal and is supported rigidly by two long bearings in the work saddle. Both bearings are bronzed bushed, and the front bearing is tapered for taking up wear. A No. 12 B and S taper is provided.

The work saddle is taper ribbed to long narrow slides in a manner to prevent any sagging when the clamping bolts are loosened. Elevating and lowering are accomplished by means of a crank handle, the movement being recorded by a graduated dial reading to .001-inch. The load is supported on ball bearing thrust collars.

Indexing Mechanism

The indexing mechanism consists of a double thread worm and a cast iron gear which are entirely closed and run in a bath of oil. Suitable adjustment is provided for taking up wear. The indexing is continuous and automatic. Variations are obtained through removable change gears.

The hob slide guide is exceptionally long with square ways taper gibbed. This long guide reduces binding action to a minimum, and the design and combination is such as to provide for the proper swiveling of the hob spindle. This can be adjusted approximately 50 degrees either side of zero, and is set by a vernier reading to five minutes.

An automatic stop for the entire machine at any point is provided for use on both belt and motor driven equipment. There is also a trip to stop the feed mechanism only.

The hob spindle is bronze bushed and adjustable for wear. Suitable means are provided for shifting to hob and hob spindle, so that the entire surface of the hob may be used before resharpening. This adjustment can be made without resetting the hob on its arbor. A cooling pump of large capacity is provided. The bed of machine forms a reservoir for the oil or compound and strainers are provided for cleaning the returning oil after it has passed over the hob. The chips are retained in a separate chip pan. All pulleys and gears are properly guarded.

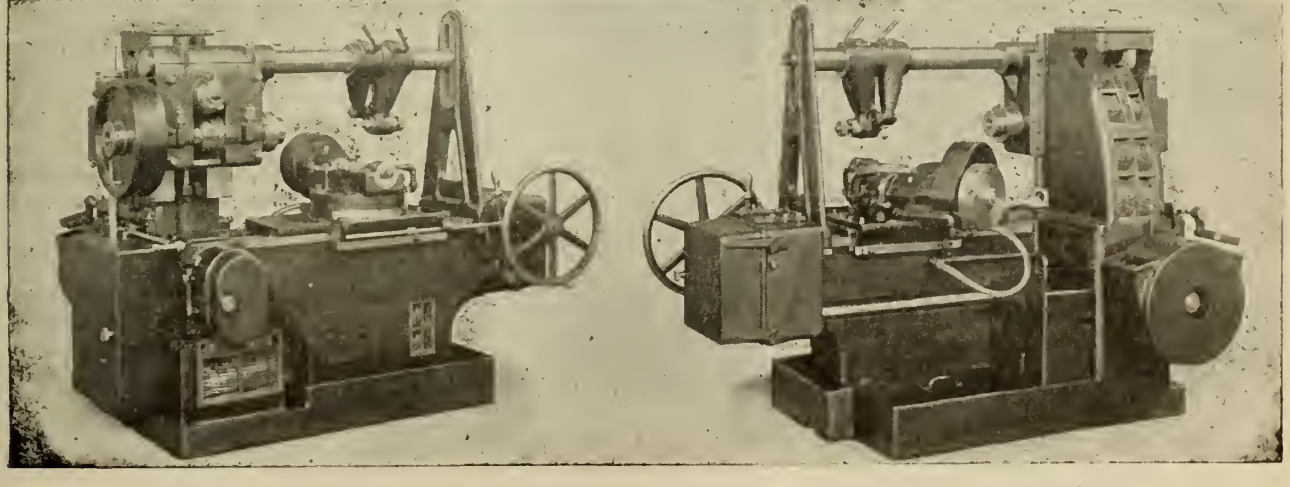
Changes in speeds and feeds are secured by means of removable change gears and sufficient range is provided to meet all average conditions. As already stated both belt and motor driven styles are made. Following are the principle specifications:

Rated capacity, diameter 16-ins; rated capacity, width of face 12-ins.; capacity, actual diameter max. gear, 17 1-4-ins.; rated capacity, spur gears C.I., 3 D.P.; rated capacity, spur gear steel, 3 D.P.; rated capacity, spiral gears C.I., 3 D.P.; rated capacity, spiral gears, steel, 3 1-2 D.P.; max. distance hob centre to spindle nose, 19 1-2 ins.; maximum diameter of hob, 4 1-2-ins.; diameter hob arbor, 1 1-4-ins.; taper hole in work spindle, B & S No., 12; driving pulley, size, 15-ins. x 3 1-4 ins.; speed of driving pulley, R.P.M., 400; number of changes of hob feeds, 26; hob feeds per revolution of work, .015-ins. to .250-ins.; number of changes of hob speeds, 8; hob speeds, R.P.M., 50 to 200; overall dimensions, covers closed, 52-ins.x82-ins.; overall dimensions, covers open, 56-ins.x103-ins.; net weight of machine, with countershaft, pounds, 5,600; domestic shipping weight, pounds, 5,900; shipping weight, boxed for export, pounds, 6,600; contents, boxed for export, cubic feet, 210.

These weights do not include electrical equipment.

WHEEL TRUING MACHINE

The Precision Truing Machine & Tool Co., Cincinnati, Ohio, has recently placed on the market the grinding wheel truing machine shown in the accompanying illustration. It is claimed that the results obtained by the use of this truing machine are equal, and in some cases superior, to those obtained with a diamond. This machine can be applied to any make and style of grinder, and is



THESE TWO VIEWS GIVE A GOOD IDEA OF THE GENERAL APPEARANCE OF THE MACHINE.

operated by either alternating or direct current of 110 or 220 volts. The attaching bracket shown at the right is furnished with each machine, but additional brackets for special or unusual applications can be supplied. Three general-purpose abradant nibs are also furnished with each machine, and nibs for special purposes can be supplied to meet requirements. The general-purpose nibs are 1 inch in diameter by 1½ inches long and it is claimed that one of these nibs will keep an average grinding wheel in proper condition for 100 hours' continuous operation. The machine has ball bearings throughout, with provision for taking up wear.

BLUSH MULTIPLE MICROMETER

A. T. Blush Tool Co., 1145 West 11th St., Erie, Pa., have placed on the market the micrometer as illustrated. The purpose of the instrument shown is to eliminate the necessity of using two instruments in taking measurements ranging from 0-in. to 2-in. This is accomplished by the use of two threads of different pitches, namely, a 20 pitch for the measuring screw and a 40 pitch for the thimble carrier. Although the mechanism embodies two screws, the accuracy of the instrument depends only and entirely upon the 20 pitch thread as the 40 pitch thread only functions in keeping the thimble in proper alignment with the graduation on the hub.

The difference in the pitch of these threads makes it possible to obtain a 2 inch movement of the spindle with only a 1 inch movement of the thimble. The adjustment for wear on the anvil and the spindle is taken care of without moving either the anvil or the measuring nut which makes a very desirable feature as it is impossible to throw the anvil and the spindle out of parallel when making adjustments.

Due to the fact that the spindle is actuated with a 20 pitch thread this makes a very fast acting instrument as the thimble travels half as fast as the spindle. Another feature is the graduation, which is said to be much easier to read than the old style of graduation.

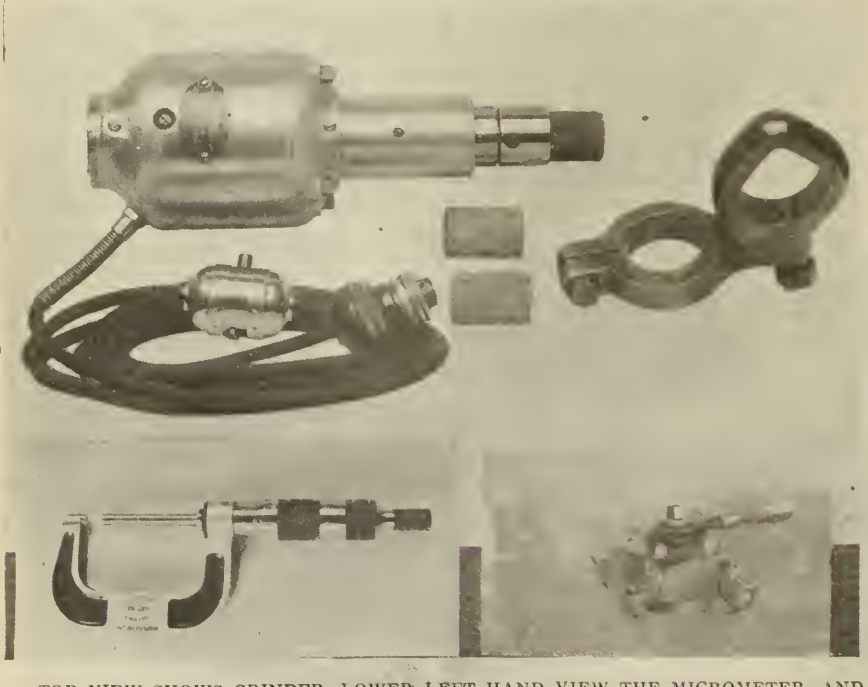
It is their intention to make these instruments in larger sizes having a range of 2 inches on each size, also a special instrument for very close work ranging from 0 inch to 1 1-2 and 1 1-2 to 3 inches.

TURRET TOOLPOST

The Lovejoy Tool Co., Inc., Springfield, Vt., has recently placed on the market a turret toolpost as shown in the accompanying illustration. The original Lovejoy positively locked cutter principle is used on all tool-holders which are held in this toolpost, and the turning and facing cutters are adjustable for height as they become worn, which permits their cutting edges to be kept in line with the lathe centre without sacrificing strength and rigidity.

By one movement of the binding lever, the operator can release and accurately index the turret to the next tool position, where it will be securely clamped in place by the completion of the single movement. The turret rings are approximately 4⅜ inches square, made of hardened steel, and are interchangeable on any base. This interchangeable feature permits the use of additional rings carrying a variety of tool combinations for various jobs, without disturbing the individual cutter adjustment, as well as a quick method of changing tools from outside to inside work.

The boring-bars are 1 inch in diameter and are free from projections, and they will cut to the bottom of a hole which is only slightly larger than the bar itself. However, special boring-bars ¾ inch in diameter with bushings can be supplied if desired. The turning tools have a shank diameter of one inch, and are furnished with 19 32-inch high-speed steel cutters. The round shank permits of rotating the holder to produce any desired side clearance, and also provides for a small amount of end adjustment without disturbing the height of the cutting edge, which is a convenience when used on lathes equipped with diameter stops or feed-screws having direct-reading dials. This toolpost will interchange with any regular engine lathe toolpost without requiring any special fitting of the lathe.



TOP VIEW SHOWS GRINDER, LOWER LEFT HAND VIEW THE MICROMETER, AND REMAINING VIEW THE TOOL POST.

OPEN-SIDE PLANER

The Universal Machine and Tool Company, of Canton, Ohio, are now making a 24-inch open-side planer which combines the advantages of the shaper and the planer. The supporting column is on the right hand side and operating controls are centralized. Variable stroke mechanism is used for driving the table, the speed of which is varied by means of shift gears, four speeds being available. Power feed is provided for the tool. Table has a surface of 17½ by 46 3-4 inches, with a height under the rail of 36 inches. Maximum stroke of 27 inches. Weight about 4,500 pounds.

PLANER IMPROVEMENTS

The Cincinnati Planer Co. have incorporated a number of changes in the design of their planers which add to the serviceability of the machine. The top arch is now being made of the box pattern, which gives increased strength and bearing surface on the housings. The cross-rail is likewise of the box type and it is claimed that increased rigidity is a feature when the tools are cutting. An automatic stop has been added to the machine so that the clutch for elevating the cross-rail may be released at any desired point in the vertical range. Improvement has also been made in the holding device for the tool post harp.

THREE-JAW MACHINE VISE

A special vise that incorporates many advantageous features for tool-room and production work is now being manufactured by Manning, Maxwell and Moore, Inc., of New York. The three jaws can be swiveled independently and can be locked in any desired position, thus providing a wide range of positions particularly applicable for holding odd-shaped pieces. The jaws are fitted with loose grip plates, which tend to draw the work down on the body of the vise when pressure is applied by means of the screw. The body of the vise is made of steel alloy and the working parts are made of mild steel, case-hardened. The vices are made in five sizes ranging from 4 to 18 inches.

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A Machinery Exhibit

IS there an opportunity for a machinery exhibit in Canada? This matter has been discussed by several of the dealers, and there seems to be a variety of opinion. The question came up in the first place owing to the absence of nearly all the Canadian makers, and many of the Canadian dealers, in the Machinery Hall at the Toronto Exhibition.

Opinion differs quite sharply as to the advisability of placing a large exhibit in Machinery Hall as it now stands at Toronto grounds. It is an out-of-the-way place on the grounds, arranged to accommodate things as they were many years ago. There is no overhead work to assist in the handling of heavy machinery, and placing equipment to advantage is a laborious and strenuous piece of work, as well as a costly one.

It would be necessary to broaden the scope of a machine exhibit in Canada to include machinery in general as well as machine tools. In fact it might well be made an exhibit of wood and metal working machinery, and other lines that are generally used in the industrial life of the Dominion. Then, too, there could be taken in all sorts of equipment and accessories.

It would be advisable to hold such an exhibit at a time separate and apart from the Toronto Exhibition. The educational side of the affair would have to be kept uppermost, and every effort should be made to impress upon the minds of exhibitors and those who would attend that the whole thing was being staged with a serious aim in view.

For instance, in the field of machine tools, manufacturers and their mechanical heads should make a study of their problems, and come to such an exhibition with the expectation of meeting experts in machine shop practice who could advise them on any points they wanted. In this way the exhibit could be made something much more than a mere show where people could come and walk past and go away again.

Unless the undertaking were approached with the idea of making it a clearing house of real information, and a place where a maker or dealer would be prepared to offer the advice of his most expert staff, little or nothing of a lasting nature could be accomplished.

The fact that it is harder year after year to interest Canadian machine tool houses in Machinery Hall at the Toronto Exhibition has prompted the above suggestions. It may be that there is an opening in this country now for a well-staged and well-conducted machinery exhibit at a time apart from other exhibitions and at a place where suitable buildings could be secured.

Looking for Ideas

FORBES MAGAZINE, in a recent issue, refers to the success of Thomas Edison, and remarks "One invention was the result of 5,000 experiments. When he was working on his improved electric lighting he sent men into remote corners of the world in search of some fibre or other material which could provide the electric bulbs with the right kind of filament. Such is his spirit of enterprise that he reads more trade publications probably than any other business leader."

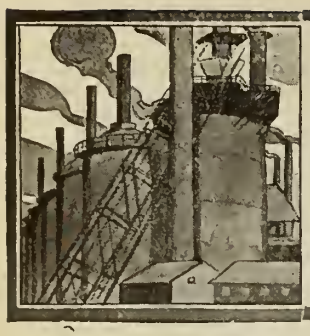
Leaders in manufacturing life in this country are coming to the point where they are depending more and more on the trade and business papers for help in their particular line of business.

Only a few weeks ago there was recorded in these columns the case of the master mechanic of one of the leading Canadian railroads. In going through one of the mechanical papers he found an idea that he was able to apply to his work in the shop, and by so doing saved the railroad company hundreds of thousands of dollars in time of repair, and also enabled the rolling stock to be put out much sooner in order that it might be earning revenue instead of eating its head off in the repair shop.

There is something worth thinking about here. If you put your ideas in print in a mechanical or technical paper you are sure of an audience of interested readers, and it is almost certain that some one is looking for the idea you have. The amount that may be paid for the material is only a small part of the service. It may not be very much, but it may be as much as the paper can afford. The big idea is that you can, through the medium of the technical pages in such a paper, pass along an idea that may be the means of giving great assistance to some mechanic who is having troubles of his own. The passing on of these ideas does not impoverish the person having them, neither is he enriched by withholding them.

Trade Follows the Flag

THE saying which is used as a caption for this article is not always true. In some cases, and perhaps the majority, the flag follows trade, and it is in this manner that the British Empire has been developed. The originators of the Canadian Government merchant marine, however, saw that the possession of a fleet of modern commerce carriers, which could go to all parts of the world, could become a great drawing power for Canadian trade, and that in this case trade would follow the flag. The Canadian Government fleet, conceived in the first instance as a measure to tide the shipbuilding yards over a doubtful period, has expanded into a ship-owning concern that will have no less than sixty-six first class modern cargo carriers under its flag. This flag is the flag of the Dominion of Canada, and it does not require a very great imagination to see what an advertisement for Canada this fleet can be. Sailing from Canadian Atlantic and Pacific ports, these Canadian built and Canadian manned steamers will carry holds full of goods manufactured in Canada to every port on the shores of the seven seas. This fleet would justify its existence were it as a great advertising scheme only, but it has already justified itself as a commercial success. The Canadian Government Merchant Marine is a fleet in being, of which every Canadian can be justly proud.



MARKET DEVELOPMENTS

Steel Prices Are Not Weakening in the Least

Independents Even Talking Now of Increasing Prices, Rather than Coming Down to the Level of the Steel Corporation Figure—Scarcity Not Believed in Canadian Market.

JUST when the steel market had it all figured out that prices were due for a drop, especially in the premium mills, rumors come into the market that there is serious talk of an upward revision of the already high prices. And coupled with this is the statement that the United States Steel Corporation is considering bringing up some of its schedules, although there is nothing to give weight to this report. It is a fact, though, that the Steel Corporation will have an added bill of some $50,000,000 per year for haulage of material and semi-finished shipments, and it is estimated that only one-quarter of this gets passed on to the consumer.

There are warehouses in this district paying around nine cents for sheets, while at the same time they have a very large tonnage on the books of the Corporation at around 2.65 or a little better. Delivery is the big item just now.

Buyers, or prospective buyers, of machine tools are not coming very rapidly into the market now. One explanation is that they may be staying out as long as possible, in the hope of a reduction being made in the price of the lines they wish to secure. There has been nothing coming from the makers that would confirm this attitude, but a continued refusal on the part of buyers might lead to some unexpected alterations in the policy of selling.

Scrap metal dealers report business as being very dull. Some of the yards are taking on material, but not at a high figure. Most of the dealers are not heavily stocked. In fact not since the war has there been anything like the stock of scrap metal, especially in iron and steel, that there was in pre-war days.

THE CONDITIONS PREVENT NORMAL VOLUME OF TRADE FOR MONTREAL

Special to CANADIAN MACHINERY

MONTREAL, Sept. 9.—The gradual betterment in railroad transportation is improving the industrial outlook but the relief is so slight that an early return to normal is not anticipated. The process of adjustment will require time, and, above all, close co-operation from all sources of production, as this is the vital element in maintaining equilibrium in trade conditions. The coal scarcity is still a factor here, but less acute. Shipments have been more regular, and plants are fairly well supplied for current needs. Operations at the Canadian Car shops are about normal, with nearly all men back at work. Canadian dealers are watching with considerable interest the developments of the coal situation in the States, and although a two-year contract has been entered into between the operators and the miners, the latter attached their signatures under protest that the wage scale was not satisfactory. Many collieries are idle as a result of men still out, and the possibilities of underproduction, at a time when the demand is increasing, has created a nervous tension among large consumers and manufacturers. The general impression, however, is that labor in general is recognizing the essential need of uninterrupted output in all lines of activity, and that the present disturbances will be short-lived.

Price Revisions Expected

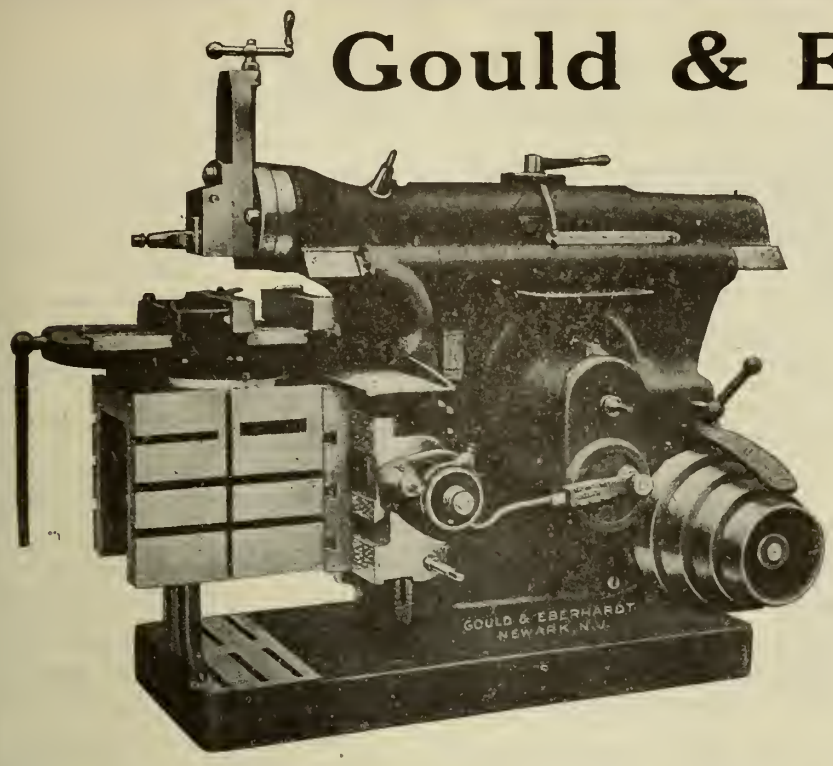
The higher freight rates are a factor now, and on present orders must be taken into account, but where goods are obtainable from stock, previous quotations are generally considered. Replacements, however, are a problem that adds to the difficulties of the dealer, and it is only a question of a week or so when all prices will be based on new freight charges. In commenting on the steel situation one dealer said: "We are now taking into consideration the increased cost of hauling materials and making such revisions as will be necessary in the readjustment of prices to meet this advance in rates. These revisions will be announced in a short time. In the meantime quotations from stock are made on the old basis, but invoices on material delivered from American points include the advanced freight charges." There is still little trouble in disposing of the sheets coming in, although the demand appears less marked at present. Tank plates are available in better quantities but the demand has lessened slightly.

Fall Improvement Expected

The month of August was a comparatively quiet one for machinery dealers, and business turnover was below the average. Some report a fair month, but the balance has been possible more from the movement of small equipment and supplies than from the sales of machine tools. The feeling that labor is more settled is having an influence, and hopes are expressed that the fall season will see a partial return to greater activity. The requirements are apparent, but unsettled conditions and constantly rising prices have prevented a more healthy state of progressive development in many lines of industry. American tools may be slated for advances, but this will apply principally to heavy equipment, as small supplies will be affected but little by the increase in freight rates.

Quiet But Firm

The listless condition of the old material market provides little of interest, and dealers are waiting for the awakening when consumers start a buying campaign. At present the buying is on a small scale and only for immediate needs, largely for local operations. Price quotations are more or less nominal, as individual sales are generally transacted on their respective merits.



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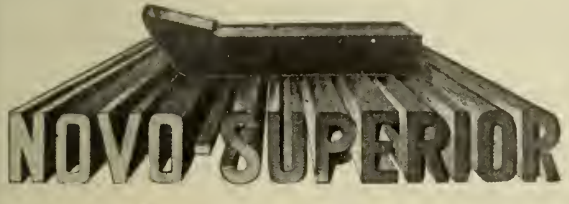

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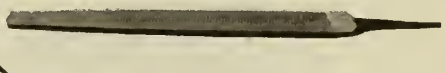

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MARKET NEEDS MORE MATERIAL

Little Improvement Noted in Securing Steel From the Mills—Prices Stay High

TORONTO.—The holiday season and the Toronto Exhibition are two factors that are quite in evidence in the market this week. Dealers in several lines make it a point to come in contact with a number of outside men at the Fair, and after many of these consultations are in better shape to plan their business for the future.

The consensus of opinion seems to be that there is going to be a lot of buying done, not primarily in machine tools, but in lines that will call for machine tool equipment to turn out the material.

Some of the dealers are going as far as to suggest that the time is ripe for a machine tool exhibit in Canada, claiming that the present one at Toronto Fair is not representative of the industry as it exists in this country. There can be no question about that, and the suggestion of a Canadian machine tool exhibit is worth thinking about.

The Shortage Still Here

There may be times when it appears that there is some improvement in the supply of steel coming through, but when one hears of the way in which manufacturers and builders are taxing their ingenuity in order to keep going, these stories of improved conditions simply pass out.

The slowing down of the automobile industry does not seem to be affording relief to other users who want the material they might have been taking had they remained open at full blast. The auto industry uses about eight per cent. of all the steel turned out in United States. As one house figures this, suppose they do cut 25 per cent. in their production, that is only two per cent. of the production. Others seem certain that the fact that labor was planning a big strike in the automobile industry has much to do with the attitude of some of the larger plants on both sides of the line, particularly in United States.

Toronto yards are having a hard time securing sheets. Prices at which these are sold run around 12 cents per pound. One of the yards put the case this way to-day: "Many users may imagine they are paying a high price for sheets, and perhaps they are, but it does not follow that we are making any more money out of it. The real state is this, that at present prices we are making less on our money than we used to when iron bars were to be had for two cents a pound. We have to pay fancy figures in order to get shipments. While we have a very large tonnage on the books of some of the large rollers at quite a bit less than 3c per pound, we are right now buying heavily and paying 8 and 9 cents for quick delivery."

Tubes Very Scarce

There is no improvement in tubes. The replacement business is very urgent now for supplies to get ready for the winter season, and there is no relief in sight. There are many public institutions, such as hospitals, asylums, etc., where it is impossible to shut down.

There are, in the steel market, occasional rumors that some of the steel mills may close for some time. There is, of course, nothing definite to hang the story on, but there seems to be a feeling that such a thing might happen if present conditions keep up much longer.

In the Toronto field there are some reports of price cutting in some of the contracts, even in fields where goods are scarce.

Contractors are calling for material for reinforcing in some quarters, and the supply of this is limited. Fortunately some of the warehouses were fairly well supplied some time back, but things would be poor were they depending entirely on mill deliveries to provide the necessary material.

There is not such an insistent demand for plate as there was some months ago when ship yards were busier. The vessel for the pen-stock of the Hydro work at Chippewa has not been placed yet, and there may be some difficulty in getting prompt delivery. There will be about 2,500 tons required.

The Scrap Metal Trade

There have been some instances in the market within the last few months where scrap iron has sold up to and beyond pig iron. But the reverse of that is the case now. It looked a week or so ago as if the furnace men had put iron—around $50 in Pittsburgh—on a plane where buyers would leave it alone. According to precedent scrap iron should follow, but it has not.

Yards are still taking on a certain amount of scrap, but there is a general "don't care" atmosphere in the whole trading, because dealers are not keen to buy when they don't see a higher market or a ready sale ahead. The yards of the country are generally pretty well depleted. In fact none of the yards are carrying anything like the stock they did before the war. In that period they were stripped of anything that looked like iron or steel, and their stocks have been short in many lines ever since.

Red and yellow metals are about the same. Copper is not moving. The needs of the consumers seem to be fairly well fixed, and there is no extra business demanding material. It is likely that copper will go up a cent a pound as a result of the new freight rates. Not that the new rate on the shipment of copper will amount to that, but there must be taken into consideration that supplies of coal and other materials are shipped to the smelters before the copper is made.

Prices in the metal market remain unchanged.

POINTS IN WEEK'S MARKETING NOTES

Pittsburgh claims that markets at this season of the year should be growing more active, instead of which they are becoming quieter and giving less evidence of sustained buying power.

Predictions are that there will be a prolonged deadlock in the pig iron market. Makers hold for $50 in the Pittsburgh market, while the trade is not prepared to buy at that figure.

The new freight rates in at United States will make a difference of $50,000,000 a year to the U. S. Steel Corporation on materials hauled to its various plants.

Independents are keeping up their high prices for steel and even talk of increasing them.

Metals may show an increase owing to freight changes of materials carried to the smelters.

Deliveries are not improving as much as desired in the steel market.

Toronto warehouses are paying as high as 9 cents for sheets for quick delivery, while at the same time they have a large tonnage on order with the Corporation around 2.65.

The New York machine tool market reports several firms holding off, waiting for lower prices, but the same advice states there is nothing to indicate a dropping market.

HAVE VERY LARGE ORDERS ON HAND

Canada Car and Foundry Have Bookings That Run Into Many Millions

Montreal.—Action in respect to the liquidation of the 22¾ per cent. dividend arrears on Canadian Car & Foundry preferred stock was again deferred by the directors of the enterprise, according to a statement made at the conclusion of the board meeting here.

As the full board does not meet again until late in October, it is not anticipated that any steps will be taken prior to that time, when the matter will probably be discussed by the directors. It is understood, however, that there has been no change in the plan by means of which the arrears are to be liquidated, the majority of the board favoring the proposal to issue 7 per cent. income bonds in lieu of cash.

The prime factor in reaching such a decision, it is stated, was due to the fact that the Car enterprise has nearly $40,000,000 in unfilled orders on its books, requiring a working capital of well upward of $15,000,000 to provide the necessary outlay for labor and materials.

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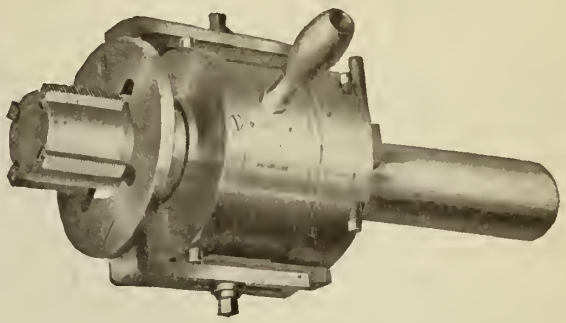

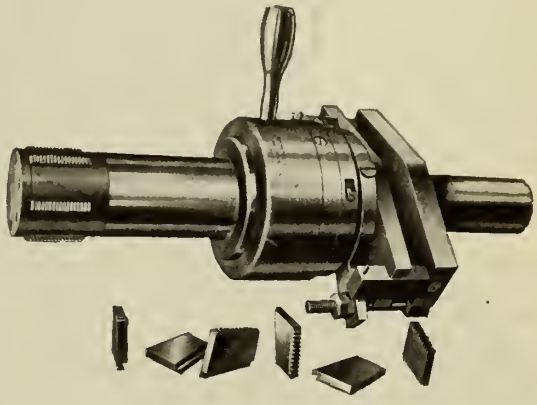

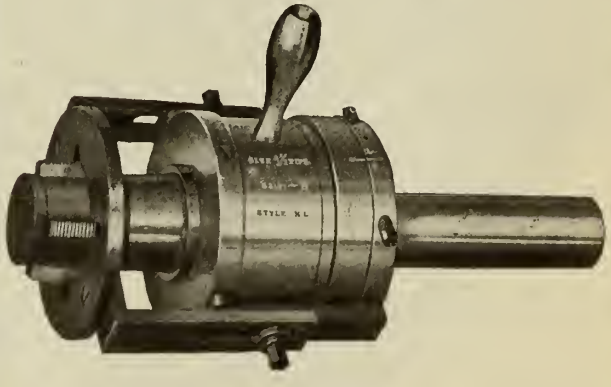

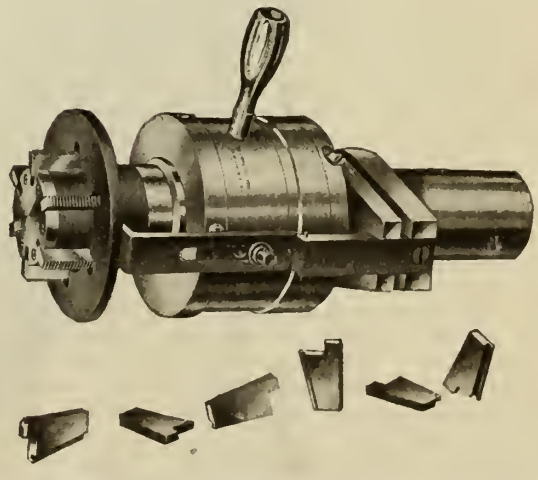

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INDEPENDENTS KEEP PRICES UP AND EVEN TALK OF MAKING INCREASES

Special to Canadian Machinery

PITTSBURGH, Sept. 9.—Producers, dealers and consumers in all branches of the general iron and steel market, including coke, pig iron, semi-finished steel and finished steel products, unite in declaring that there is a condition of quietness if not of absolute stagnation. Coming on the heels of the ending of the July-August midsummer period, which is traditionally a dull one, the situation today is important and suggestive. The markets ought to be growing more active. Looking back to June, one can now see that the markets have grown more and more quiet as time passed, and the fact that what is normally a dull season of the year was passed through seems to have had nothing to do with it.

There is nothing in the technical position of the markets that would presage any increase in activity in the near future. Producers are moderately well sold up and consumers are moderately well covered. No large number of producers will run out of orders in the near future, requiring them to force sales, while buyers are unlikely to be forced to buy heavily for quite a while to come. The attitude of producers is that of "standing pat" on prices as there is nothing to be gained by trying to stimulate activity. The position of buyers is that they will buy only for absolutely known wants in the near future, and as they are already covered, in the main, the current purchases are very light.

Pig Iron

The pig iron markets are stagnant, particularly in the western Pennsylvania and valley district. Men are discussing now how it happened that foundry pig iron recently was shoved up $4 a ton to $50 valley. As there has been little buying at the new price the advance does not seem to have done the producers much good, and it may prove to have done them harm by straining the patience of consumers to the breaking point. If the furnaces had left the market at $46 they might have pulled the consumers along and gotten them to buy from time to time. One man who is practically neutral as between buyer and seller, but very well posted, remarks that the advance was simply a sort of notion, so many furnacemen having made up their minds it would look nice to have pig iron advance to the round figure of $50, and it is known that quite a number of bets were made as to whether or not pig iron would reach $50. Bets can be collected even if little pig iron can be sold. The same observer just referred to remarks that the southern furnacemen seem to have handled their market with more skill. They got the price of pig iron at Birmingham up to $42 at the end of last April, and they have held it there steadfastly, though sometimes obtaining delivery premiums. When northern iron started advancing over again there was afforded a wider field for the sale of southern iron, of which the southern furnaces have been taking advantage. For instance, years ago the alignment of prices became such that Birmingham iron could rarely get into Pittsburgh, being shut out by valley iron, but even with the advance in freights Birmingham iron can beat valley iron for Pittsburgh delivery by over $2 a ton, the freight Birmingham to Pittsburgh being advanced from $5.70 to $7.60, making southern iron at $42 Birmingham $49.60 delivered Pittsburgh. Valley iron, on the other hand, at $50, furnace, is $51.96 delivered Pittsburgh. The Pittsburgh consumer may not buy southern iron, but he is deterred from buying valley iron unless he needs a small lot for very early delivery, in which case the price matters very little.

A fair conclusion is that there will be a prolonged deadlock in the pig iron market, with only very light transactions. A certain amount of iron has been sold and bought, and the question is whether the producers will first need orders or the consumers will first need iron. For a long time past production and consumption have balanced, while the present outlook is that production will increase and consumption will decrease. Unless fundamental conditions change, therefore, it would look as though sellers will have to come into the market first, and necessarily with cut prices, but this may not be, possibly, until several months have elapsed.

Steel Prices Unchanged

The gap between Steel Corporation and independent prices is not being narrowed, despite the dullness of the market. In the past week or two there have been little cases of price declines and also little cases of price advances, on the part of some independents. The point seems to be that when there is competitive business the price declines while when there is no business a mill may mark its prices up, as it loses nothing by doing so and makes safer from cancellation the business it already has on its books. It is about a year now since there first appeared a distinct difference between Steel Corporation and independent prices, the difference increasing until substantially the maximum was reached last February or March, since when there has been practically no change, taking the general average of the market. Expectations used to be entertained that the phenomenal and almost unbelievable condition of there being two markets would be terminated by a gradual sagging of the independent prices. The course of the market recently indicates that nothing of the sort will occur. There will be no sagging, but rather the prices will be maintained to the last moment, the banners waving and the band playing. The independents still talk of there being further price advances, and have even revived talk of the Steel Corporation being about ready at last to advance its own prices, which have been maintained without change since the Industrial Board adjustment of March 21, 1919. While there is no official statement, there is an intimation from New York, possibly inspired, to the effect that the corporation has no intention of advancing its prices. Now would be the time of all times for the corporation to advance its prices, for by the recent advance in freight rates its costs are increased by about $50,000,000 a year in increased freights it pays on materials assembled at its various plants and on shipments between plants. The corporation gets a part of this back, however, possibly a fourth or a third, in that it makes a greater profit on such material as it sells on the "Pittsburg basis" to point taking a lower freight from the producing mill to the point of delivery. The $50,000,000 a year is approximately equal to the rate at which the corporation accumulated surplus during the first half of this year, after paying charges and dividends. However, the corporation does not necessarily need to accumulate surplus all the time, having a good surplus now, while its book-keeping has been particularly conservative, large sums having been written off lately, keeping the property account down.

NEW YORK TOOL MARKET IS DULL

Some Buyers Reported Staying Out in Expectation of Getting a Lower Price

Special to CANADIAN MACHINERY.

NEW YORK, September 9.—During the week Labor Day has cast its shadow over the machine tool business, which has been unusually quiet. Aside from the inquiries from the General Electric Co., reported last week, there has been virtually nothing in the market worthy of note. The General Electric Co. is inquiring also for a considerable number of tools for its Bridgeport, Conn., works, in addition to 84 wanted for its North Easton, Mass., plant, and 25 for Schenectady works.

One large manufacturer in the East, who had been on the point of buying a large list of tools, has decided to hold off, possibly for several months. The impression seems to be gaining that prices of machine tools will come down within a few months, but there is as yet nothing tangible upon which to base such an expectation other than the fact that current business is in small volume compared with what was done in the early part of the year.

Not only has domestic business in ma-

If interested tear out this page and place with letters to be answered.

chine tools fallen off, but there has been a decided slump also in export buying, particularly in England. The recent increase in the profits taxes in England has considerably upset the manufacturers of that country, and they are not in a mood to take on new commitments.

LINE TO TAP THE FELDSPAR FIELDS

Revival of an Ontario Mining Industry As Result of Increased Demand

Kingston.—There is likely to be a branch line of railway run from the Canadian National Railway into the township of Bedford, starting probably from Westport. This line is designed to open up the development of feldspar deposits in the district that cannot now be reached owing to the absence of railway facilities. The feldspar in this district is regarded as one of the richest in North America. The only two other important deposits are in North Carolina and Maine, but the deposits in the Kingston district are said to be engaging the attention of the manufacturers of porcelain ware, electrical insulation, Old Dutch and Sapolio, bathroom fixtures, fine tile and enamelware, including automobile enamel. The demand for feldspar as the basis of a great many manufactured ornamental articles is growing by leaps and bounds and the Frontenac deposits have increased enormously in value.

There is a likelihood, too, of the location of grinding mills at the pits so that there may be some control over the process of manufacture, thus utilizing local labor as far as possible. Up to the present time, however, the ore has been exported direct from the mines by vessels from Kingston and Cobourg to the United States, where it was refined, and some deposits have already been purchased outright by Americans.

OPERATIONS AT THE SAULT WERE ON LOWER BASIS—OUTLOOK BRIGHT

President Wilfrid H. Cunningham, of the Lake Superior Corporation, referred at length to conditions in the steel trade in his annual address to the directors. Regarding work at the Soo mills he said:

"Operations of the steel plant for the fiscal year," he says, "continued throughout the first quarter at below 50 per cent. capacity on account of scarcity of new orders, and subsequently until April were seriously curtailed, notwithstanding heavy orders on hand booked in November and December. The winter was unusually severe, and operations were seriously hampered by heavy snowfalls and extremely cold weather. These conditions affected our own transportation facilities, and interfered with shipments by rendering it impossible at times for railways to supply sufficient cars. Sickness was very prevalent during the winter, at one time 20 per cent. of the operating force being absent from this cause. Not until the last quarter of the year was the plant able to operate approximately to capacity."

But the outlook is now brighter, according to Mr. Cunningham. "Orders on hand," he goes on, "at the close of the year in steel and iron products, amounted to 268,000 gross tons, which will assure capacity operation until December, 1920. At the present time business is offering in large tonnage for delivery in the first six months of 1921, and booking will be made as soon as the advanced prices are definitely settled. The outlook is considered satisfactory as to new business throughout the coming year." Equipment was completed for rolling structural shapes up to 15 inch beams and channels, and chrome vanadium and nickel steel are now being made for the automobile industry.

"Contracts for new structural mills were placed," says Mr. Cunningham, "but have since been suspended, pending an improvement in the money market, when it is expected more favorable arrangements can be made for the financing."

TRYING TO CUT OUT ACCIDENTS

So a Committee is to Go Over the Buildings in Course of Construction

An innovation in making provision for the safety of workmen engaged in building and construction work has been introduced in the erection of large extensions to the plant of the American Rolling Mill Company at Middletown, Ohio.

At two p.m. each Tuesday a committee composed of foremen, mechanics and laborers inspects the entire job from sewers to roof with the one purpose of seeing that proper methods are taken to safeguard the employees against accident. This committee makes a detailed report of each inspection to a representative safety committee, which considers and puts into effect the recommendations of the inspection committee.

The success of this program is being closely watched by various safety societies which are now encouraging day laborers as well as trained men to speed up their work. Experts in all types of building construction are agreed that the first marked reduction in building cost will come through increased production. The best features of this new safety plan are being copied by many large construction companies in the United States and Canada. The public is interested in the plan because indirectly it will lower rentals by reducing construction costs. This applies equally well to industrial construction, large building projects and homes.

MONTREAL NOTES

William P. Millar, an old resident of Morrisburg and Brockville, who has been travelling representative in China and Japan for the Canada Foundry and Forgings, died recently at his home in Virden, Man., at which place he had been residing for some years past.

Roy M. Welvin, president of the Dominion Steel Corporation, left Montreal last week on a business trip to the steel and coal interests of the company at Sydney. While away he will attend the launching of the C. G. M. M. steamer, "Canadian Mariner," which has been constructed by the Halifax Shipbuilding Company; the ceremony of christening will be performed by Mrs. Wolvin.

At a recent meeting of the Montreal Board of Trade W. S. Leslie, chairman of the committee on municipal affairs, was appointed to confer with the Administration Commission in connection with the application of the Bell Telephone Company for increased rates and the manner of collecting them. On the question of increased facilities for communication with the South Shore, the Board appointed W. B. Ramsay, chairman of the harbor and navigation committee, and A. M. Irvine, as a committee to confer with the South Shore Board of Trade.

In connection with the forthcoming trans-continental air flight from Halifax to Vancouver, the Quebec Harbor Commissioners have been approached as to the using of Lampson's Cove as a seaplane harbor, which will serve as a permanent station for transcontinental flights, and will place Quebec on the all-red air route. Capt. Leroyer, of the Canadian Air Board, has stated that one of these flights will take place towards the end of this month. The object of these flights is not only of military value but it is to demonstrate the practicability of the airplane for commercial purposes.

The Superheater Company, Limited, will manufacture the type of fire-tube superheaters now in general use in locomotives of all Canadian railways, and also fire tube superheaters for marine installations, of which there are now over two thousand in daily service. In the case of the water tube boilers in marine service, the company designs and manufactures the superheater to suit each individual case. This likewise applies to stationary installations, either water-tube, fire-tube, or separately fired. The conditions are studied in each case with a view to supplying the most economical and effective installation. The company employs a form of return bend which is made by a forging process from the metal of the superheater pipes, making an exceptionally strong construction which is proof against high temperatures. This form of return bend has also been considerably sought after for the use in pipe coils for refrigerating purposes, condensers and other uses.

Extending Canada's Trade to Every Harbor

Development of Canadian Marine is Proceeding on a Profitable Basis—Ships Are Now Sailing from Canada to Many Points—Equipment and Service of a Very High Order.

ALTHOUGH Canada has come into the world view in maritime matters of recent years, many of her people, far removed from the sea board, are but dimly aware of her position in this respect. As a means of putting first hand information on the activities of the Government marine before these people, a party of press representatives from Toronto, Hamilton, Ottawa, London, Quebec, and Montreal were entertained to luncheon on board the "Canadian Victor," the latest acquisition to the fleet. The party travelled over Government-owned lines from their respective towns to Montreal, where the vessel was loading for Liverpool at Pier 12, Montreal. The Toronto and Hamilton representatives travelled via Napanee, Smiths Falls and Ottawa over the C.P.R., transferring to the Grand Trunk at Ottawa for the remainder of the journey to Montreal. The trip to Ottawa was made by daylight, and the scenic beauties of the route were much enjoyed by the newspaper men. The portion of the route through the Rideau chain of lakes is especially beautiful, and the excellence of the road bed contributed materially to the pleasure of the trip. The train at times made considerably over 60 miles an hour, and there was no evidence of the usual bumping and swinging which so often accompanies railroad travelling on the roads of this country. Montreal was reached about 11 p.m.

Luncheon on Board

Luncheon on board the "Canadian Victor" was set for 1.30 p.m. on Tuesday, August 21st, and at that hour a deeply interested company gathered around the table in the smoke room. Yes, the "Canadian Victor" has a smoke room in her accommodation, which is far in advance of that on any cargo steamer the writer has so far run across. The head of the table was taken by Captain Coffin, master of the vessel, while facing him at the other end was Mr. R. B. Teakle, manager of the Canadian Government Merchant Marine, who had on his right Mr. M. P. Fennell, secretary of the Montreal Harbor Commission and on his left Capt. S. E. Tedford, marine superintendent of the C.G.M.M. Besides the representatives of the press, there were present Captain Bourassa, Harbor Master of Montreal, Captain Bales, Port Warden of Montreal, Mr. H. Milburn, assistant manager of the C.G.M.M., Mr. H. J. Whiteside, publicity agent of the C.N.R., and Mr. Walter Thompson, publicity agent of the G.T.R. During the luncheon, the subdued clatter of the winches rapidly lowering the cargo into the holds formed a bass accompaniment to the hum of conversation and served to remind one that this was no pleasure ship, but a busy commerce carrier, carrying Canada's goods and Canada's flag to the far confines of the Empire.

Mr. R. B. Teakle, in a post-prandial speech, gave a highly interesting and closeup view of the attainments of the C.G.M.M. from its inception to the present day, and the achievements that are aimed at for the future. Mr. Teakle's speech impressed one as that of a man who knew his subject thoroughly and was imbued with a very warm enthusiasm for the project he had under his charge. In fact, every official of the C.G.M.M. one meets seems to be infected with this same spirit.

Started After the War

Mr. Teakle spoke of the inception of the fleet, which was really started in order to keep the shipyards, then concluding their Imperial Munitions Board contracts, employed for a further period. The world shortage of shipping induced the Government to increase their earlier orders, and then the vision of what such a fleet might mean to Canada decided them to bring the fleet up to its present dimensions. The "Canadian Victor" was the 38th ship to be delivered, and brought the total tonnage now in commission up to 203,000 tons. There were 28 more steamers to be delivered, which would make a total of 400,000 tons dead weight and a fleet of 66 steamers. A fleet of this size was a very respectable one for any company to own. The first vessel to sail was the "Canadian Voyageur," a product of the same firm that had built the "Canadian Victor," the Canadian-Vickers, Ltd. At the end of 1919, the total tonnage in commission was 93,900 tons. The fleet when all are delivered will virtually girdle the earth, services being established to every part of the world. Close by the "Canadian Victor" the "Canadian Pioneer" was loading for Bombay, Calcutta and Kurrachee, while from the British Columbia coast the "Canadian Importer" and "Canadian Exporter" had inaugurated a service to Australia and New Zealand, Hong Kong, Shanghai and Japan, and the Dutch East Indies will have services and the Canadian vessels from the Pacific coast will meet in far Eastern ports with Canadian vessels from the Atlantic coast, thus forming virtually a girdle of the globe.

Training Canadian Officers

Not only were these vessels Canadian built, but they were 80 per cent. Canadian manned. In order to provide future officers from the youth of Canada every steamer carried two apprentices, selected from various towns in Canada. Mr. Teakle was one of the originators of the Navy League and through this organization many of the boys were supplied. These apprentices, after four years' service, would be eligible to sit for examination as junior officers, and then climb up the ladder in the usual way, until they attained the highest position attainable at sea. The "Canadian Victor" was the first of the Government vessels to be fitted with a cold storage hold, and some of the future vessels would probably be equipped with oil fuel. Speaking of the organization, of the fleets, Mr. Teakle mentioned that they had as Australian manager, Mr. Geo. E. Bunting, a Canadian of long experience and training in the shipping business, while in London, England they were represented by Mr. Wm. Phillips, also a Canadian. The ships ...

ONE OF THE CANADIAN MARINE VESSELS

run in exactly the same manner as the large English companies ran their ships. In fact in some ways they were run better, and he instanced cases where Canadian Government ships were turned round in four or five days, while old country ships in the same ports took ten or fourteen. They handled in the port of Montreal as many as six or seven ships a week, and they came and went quietly with no fuss, but with full holds. So far the ships had been run at a handsome profit. It had been said, and there was some truth in it, that even if the vessels were run at a loss they would be of value to the country. However, that was not the view that he and his assistants took of it, and they were running them as a business organization, to make a profit for the owners, who were the people of Canada.

At the conclusion of his speech, Mr. Teakle was thanked very heartily, and congratulated on his clear exposition of the purpose of the C.G.M.M.

The "Canadian Victor"

Following Mr. Teakle's speech, the company were taken on a tour of inspection of the vessel, and the various features pointed out by the officers in charge. As before mentioned, the accommodation for all hands is very much above the average to be found in a cargo steamer, and there is in addition accommodation for eight passengers, should there be need at any time to carry someone from port to port. The men's accommodation under the poop is spacious and considerably better than used to be provided for third class passengers up till quite recently. The poop deck itself is long and spacious and makes an excellent promenade deck.

The facilities for handling cargo are very good, there being four winches at each hatch, besides one on the poop, and the anchor windlass on the fo'c's'le head. The steering engine is located in the poop, and is operated by telemotor gear from the wheel-house on the bridge. Hand gear is fitted in case of emergency and a powerful brake is fitted that can hold the rudder stationary in case of a breakdown of any part of the gear.

The vessel's leading dimensions are: 400 feet long by 52 feet beam and 32 feet deep, while her deadweight tonnage is 8,432. She has triple expansion engines, with the contraflo type condenser, the air pump and bilge pumps only being operated off the h.p. cylinder. A winch condenser is fitted for port use. The main feed pumps are independent, made by the well known G. & J. Weir, of Glasgow. There is also a Lamont pump. The circulating pump is of the centrifugal type. There are three boilers of the Scotch marine type, with three furnaces in each, operated under the Howden system of forced draught. Mr. McGregor, the chief engineer, had two vessels blown up under him during the war, but looks none the worse for his unpleasant experiences.

Canadian-made Goods

Going through the sheds afterwards under the guidance of Capt. Tedford, it was highly impressive to observe Canadian-made autos in huge crates consigned to India, and even Arabia. Those were part of the cargo of the "Canadian Pioneer," which was loading for these ports. At another shed was observed the "Canadian Observer," loading for Newfoundland and Gulf ports, while at another wharf the Canadian Government steamers have been the means of bringing 8,000 tons of Cuban sugar to Montreal, which otherwise would have been difficult to get. Captain Tedford becomes enthusiastic when speaking of the steamers of the fleet and claims that there is no line of ships that can show better operation than the C.G.M.M. He wants the funnel of the line to carry a maple leaf to distinguish them, and let everyone who sees them know that there is a Canadian ship. He rightly contends that there is no better advertisement for Canada than a Canadian ship in every port of the world.

A Little "Extra" Work

Despite the work of looking after a fleet, Captain Tedford is ready for any special duty that comes along. Quite as a matter of course he mentioned that he had lately returned from a little salvage operation on the coast of the St. Lawrence. The steamer J. E. McKee went ashore on the rocks at the mouth of the Saguenay River in a thick fog, and at high tide. A vessel going ashore at this place under these conditions usually stays there. and most people thought that the McKee would. However, Captain Tedford thought she could be salved and proceeded to salve her. They left Quebec for the scene of the wreck in the afternoon and arrived at 2 o'clock the following afternoon, which was a Saturday. At 2 o'clock Sunday the vessel was afloat, after a portion of her cargo had been discharged. Her propeller was gone and her rudder badly damaged but she was towed into Quebec three days after the expedition started. This was a highly successful and expeditious salvage feat, for which Capt. Tedford came in for many congratulations.

Canada possesses an organization in her merchant fleet which is a distinct asset to the country. It is carrying her flag to countries which have hardly heard of her, and incidentally opening up trade routes for her manufacturers. The company, for it is a company, is to be congratulated on the men it has secured to organize and operate the fleet. The fleet is Canadian-built and 80 per cent. Canadian manned. May it soon be 100 per cent. Canadian and 100 per cent. successful.

Mr. H. J. Whiteside, of the Canadian National Rys., and Mr. Walter Thompson, of the Grand Trunk Ry., were responsible for the guidance and comfort of the party, and were tireless in their efforts for the well being of their guests.

HERE ARE FIRMS THAT ARE ASKING FOR SEVERAL LINES

Firms interested in the following lines are advised to write to the Intelligence Department, Trade & Commerce Dept., Ottawa, mentioning key numbers:

1584.—Electrical apparatus. A firm in Roumania desires to receive prices and quotations as well as other particulars from Canadian firms in a position to export electrical apparatus.

1585.—Industrial machinery and tools. —A Genoese firm would be glad to enter into negotiations with Canadian firms with the end in view of representing them in Italy.

1586.—Machinery. A house in Milan, Italy, wishes to purchase machinery in Canada.

1587.—Cranes, machinery, hardware, etc. A house in Turin, Italy, is willing to purchase the above in Canada.

1588.—Machinery. A firm in Roumania desires to receive quotations and other particulars from Canadian firms in a position to export all kinds of electrical machines.

1589.—A house in Milan, Italy, is anxious to represent Canadian houses dealing in machinery.

1590.—Agricultural and industrial machinery. A most important house in Rome would be glad to hear from Canadian firms dealing in the above.

1593.—Agricultural and industrial machinery, pumps. An old established firm in Naples. dealing in agricultural and industrial machinery and pumps would welcome proposals from Canadian exporters.

1598.—Electric machinery and material. A Cape Town firm of electric engineers are prepared to take up the South African representation of Canadian electric machinery and materials.

1607.—Machinery, hardware, pumps etc. A most important firm in Genoa is willing to consider offers from Canadian firms dealing in machinery, hardware pumps, etc.

116.—Iron and steel goods, etc. A Cape Town commission agent is seeking agencies for all of the lines mentioned above.

1617.—Machine tools. A Cape Town commission agent is seeking agencies for all of the lines mentioned above.

1617.—Machine Tools.—A Cape Town representative is prepared to consider offers of agency for the Union in machine tools, gears, etc.

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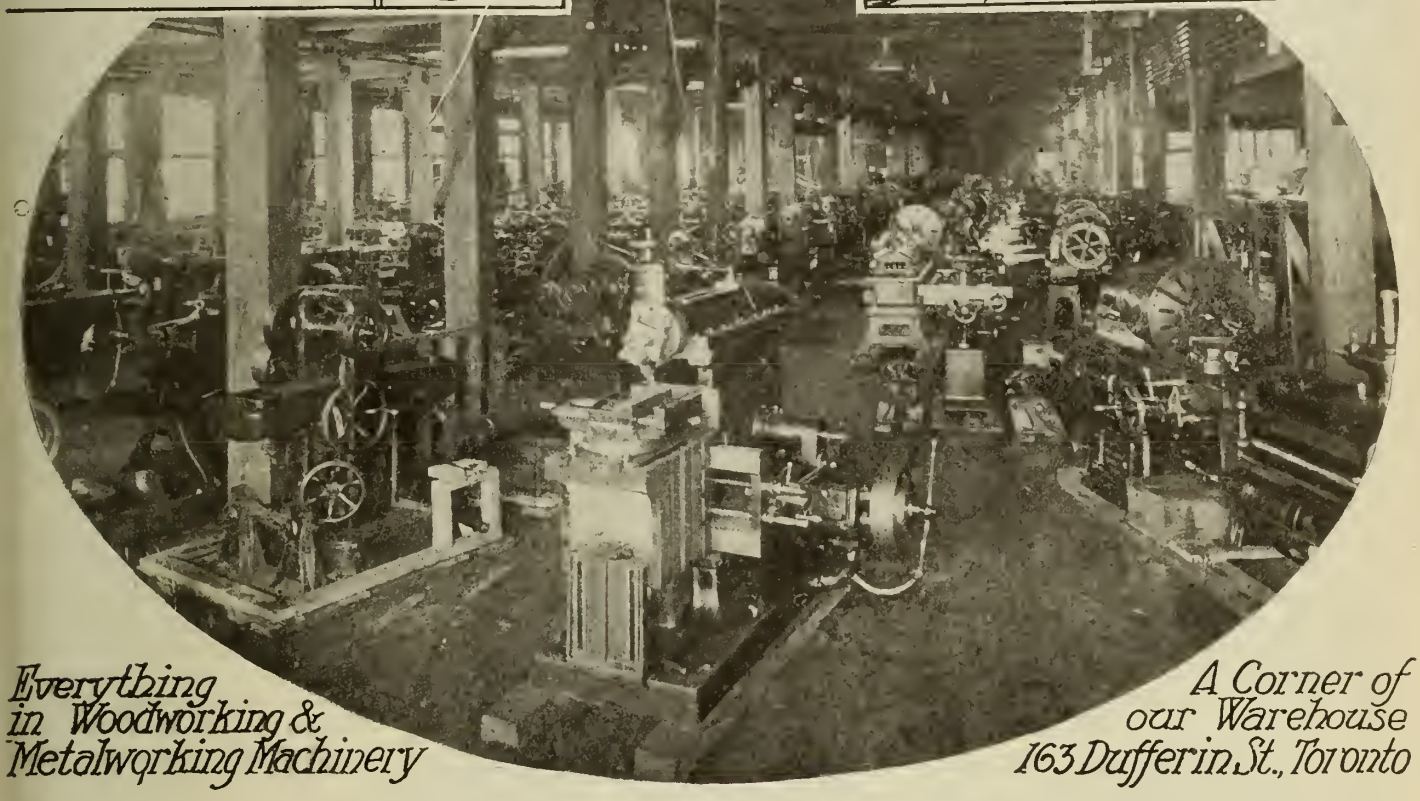

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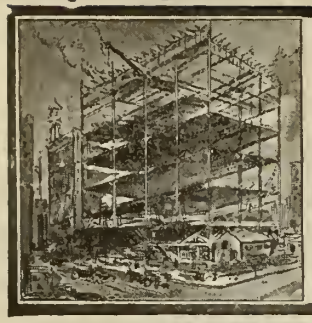

INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS PERSONAL AND TRADE NOTES

Have Contract.—A contract for the mechanical equipment of the Hudson's Bay Company's store at Victoria, B.C., has been awarded to Greene and Lister, plumbing and heating contractors, Winnipeg.

A Busy Shop.—Favorable reports are received regarding operations by the Ontario Steel Products, Limited. The plant at Gananoque, where shovels are made, is running at capacity, and business at the other factories is also reported to be very good.

Make Steel in West.—Rolling mills and blast furnaces for the manufacture of steel, will, it is expected, be established in this province as soon as the necessary market for the product of such an undertaking has been assured, according to a statement made by Major Martyn, Industrial Commissioner for the province, who, with James H. McVity and Nichol Thompson, of the Advisory Council of the British Columbia Department of Industries, has left for Chicago and San Francisco in connection with the matter.

Toronto.—The Canada Steamship Lines will build a new steamer for their Lewiston service, which will be in commission for next season. She will be the largest passenger boat in the fleet, and will be thoroughly modern in every respect. She will be propelled by geared turbines, and will have a speed of about 22 knots. She will have four decks, and a restaurant, dancing floor, moving picture theatre, and a children's playground are spoken of. Pressed steel fittings will be used entirely in the interior, reducing the fire risk to a minimum. Passenger accommodation will be provided for 4,000.

Customs Tariff Inquiry.—In preparation for the approaching revision of the Canadian Customs Tariff by Parliament, a committee of cabinet ministers, consisting of Sir Henry Drayton, Minister of Finance; Senator Robertson, Minister of Labor, and Hon. Tolmie, Minister of Agriculture, will begin an inquiry into the tariff at Winnipeg, on September 14 next. The itinerary as announced is as follows: Winnipeg, September 14, 15 and 16; Vancouver, September 20, and 21; Vancouver, September 24 and 25; Nelson, September 30 and October 1; Edmonton, Otober 6 and 7; Regina, October 11 and 12; Winnipeg, October 14; Sault Ste. Marie, October 18; Medicine Hat, September 17; Victoria, September 22 and 23; Vernon, September 27; Calgary, October 4 and 5; Saskatoon, October 8; Brandon, October 13; Fort William and Port Arthur, October 15; Windsor, October 21. The itinerary for the rest of Canada will be announced later.

Build Machine Shop.—The Gunnel Company of Canada, 2410 West Dundas Street, Toronto, received a permit from the city architect for the erection of a three-storey brick and reinforced concrete machine shop, which, when completed, will cost in the neighborhood of $100,000.

Want Yards Open.—Business Manager Herbert Wright, of the Toronto Union of Shipbuilders, is in Ottawa conferring with the Minister of Marine and Fisheries, urging that they proceed with the construction of the two ships on the ways of the Dominion Shipbuilding Company. These were started before the company was forced into liquidation. The third vessel, that was under way for a New Orleans firm, is being finished by the owners. Mr. Wright will urge upon the Government the fact that if the work does not go on many men will be out of work this winter.

Will Rebuild.—The first sod of the new factory of the Imperial Steel & Wire Co. at Collingwood was formally turned by Deputy Reeve William Williams, in the presence of members of the municipal council, the chamber of commerce, and other business men. Lt.-Col. J. A. Currie, president of the company, said the new buildings would be much larger than those destroyed by fire in May, 1919, while the plant would be so expanded as to give an output of about 200 tons of wire products per day. Contracts for the building, Lt.-Col. Currie also said, have practically been awarded, local firms being the successful tenderers. Construction will be proceeded with immediately.

Change in Welland.—The plant of the Dillon Crucible Alloys, Limited, Welland, has been purchased by the Canadian Atlas Crucible Steel Co., Limited, and Canadian interests will be strongly represented in the company as well as on the board of directors. Atlas products, which include "L-XX" brand of high speed steel and other Atlas brands, carbon and special alloy tool steels, will now be made in Canada. The general sales office of the company will be located at 133 Eastern Ave., Toronto, Ont with a warehouse in conjunction, and branch warehouses and sales offices at 326 Craig St. W., Montreal, also at Winnipeg, Man.

Toronto.—Mr. F. S. Wood, former Agent for the Canadian National Railways at Pittsburgh, is being transferred to Toronto to look after the interests of the Canadian Government Merchant Marine. Mr. Wood has been located at Pittsburgh for the past five years.

To Make Matches. — Sir Alexander Maguire and his brother Dr. D. P. Maguire, who have been in Montreal at the Ritz-Carlton Hotel in connection with the plans for the erection of a match factory plant to be operated by the British firm of Maguire, Paterson and Palmer, Limited, have left for New York, where they will embark on the Olympic for Southampton. They expect to return in about three weeks to complete all details of their plans. It was stated by Sir Alexander Maguire that machinery is already awaiting shipment on the other side, and they anticipate being able to commence manufacturing operations early in January.

INCORPORATIONS

Dominion Motor Castings, Ltd. Incorporators: Clifford Albert Ripley, manufacturer; and others, all of Detroit. Capital $250,000. Head office, Windsor.

Canadian Farm Power and Machinery Co., Ltd. Incorporators: Milton A. Adolphe, farmer, Listowel, Ont.; and others. Capital $1,000,000, divided into 10,000 shares of $100 each, of which 5,000 shares shall be preference shares. Head office, Toronto.

Auto Supplies Co., Ltd. Incorporators: Henry Howard Shaver, barrister-at-law; Alexander Findlay Boyle, automobile builder; and others, all of Toronto. Capital $150,000, divided into 1,500 shares of $100 each. Head office Toronto.

London Concrete Machinery Co., Ltd. Incorporators: Henry Pocock and James Charles Doidge, manufacturers; and others, all of London. Capital $500,000, divided into 5,000 shares of $100 each. Chief place of business London.

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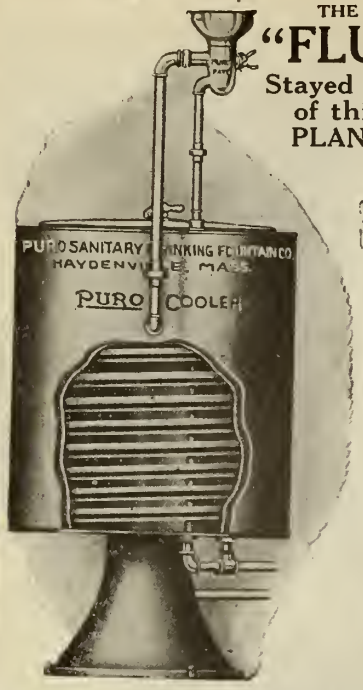

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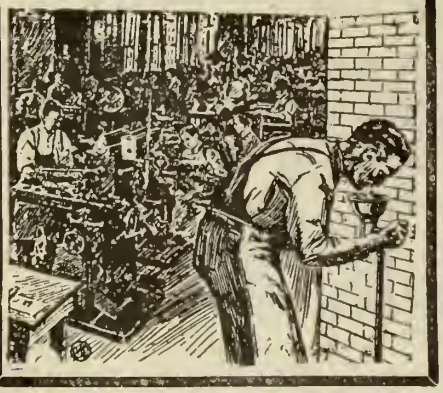

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NEW ZEALAND IS A GOOD SPOT FOR CANADIANS TO DO BUSINESS

F. C. Brookbanks, a prominent merchant of Auckland, New Zealand, who has been in Canada, believes there is a chance to develop very satisfactory trade relations between Canada and New Zealand.

"New Zealand trade is worth cultivating by Canadian manufacturers, said Mr. Brookbanks, "since we are purely a pastoral and agricultural country with little or no manufactures to speak of. During the war we did an extensive business with Japan, but the Eastern sources of commerce are no longer satisfactory. The grades are too low in quality and business methods are unsuitable to us in every way. Goods are far too often not sent to sample and as a result nobody wants their merchandise. Latterly, it has become impossible to judge colors from their dyes, which are especially bad in dark shades.

United States Busy

"The United States," said Mr. Brookbanks, "has fully realized the importance of trading with us and is already doing a tremendous business, having sent out its own representatives and appointed resident agents in the various large cities such as Auckland, Wellington. Dunedin and Christchurch. Furthermore, for the last two years certain American firms have been allocating a considerable portion of stock for New Zealand trade. In some cases these goods could have been disposed of in their own country, but in order to encourage and foster New Zealand commerce they have adopted this course.

"Now, in theory, the ideas of the American manufacturer are excellent, but in practice they are bad," stated Mr. Brookbanks, "and English goods are therefore much preferred by our stores. I am here to investigate personally trade conditions in Canada and to judge at first hand whether Canadian markets offer greater opportunities to the New Zealand importer than do the European or American.

"After a careful study carried out in all parts of the world I am convinced that Canada alone can satisfy our requirements, if she will but take the trouble to rectify and overcome the drawbacks existing at present so detrimental to the expansion of her foreign export trade."

When asked what criticism he had to make regarding the matter, Mr. Brookbanks replied: "I can readily give several instances of the difficulties I refer to, but my criticisms are meant in the kindest way as between cousins, so to speak.

"To begin with, we merchants invariably experience annoying delays in the execution of our Canadian orders. A delay in delivery is just as vital a loss to us as to Canadians themselves. When you consider that we are five months behind you as regards seasons, it ought to be the easiest thing in the world to accommodate us, since what is unseasonable in Canada is just the reverse in New Zealand. Again, when a manufacturer accepts an order from us, he must give us some idea of the date of delivery, otherwise we could not assume the risk at so great a distance. Another thing, some of your manufacturers have a bad habit of substituting without authority, and the result is invariably unsuitable. In every case, we should prefer to place a second choice, if this would be adhered to.

"Carelessness in shipping arrangements is another fruitful cause of annoyance to us. The omission, for example, of the statutory customs declaration to the effect that 'these goods were made in the British Empire' entails the payment of enormously increased duty, whereas, a little foresight anad extra trouble on the part of the exporter would save us a considerable amount of needless expense."

MARINE

Montreal.—The Canadian Government Merchant Marine has taken delivery of the Canadian Victor, built at the plant of the Canadian Vickers Co., Montreal. The vessel is of 8,400 tons, and will load for Liverpool. The line to the Far East will be opened in the immediate future by the departure of the Canadian Pioneer.

Washington.—The U.S. Shipping Board has authorized increased freight and passenger rates on the Great Lakes, to be made effective after one day's notice not later than January 1st next. The freight rates are enabled to be increased by 40 per cent. and the passenger rates by 20 per cent. It is expected that the vessel owners will put the new rates in force without delay.

Kingston.—The steamer Chamberlain, recently damaged by fire, has been sold by Captain Harry Martin to A. A. Laroque of the McNaughton line. Capt. Martin has also sold the barge "White Friant" to R. C. Weddell, Trenton, for the coal and stone trade.

Vancouver.—The Hon. C. C. Ballantyne, speaking at Vancouver, said that eventually many more millions would be spent on the harbour, in addition to the five millions which would be devoted to the Government pier.

Brockville.—The work of lightering the cargo of the stranded steamer Phelan at Iroquois Point is proceeding rapidly. The Donelly wrecking fleet has about completed this work, 32,000 bushels having been removed, and the work of pumping out the wet grain is now being proceeded with. The grain is being loaded into barges, the dry and wet being kept separate.

PROPER RAILWAY OPERATION

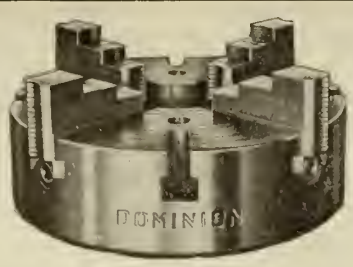
Continued from page 250

tives, besides being a competent transportation officer, and the best way to acquire this general knowledge is to be placed in a position to gain the practical experience. A superintendent given such an opportunity will naturally make a more capable general officer than one whose training is confined to one department.

It has always been stated that some railways are being efficiently and economically managed under a departmental organization. The question naturally arises, "Would still better results be produced under a divisional organization?"

Trying the Coal.—E. H. Oliver, chief engineer of the Alberta Government power plant, has been sent to Winnipeg to conduct a series of tests with Alberta coal for the purpose of demonstrating to consumers in that province that coal from Alberta will stand the shipping and the climate conditions and will burn well.

Vancouver.—The Canadian Pacific Railway coast-service will be augmented by a new steamer which will replace the "Princess Sophia" which was lost last year in the Alaskan straits. The contract has been let to the Wallace Shipyards of Vancouver, and the vessel will be 326 feet long with a speed of 17 knots. She will cost about $1,500,000.



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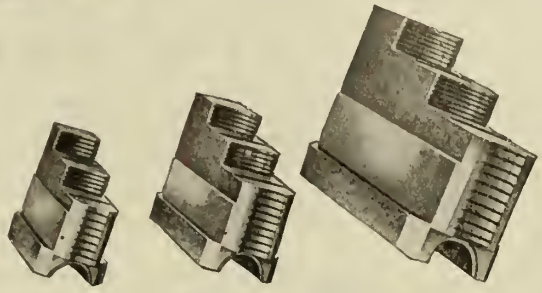

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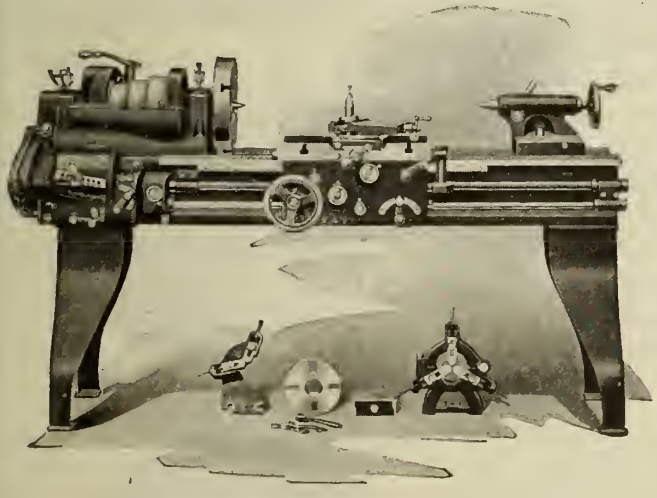

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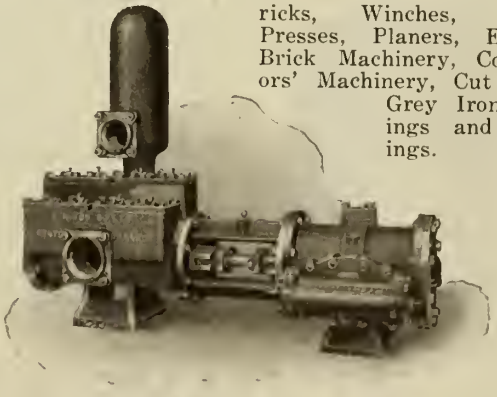

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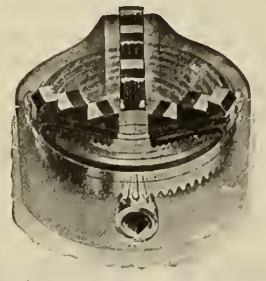

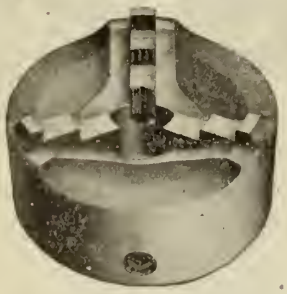

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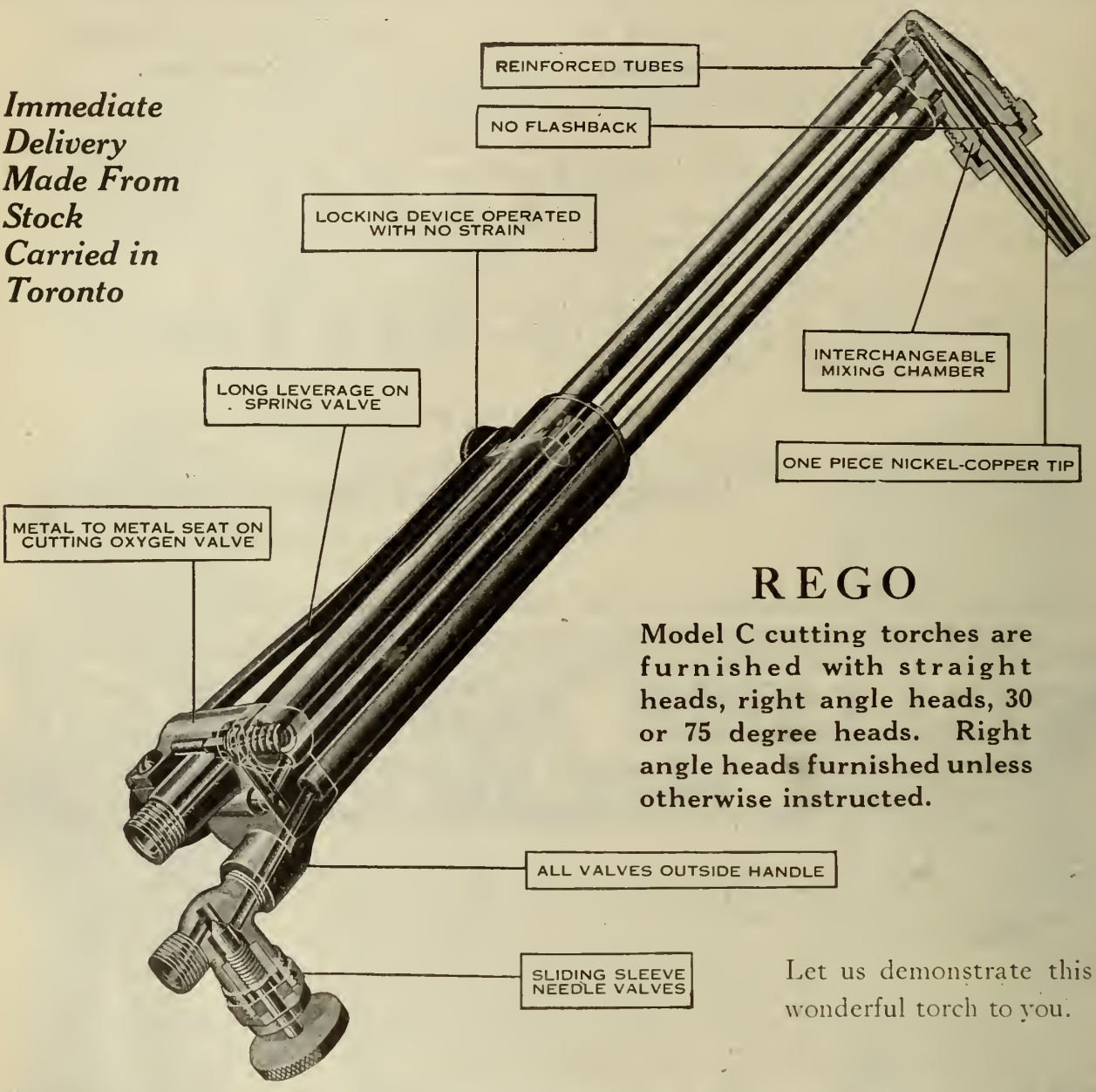
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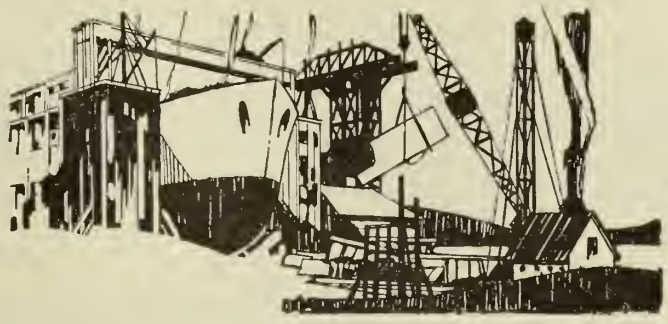

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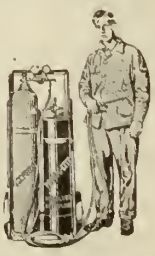

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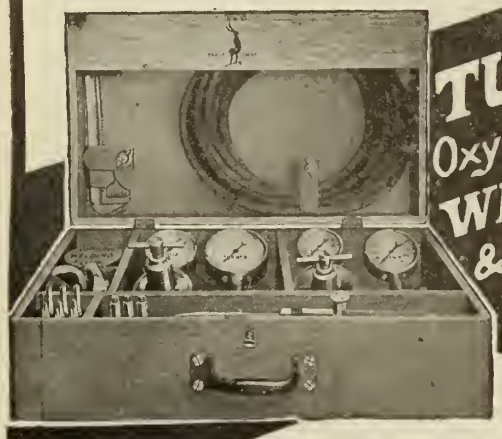

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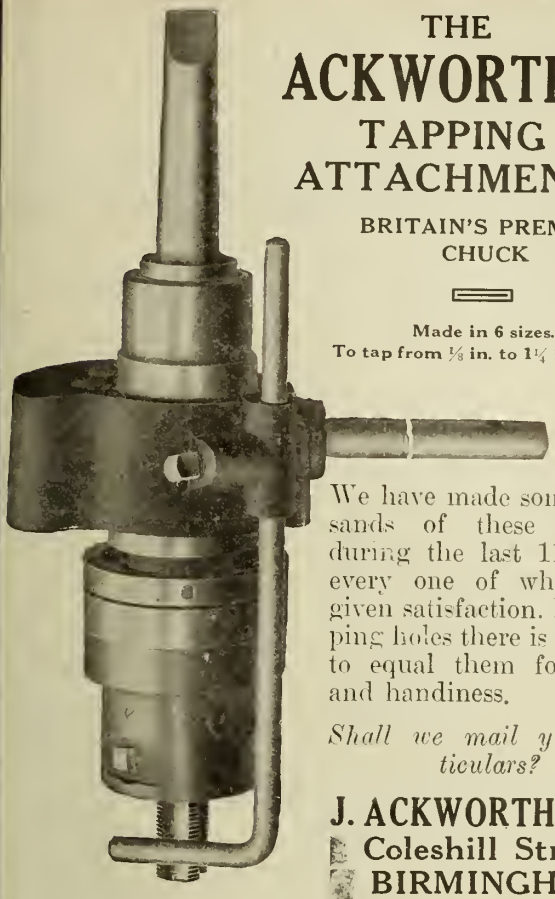

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To tap from ⅛ in. to 1¼ in. Whit.

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Shall we mail you particulars?

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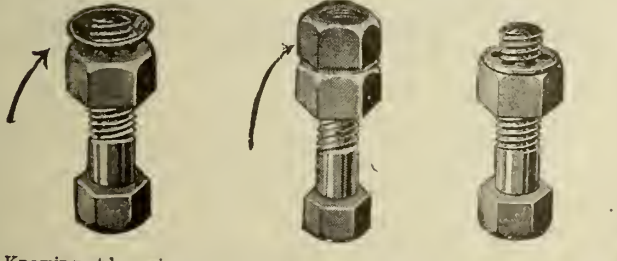
HOLD TITE NUT LOCK

See How Easily Applied



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Screw another Nut onto Nut Lock and Depress it — as shown above.

Remove Second Nut and Nut Lock will Look — as shown above.

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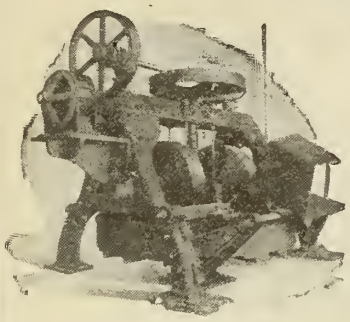

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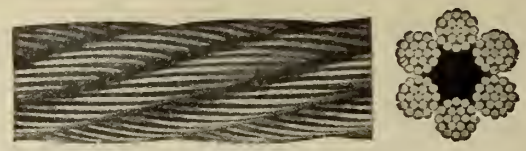

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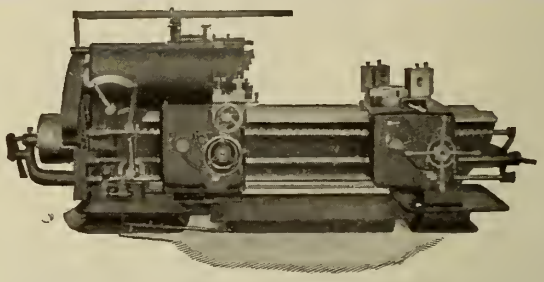

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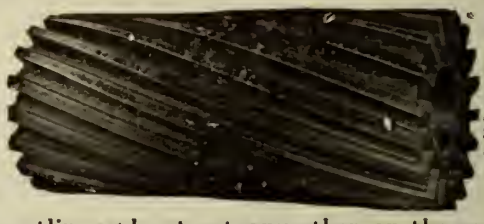

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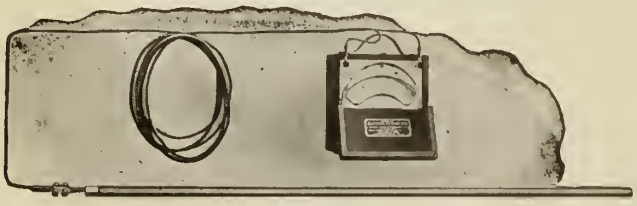

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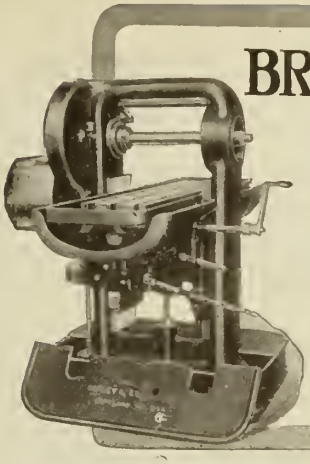

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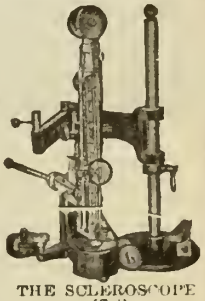

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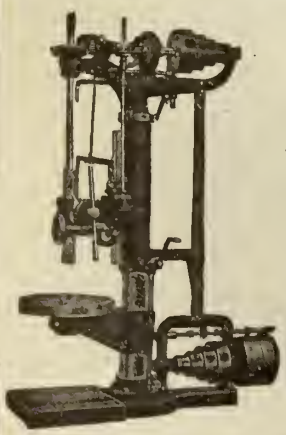

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Jones & Glassco, Montreal, Que.
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McLaren Belting Co., J. C., Montreal.
Morse Chain Co., Ithaca, N.Y.
Petrie, Ltd., H. W., Toronto.
Quaker City Rubber Co, Philadelphia, Pa.
Rice, Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.
Sumner & Co., New York, N. Y.
Williams Mchy Co., A. R., Toronto, Ont.

BELTING, FRICTION AND SURFACE
Can. Con. Rubber Co., Ltd., Montreal.
Gutta Percha & Rubber, Ltd., Toronto.

BELTING, HAIR
Sumner & Co., New York, N.Y.

BELTING, LEATHER
Can. Graton & Knight Mfg. Co., Montreal
Gutta Percha & Rubber, Ltd., Toronto, Canada.

BELTING, RUBBER
International Mchy. Spls., Ltd., Montreal.
Quaker City Rubber Co, Philadelphia, Pa.

BELTING, STITCHED COTTON DUCK
Dominion Belting Co., Hamilton, Ont.
Gutta Percha & Rubber, Ltd., Toronto.

BELTING, WOVEN
Federal Engineering Co., Ltd., Toronto
Sumner & Co., New York, N.Y.

BENDING MACHINERY
Bertrams, Ltd., Edinburgh, Scotland.
Bertram & Sons Co., John, Dundas
Brown-Boggs Co., Ltd., Hamilton, Ont.
Can. Blower & Forge Co., Kitchener.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Mach. Co., Toronto.
Petrie, Ltd., H. W., Toronto.

BLAST GATES
W. S. Rockwell Co., New York, N.Y.

BLASTING MACHINES, SAND
Garlock-Walker Machinery Co., Toronto
Jardine, A. B., & Co., Hespeler, Ont.
National Mach. Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Toledo Machine & Tool Co., Toledo
Williams Mchy Co., A. R., Toronto, Ont

BILLET MARKERS
Matthews & Co., Jas. H., Pittsburgh, Pa.

BILLETS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Swedish Steel & Importing Co., Ltd., Montreal.
Algoma Steel Corp., Sault Ste. Marie.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
United Alloy Steel Corp., Canton, Ohio.

BILLETS, FORGING
Dominion Foundries & Steel Ltd., Hamilton, Ont.
Kayser-Ellison & Co., Ltd., Montreal.

BINS, STEEL
Dennis Wire & Iron Works, London, Ont
Dominion Bridge Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Toronto Iron Works, Ltd., Toronto, Ont.
Wilis's Hamilton Co., Peterboro, Ont.

BLACKSMITH WORK
The Thos. Pink Co., Ltd., Pembroke.

BLOCKS, CHAIN
Oliver Engineering Co., Montreal.

BLOOMS AND SLABS
Algoma Steel Corp., Sault Ste. Marie
nited Alloy Steel Corp., Canton, Ohio.

BLOWERS
Can. Blower & Forge Co., Kitchener, Ont.
Chicago Flexible Shaft Co., Chicago, Ill.
Garlock-Walker Machinery Co., Toronto.
MacGovern & Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto.
Sturtevant Co., B. F., Galt, Ont.

BLOWING ENGINES
General Combustion Co., Ltd., Montreal, Que.

BLOW PIPES AND REGULATORS
Carter Welding Co., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Welding & Supplies Co., Montreal, Que.

BLUE PRINTING MACHINERY
Commercial Camera Co., Providence, R.I.

BLUE PRINT PAPER
Hughes, Owens Co., Ltd., Montreal, Que.

BOARDS, GLASS CUTTING
Lufkin Rule Co., of Can., Windsor, Ont.

BOARTZ
Joyce, Koebel & Co. Inc., New York

BOLT CUTTERS
Greenfield Tap & Die Corp., Greenfield Mass

BOILER TUBES
Lyman Tube & Supply Co., Montreal, Que

BOILER BREECHINGS
Que.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
William Hamilton Co., Peterboro, Ont.

BOLT CUTTERS
Fellows Gear Shaper Co., Springfield, Vt.
Greenfield Tap & Die Corp., Greenfield Mass.
Wells Bros., of Can., Galt, Ont.
Petrie, Ltd., H. W., Toronto.

BOILERS, RANGE
Can. John Wood Mfg. Co., Ltd., Toronto Ont.

BOILERS
Dominion Bridge Co., Montreal, Que
MacGovern & Co., Montreal, Que

BOILERMAKERS' TOOLS
Holden Co., Ltd., Montreal, Que.

BOLT CUTTERS AND NUT TAPERS
Aikenhead Hardware Co., Toronto, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto
Landis Machine Co., Waynesboro, Pa.
A.B. Jardine & Co., Ltd., Hespeler, Ont
Rice Lewis & Son, Toronto, Ont.
Wells Bros. Co. of Canada, Galt, Ont.
Petrie, Ltd., H W., Toronto

BOLTS
Aikenhead Hardware Co. Toronto, Ont.
London Bolt & Hinge Wks., London, Ont.
Morrow Screw & Nut Co., John, Ingersoll.
Rice, Lewis & Son, Toronto, Ont.
Steel Co., of Canada, Ltd. Hamilton.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Co.., J. H. Brooklyn, N.Y.

BOLTS, COUPLING
Galt Machine Screw Co., Ltd., Galt, Ont.

BOLTS, STAY
Morrow Screw & Nut Co., John, Ingersoll.

BOLTS, SPRING SHAKLE
Can. Winkley Co., Ltd., Windsor, Ont.
Morrow Screw & Nut Co., John, Ingersoll

BOLTS, PATCH
Morrow Screw & Nut Co., John, Ingersoll.
BOLT AND NUT MACHINERY
Barber Mchy. Co., Ltd., Toronto, Ont.
Bertram & Sons Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Gardner & Son, Robt., Montreal.
Landis Machine Co., Waynesboro, Pa.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ohio.
Universal Mach. Co., Bowling Green, O.
Williams Machinery Co., A. R., Toronto
BOLT THREADING MACHINERY
Jardine & Co., Ltd., [illegible] B., Hespeler.
Landis Machine Co., W[illegible]esboro, Pa.
National Acme Co., Cleveland, Ohio.
Victor Tool Co., Waynesboro, Pa.
BONDING MACHINES (Electric Railway)
The Lincoln Electric Co., Toronto, Ont.
BORING MACHINES, PNEUMATIC CYLINDER
Cleveland Pneumatic Tool Co., Toronto.
Canadian Fairbanks-Morse Co., Montreal
Can. Ingersoll-Rand Co., Sherbrooke Que
Garlock-Walker Mach. Co., Toronto.
BORING MACHINES, UPRIGHT AND HORIZONTAL
Barber Mchy. Co., Ltd., Toronto, Ont.
Bertram & Sons Co., John, Dundas.
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto
Gisholt Machine Co., Madison, Wis.
Herbert, Ltd., Alfred, Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Hoefer Mfg., Co., Freeport, Ill.
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Oliver Mach'y Co., Grand Rapids, Mich.
Roelofson Machine & Tool Co., Toronto.
Rockford Drilling Mchs. Co, Rockford, Ill
Strelinger, Chas. A. Co., Windsor, Ont.
BORING AND TURNING MILLS
Barber Mchy. Co., Ltd., Toronto, Ont.
Bertram & Sons Co., John, Dundas.
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Foss Mch. & S'ply Co., Geo. F., Montreal
Herbert, Ltd., Alfred, Toronto, Ont.
Knight Metal Products, Toronto.
Oliver Mach. Co., Grand Rapids, Mich.
Niles-Bement-Pond Co., New York.
Strelinger, Chas. A. Co., Windsor, Ont.
BOXES, CAST IRON
Brown & Sharpe Mfg. Co., Providence, R.I.
BOXES, STEEL SHOP AND TOTE
Cleveland Wire Spring Co., Cleveland.
BRAKES
Brown, Boggs & Co., Hamilton, Can.
Electric Steel & Metals, Ltd., Welland.
BRASS—SHEETS, ROLLS, PLATES, and RODS
Brown's Copper and Brass Rolling Mills, New Toronto.
BRASS ALLOYS
British Smelting & Refining Co., Ltd., Montreal, Que.
BRASS AND COPPER TUBING
Lyman Tube & Supply Co., Montreal, Que.
BRASS FOUNDERS
Canada Metal Co., Toronto.
St. Lawrence Welding Co., Montreal.
Tallman Brass & Metal Co., Hamilton.
BRASS GOODS
Crane, Ltd., Montreal, Que.
BRASS PIPE AND TUBE
Crane, Ltd., Montreal, Que.
BRASS WORKING MACHINERY
Barber Mchy. Co., Ltd., Toronto, Ont.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machinery Co., Toronto.
Warner & Swasey Co., Cleveland, O.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Prest-O-Lite Co., Inc., Toronto, Ont.
Wood Turret Machine Co., Brazil, Ind.
Williams Machy. Co., A. R., Toronto.
Brown's Copper and Brass Rolling Mills, New Toronto.
BRAZING EQUIPMENT
Chicago Flexible Shaft Co., Chicago, Ill.
BRICKS, FIRE
Elk Fire Brick Co., Can., Ltd., Hamilton, Ont.
BRIDGES, RLY. AND HIGHWAY
Canadian Mead-Morrison Co., Limited, Montreal, Que.
Dominion Bridge Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
BROACHING MACHINES
Strelinger Co., C. A., Windsor, Ont.
BRONZE—SHEETS, ROLLS, PLATES, and RODS
Brown's Copper and Brass Rolling Mills, New Toronto.
BRONZE, NAVAL
Canada Metal Co., Toronto.
Tallman Brass and Metal Co., Hamilton.
BRONZE COPPER
Canada Metal Co., Toronto.
BRUSHES, CARBON
Lyman Tube & Supply Co., Montreal, Que.
BUFFING AND POLISHING MACHINERY
Ford-Smith Mach. Co., Hamilton.
Foss Mchy. & S'ply Co., Geo. F. Montreal
Garlock-Walker Machinery Co., Toronto.
Petrie, Ltd., H. W., Toronto.
BUCKETS, DUMP
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
St Lawrence Welding Co, Ltd, Montreal
BUCKETS, ELEVATOR
Can. Link-Belt Co., Toronto, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
[illegible]nce Welding Co. Ltd., Montreal
BUCKETS, CLAM SHELL, CRAB, DUMP
Brown Hoisting Machinery Co., Cleveland, Ohio.
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Ltd, Walkerville.
BULLDOZERS
Bertram & Sons Co., John, Dundas.
Canada Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machinery Co., Toronto.
Lourie Manufacturing Co., Springfield, Ill
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.
BURNERS, OIL AND NATURAL GAS
Northern Crane Works, Ltd., Walkerville.
W. S. Rockwell Co., New York, N.Y.
BURRS, IRON AND COPPER
Parmenter & Bulloch Co., Gananoque,.
BUSHINGS, BRONZE
Morrow Screw & Nut Co., John, Ingersoll.
CALIPERS
Brown & Sharpe Mfg. Co., Providence, R.I.
Pangborn Corporation, Hagerstown, Md.
CABINETS, SAND BLAST
Pangborn Corporation, Hagerstown, Md.
CABLE, ELECTRIC
International Machinery & Supply Co., Ltd., Montreal, Que.
CABLES, TRANSMISSION AND TELEPHONES
Northern Electric Co., Ltd., Montreal.
CALKS, BOOT
Lufkin Rule Co., of Can., Windsor, Ont.
CANNERS' MACHINERY
Bliss, E. W. Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Can.
CANNERS' CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
CARBIDE
Carter Welding Co., Ltd., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.
Union Carbide Co., of Canada, Limited, Weland, nt.
CARBONIZING BOXES
Can. Driver-Harris Co., Ltd., Walkerville
Katie Foundry, Galt, Ont.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.
Swedish Crucible Steel Co., Windsor.
CARRIERS, PNEUMATIC TUBE
Jones & Glassco, Montreal.
CARS, INDUSTRIAL
Can. Blower & Forge Co., Kitchener, Ont
Can. Fairbanks-Morse Co., Ltd, Montreal
Elec. Steel & Metals, Welland, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.
CAR MOVERS
Holden Co., Ltd., Montreal, Que.
CASES, FILING
Economy Drawing Table Co., Adrian, Mich.
CASTINGS, ALUMINUM, BRASS BRONZE, COPPER, AND GUN METAL
Algoma Steel Corp., Sault Ste. Marie.
Franklin Mfg. Co., Syracuse, N.Y.
Canada Metal Co., Ltd., Toronto, Ont.
CASTINGS, DIE CAST
Canada Metal Co., Ltd., Toronto, Ont.
Franklin Mfg. Co., Syracuse, N.Y.
Fisher Motor Co., Ltd., Orillia, Ont.
Tallman Brass & Metals Ltd., Hamilton, Ont.
CASTINGS, STEEL—ALL KINDS
Canada Electric Castings, Ltd., Orillia, Ont.
Dominion Foundries & Steel Ltd., Hamilton, Ont.
Electric Steel & Metals Co., Welland.
Mesta Machine Co., Pittsburgh, Pa.
CASTINGS, ELECTRIC AND ALLOY STEEL
Can. Elec. Castings Co. Ltd., Orillia, Ont
Dominion Foundries & Steel Ltd., Hamilton, Ont.
CARRIERS COUPLING BOLTS
John Morrow Screw & Nut Co., Ingersoll
Alexander Fleck Ltd., Ottawa.
Tallman Brass & Metal Co., Hamilton.
CASTINGS, BENCH LEG.
Brown & Sharpe Mfg. Co., Providence, R.I.
CASTINGS, BRASS AND IRON
Algoma Steel Corp., Sault Ste. Marie.
International Machinery and Supply Co., Ltd., Montreal, Que.
CASTINGS, BUILDING
Katie Foundry, Galt, Ont.
CASTINGS, GRAY IRON
Bernard Industrial Co., A., Fortierville, Q.
Brown & Sharpe Mfg. Co., Providence, R.I.
Brown, Boggs Co., Ltd., Hamilton.
Can. Elec. Castings Co, Ltd., Orillia, Ont
Alexander Fleck, Ltd., Ottawa.
Gardner & Son, Robt., Montreal.
Hull Iron & Steel Foundries, Ltd., Hull
International Malleable Iron Co., Guelph
Kennedy & Sons, Ltd., Wm., Owen Sound.
Katie Foundry, Ltd., Galt, Ont.
Hamilton Co., Wm., Peterboro.
McFarlane Engineering Ltd., G. W., Paris, Ont.
CASTINGS, PLUMBERS'
Katie Foundry, Galt, Ont.
CASTINGS, NICHROME
Can. Driver-Harris Co., Ltd., Walkerville
CASTINGS, HARDWARE
Katie Foundry, Galt, Ont.
CASTINGS, STEEL CHROME AND MANGANESE STEEL
Thos. Davidson Mfg. Co., Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Hull Iron & Steel Foundries, Ltd., Hull.
Kennedy & Sons, Ltd, Owen Sound.
CASTINGS, MALLEABLE
International Malleable Iron Co., Guelph
CASTINGS, NICKEL STEEL
Hull Iron & Steel Foundries, Ltd., Hull.
CEMENT MACHINERY
Can. Fairbanks-Morse Co., Ltd., Montreal.
Gardner, Robt., & Son, Montreal.
CEMENT HANDLING MACHINERY
Can. Link-Belt Co., Toronto, Ont.
CEMENT TOOLS
Atkins & Co., E. C., Hamilton, Ont.
CENTERING MACHINES
Victoria Foundry Co., Ottawa, Ont.
CENTRE REAMERS
Bertram & Sons Co., John, Dundas.
Butterfield & Co., Inc., Rock Island, Que.
Gardner, Robt. & Son, Montreal.
Hurlburt, Rogers Mch. Co., South Sudbury, Mass.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co., of Canada, Galt, Ont.
CHAIN, WELDED COIL
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
CHAIN BLOCKS
Aikenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Ford Chain Block & Mfg. Co., Phila., Pa.
Garlock-Walker Machy. Co., Toronto.
Lyman Tube & Supply Co., Montreal, Que.
Morris Crane & HoistCo., Herbert, Niagara Falls, Ont.
Oliver Engineering Co., Montreal.
Rice Lewis & Son, Toronto, Ont.
Jones & Glassco, Montreal, Que.
CHAINS, AGRICULTURAL
Canadian Link-Belt Co., Ltd., Toronto, Ont.
Morse Chain Co., Ithaca, New York.
Renold of Canada Ltd., Montreal.
CHAINS, AUTOMOBILE ENGINE
Can. Link-Belt Co., Ltd., Toronto, Ont.
Morse Chain Co., Ithaca, New York.
Renold of Canada Ltd., Montreal.
CHAINS, BICYCLE, DRIVE AND BLOCK
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold of Canada Ltd., Montreal.
CHAINS, FOR ELEVATORS AND CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Petrie, Ltd., H. W., Toronto.
Renold of Canada Ltd., Montreal.
Williams Mchy Co., A. R., Toronto, Ont.
CHAIN, MALLEABLE, DETACHABLE AND RIVETED
Can. Link-Belt Co., Toronto, Ont.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.
CHAINS, POWER TRANSMISSION
Canadian Link-Belt Co., Ltd., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, New York.
Glasgow, N.S.
Renold of Canada Ltd., Montreal.
CHAINS, SPROCKET WHEEL
Can. Link-Belt Co., Ltd., Toronto, Ont.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
CHAIN DRIVES
Can. Link-Belt Co., Toronto, Ont.
Coventry Chain Co., Coventry, England.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold of Canada Ltd., Montreal.
CHASERS
National Acme Co., Cleveland, Ohio.
Taylor, J. A. M., 318 Stair Bldg., Toronto, Ont.
CHEMISTS
Toronto Testing Lab'tory, Ltd., Toronto
CHUCKS, AERO, AUTOMATIC
Garvin Machine Co., New York.
CHUCKS, CENTERING
Hoagson & Pettis Mfg. Co., New Haven, Conn.
CHUCKS, COLLET, AIR
Elliott & Whitehall Mach. & Tool Co. Galt, Ont.
Smalley-General Co., Inc., Bay City, Mich.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.
CHUCKS, DRILL, LATHE AND UNIVERSAL
Aikenhead Hardware Co., Toronto, Ont
Bertram & Sons Co., John, Dundas.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Ltd., Brantford.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Mach'y Co., Toronto.
Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Chicago, Ill.
Herbert Ltd., Alfred, Toronto, Ont.
Jacobs Mfg. Co., Hartford, Conn.
Ker & Goodwin Machine Co., Ltd., Knight Metal Products, Toronto.
Modern Tool Co., Erie, Pa.
Rice Lewis & Son, Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.
CHUCKS, DRILL, AUTOMATIC AND KEYLESS
Aikenhead Hardware Co., Toronto, Ont
Can. Blower & Forge Co., Kitchener.
McCrosky Tool Corp., Meadville, Pa., U. S. A.
Strelinger, Chas. A. Co., Windsor, Ont.
CHUCKS, FRICTION AND TAP
Victor Tool Co., Waynesboro, Pa.
CHUCKS, MAGNETIC
Heald Machine Co., Worcester, Mass.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co, Ltd., A. R., Montreal
CHUCKS, RING WHEEL
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.
CHUCKS, WHEEL, CAR
Hoagson & Pettis Mfg. Co., New Haven, Conn.
CHUCKING MACHINES
Barber Mchy. Co., Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Garvin Machine Co., New York.
Gisholt Machine Co., Madison, Wis.
National Acme Co., Windsor, Vt.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Warner & Swasey Co., Cleveland, O.
Wood Turret Mach. Co., Brazil, Ind.
Williams Mchy Co., A. R., Toronto, Ont.
CIRCULATING SYSTEMS FOR LUBRICATING OIL
Bowser Co., Ltd., S. F., Toronto, Ont.
Williams & Co., J. H., Brooklyn, N.Y.
CLAY FIRE
Elk Fire Brick Co., Can., Ltd., Hamilton, Ont.
CLEANERS, METER, WASTE, GENERAL
Oakley Chemical Co., New York, N.Y.
CLEANING COMPOUND
Oakley Chemical Co., New York.
CLOCK SPRINGS
The Dunbar Brothers Co., Bristol, Conn.
CLOCKS, WATCHMAN, PORTABLE
Gisholt Machine Co., Madison, Wis.
CLOSETS
Crane, Ltd., Montreal, Que.
CLUTCHES, CHAIN
Wright Mfg. Co., Lisbon, Ohio.
CLUTCHES, FRICTION AND PULLEY
Bernard Industrial Co., A., Fortierville, Q
Can. Link-Belt Co., Toronto, Ont.
Carlyle Johnson Mach. Co., Manchester, Conn.
Positive Clutch & Pulley Wks., Aurora Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
COAL CRUSHERS
Canadian Link-Belt Co., Ltd., Toronto, Ont.
Canadian Mead-Morrison Co., Limited, Montreal, Que.
COAL HANDLING MACHINERY
Brown Hoisting Machinery Co., Cleveland, Ohio.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Canadian Mead-Morrison Co., Limited,
Can. Link-Belt Co., Toronto, Ont.
Montreal, Que.
Dominion Bridge Co., Montreal, Que.
MacGovern & Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont
Nova Scotia Steel & Coal Co. New
COLD ROLLED STRIP, ALL METAL
COLLARS, SHAFTING
Can. Driver-Harris Co., Ltd., Walkerville
Williams & Co., J. H., Brooklyn, N.Y.
COLLECTORS, PNEUMATIC
Can. Blower & Forge Co., Kitchener.
Sturtevant Co., B. F., Galt, Ont.
COLLETS
Becker Milling Machine Co., Boston.
COMPOSITION INGOT
Canada Metal Co., Toronto, Ont.
COMPOUNDS, CUTTING AND GRINDING, DRAWING, STAMPING
Oakley Chemical Co., New York, N.Y.
COMPRESSORS, AIR
Atkins & Co., E. C., Hamilton, Ont.
Can. Ingersoll-Rand Co., Sherbrooke.
Cleveland Pneumatic Tool Co., Toronto.
Curtis Pneumatic Machy. Co., St. Louis
Elliott & Whitehall, Galt, Ont.
Garlock-Walker Machy. Co., Toronto
Holden Co., Ltd., Montreal, Que.
MacGovern & Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto.

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EXTRA *Cast Steel*
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BEST *Cast Chisel Steel*

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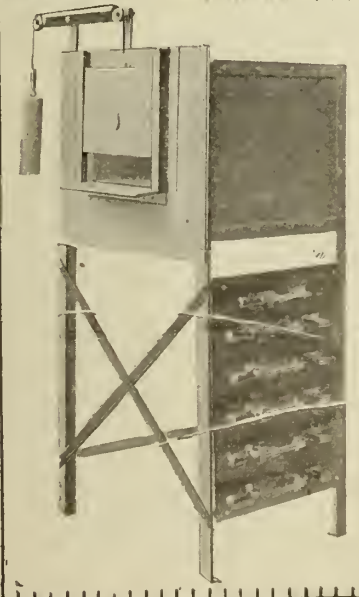
HOSKINS ELECTRIC FURNACES



SIMPLE
EFFICIENT
ACCURATE
ECONOMICAL

Hiram Walker & Sons Metal Products, Limited
Walkerville, Ontario

Superior Machinery Co., London, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

CONDENSERS

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
MacGovern & Co., Montreal, Que.
Smalley-General Co., Inc., Bay City, Mich.

CONDUITS

Northern Electric Co., Ltd., Montreal Que

CONNECTING RODS

Canada Found'g & Forgings, Ltd., Welland, Ont.

CONNECTING ROD CUTTERS INTERCHANGEABLE

Eclipse Counterbore Co., Ltd., Walkerville, Ont.

CONTRACTORS' HOISTS

Canadian Mead-Morrison Co., Limited, Montreal, Que.

CONTRACT WORK

Brown Engineering Corp., Toronto.
Ford-Smith Machine Co., Hamilton, Ont.
Globe Engineering Co., Hamilton, Ont.
Katie Foundry, Ltd., Galt, Ont.
Victoria Foundry Co., Ottawa.

CONTROLLERS, MAGNETIC BRAKES, ELEC. WINCHES, MONO RAIL HOISTS

Volta Mfg. Co., Welland, Ont.

CONTROLLERS AND STARTERS

Williams Mach'y Co., A. R., Toronto.

CONTROLLING INSTRUMENTS

Taylor Instrument Co., Rochester, N.Y.

CONVERTERS, ROTARY

MacGovern & Co., Montreal, Que.
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal.

COOLERS, WITH DRINKING FOUNTAINS

Pure Sanitary Drinking Fountain Co., Haydenville, Mass.

COPING MACHINES

Bertram & Sons Co., John, Dundas, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machinery Co., Toronto.
Niles-Bement-Pond Co., New York.
Can. Blower & Forge Co., Kitchener.

COPPER, BUS BAR, SHEET, PATES, RODS

British Smelting & Refining Co., Ltd., Montreal, Que.
Brown's Copper and Brass Rolling Mills, New Toronto.

CORE OIL

Swan & Finch, Inc., 165 Broadway.

COUNTERBORES AND COUNTERSINKS

Aikenhead Hardware Co., Toronto, Ont.
Cleveland Twist Drill Co., Cleveland.
Eclipse Counterbore Co., Ltd., Walkerville.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
McOrosky Tool Corp., Meadville, Pa., U. S. A.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.

COUNTERSINKS, INTERCHANGEABLE

Eclipse Counterbore Co., Ltd., Walkerville, Ont.

COUNTERBORES, INVERTED, INTERCHANGEABLE

Eclipse Counterbore Co., Ltd., Walkerville, Ont.

COUNTERSHAFTS

Almond Mfg. Co., Ashburnham, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Gray Ball Bearing Co., Ltd., Toronto.
Baird Machine Co., Bridgeport, Conn.
Ford-Smith Machine Co., Hamilton, Ont.
Foster Machine Co., Elkhart, Ind.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co. Ltd., A. R., Montreal
Williams Mchy Co., A. R., Toronto, Ont.

COUPLINGS, FRICTION

Bernard Industrial Co., The A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

COUPLINGS, RAPID HOSE

Int. Machinery & Supply Co., Ltd., Montreal, Que.

COILING MACHINERY, WIRE AND SPRING

Garlock-Walker Machinery Co., Toronto.

COKE AND COAL

Hanna & Co., M. A., Cleveland, O.

COUPLINGS, PLAIN, FLEXIBLE AND CUT OFF

Cleveland Pneumatic Tool Co., of Canada, Toronto.

CRANES, OVERHEAD, HAND AND

Gardner, Robt. & Son, Montreal.
Independent Pneumatic Tool Co., Chicago

CRANES, LOCOMOTIVE

Can. Link-Belt Co., Toronto, Ont.
Northern Crane Works, Walkerville.

ELECTRIC

Volta Manufacturing Co., Welland, Ont.

CUPS, OIL

Can. Winkley Co., Ltd., Windsor, Ont.

COVERS, OIL HOLE

Can. Winkley Co., Ltd., Windsor, Ont.

CRANES, GANTRY

Brown Hoisting Machinery Co., Cleveland, Ohio.
Can. Link-Belt Co., Toronto, Ont.
Canadian Mead-Morrison Co., Limited, Montreal, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.

CRANE RUNWAYS

MacKinnon Steel Co., Sherbrooke, Que.

CRANES, JIB

Brown Hoisting Machinery Co., Cleveland, Ohio.

CRANES, LOCOMOTIVE

Brown Hoisting Machinery Co., Cleveland, Ohio.
Holden Co., Ltd., Montreal, Que.

CRANES, GOLIATH, PNEUMATIC AND PORTABLE

Brown Hoisting Machinery Co., Cleveland, Ohio.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Morris Crane and Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Petrie, Ltd., H. W., Toronto.

CRANES, PILLAR

Brown Hoisting Machinery Co., Cleveland, Ohio.

CRANES, PORTABLE

Aikenhead Hardware Co., Toronto, Ont.
Brown Hoisting Machinery Co., Cleveland, Ohio.
Can. Link-Belt Co., Toronto.
Lyman Tube & Supply Co., Montreal, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Rice Lewis & Son, Toronto, Ont.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

CRANES, TRAVELLING, ELECTRIC AND HAND POWER

Brown Hoisting Machinery Co., Cleveland, Ohio.
Can. Link-Belt Co., Toronto, Ont.
Curtis Pneumatic Machy. Co., St. Louis
Dominion Bridge Co., Montreal.
Hepburn, John T., Ltd., Toronto.
Lyman Tube & Supply Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Niles-Bement-Pond Co., New York.
Northern Crane Works, Walkerville.
Oliver Engineering Co., Montreal.

CRANK SHAFTS

Canada Found'g & Forgings Ltd., Welland
Williams & Co., J. H., Brooklyn, N.Y.

CRANK PIN TURNING MACHINES

Herbert, Ltd., Alfred, Toronto, Ont.

CRIMPS, LEATHER

Graton & Knight Mfg. Co., Worcester, Mass.

CRUSHERS

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Elec. Steel & Metals, Welland, Ont.

CUPOLAS

Can. Blower & Forge Co., Kitchener.
Northern Crane Works, Walkerville.

CURB PUMPS FOR OIL, GASOLINE

Bowser Co., Ltd., S. F., Toronto, Ont.

CURRENT TRANSFORMERS

Volta Manufacturing Co., Welland, Ont.

CUT-OFF COUPLINGS, FRICTION

Petrie, Ltd., H. W., Toronto.

CUTTERS, BOLT

See Bolt Cutters.

CUTTERS, GEARS

Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Fellows Gear Shaper Co., Springfield, Vt.

CUTTERS, FLUE

Cleveland Pneumatic Tool Co., Toronto.

CUTTER HEADS

Oliver Machinery Co. Grand Rapids, Mich

CUTTERS, PIPE (See Pipe Cutters)

CUTTERS, MILLING

Becker Milling Mach. Co., Boston, Mass.
Butterfield & Co., Rock Island, Que.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Cleveland Twist Drill Co., Cleveland.
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garvin Machine Co., New York.
Ingersoll Machs. Co., Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Toronto, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Whitney Mfg. Co., Hartford, Conn.
Wilt Twist Drill Co., Walkerville, Ont.

CUTTER RELIEVING MACHINES

Cleveland Milling Machine Co., Cleveland.

CUTTING-OFF MACHINES

Armstrong Bros., Tool Co., Chicago.
Atkins & Co., E. C., Hamilton, Ont.
Bertram & Sons Co., John, Dundas.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Foss Mchy & S'ply Co., Geo. F., Montreal
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield, Mass
Hurlburt, Rogers Machy. Co., South Sudbury, Mass.
Kennedy & Sons, Wm., Owen Sound.
Lyman Tube & Supply Co., Montreal, Que.
Niles-Bement-Pond Co., New York, N.Y.
Prest-O-Lite Co., Inc., Toronto, Ont.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Williams Tool Corp. of Can. Ltd., Brantford, Ont.
Wells Bros. of Can., Galt, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

CUTTING COMPOUND AND CUTTING OIL

Cataract Refining Co., Ltd., Toronto.
Swan & Finch, Inc., New York.

CUTTING OIL, RECLAIMING SYSTEM

Bowser Co., Ltd., S. F., Toronto, Ont.

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Davis-Bournonville Co., Jersey City, N.J.
Prest-O-Lite Co., Inc., Toronto, Ont.
Welding & Supplies Co., Montreal, Que.

CYANIDE AND LEAD BATH POTS

Swedish Crucible Steel Co., Windsor.

CYLINDERS, AIR

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Ford-Smith Machine Co., Hamilton, Ont.
Smalley General Co., Inc., Bay City, Mich

CYLINDERS, AUTOMATIC REBORING JIGS AND REAMERS

Kelley Reamer Co., Cleveland, O.

DEHUMIDIFYING

B. F. Sturtevant Co, Galt, Ont.

DERRICKS

Aikenhead Hardware Co., Toronto, Ont.
Dominion Bridge Co., Montreal.
Hepburn Co., Ltd., J. T., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

DERRICK HOISTS

Canadian Mead-Morrison Co., Limited, Montreal, Que.

DIAMOND (BORTZ)

Furniss, Clarke & Co., Montreal, Que.

DIAMOND TOOLS

Can. Desmond-Stephan Mfg. Co., Hamilton
Ford-Smith Machine Co., Hamilton, Ont.
Furniss, Clarke & Co., Montreal, Que.
Joyce-Koebel Co., Inc., New York City.
Wheel Truing Tool Co., Detroit.
Petrie, Ltd., H. W., Toronto.

DIAMONDS, CARBON AND BORTZ

Joyce Koebel Co., Inc., New York, N.Y.
Wheel Truing Tool Co., Detroit.

DIAMONDS, BLACK AND ROUGH

Joyce, Koebel & Co., Inc., New York.
Wheel Truing Tool Co., Windsor, Ont.

DIE CASTINGS

Fisher Motor Co., Ltd., Orillia, Ont.
Tallman Brass & Metals Ltd., Hamilton, Ont.

DIE HEADS, AUTOMATIC

Greenfield Tap & Die Corp., Greenfield Mass.
Wells Bros. of Can., Galt, Ont.
Petrie, Ltd., H. W., Toronto.

DIES, BRASS PRINTING, EMBOSSING AND LETTERING

Matthews, Jas. H., & Co., Pittsburgh, Pa

DIES FOR BIT BRACE USE

Butterfield & Co., Rock Island, Que.
Crescent Mchs. Co., Ltd., Montreal, P.Q.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Wells Brothers Co., of Canada, Galt.

DIES AND DIE STOCKS

Ackworthie Ltd., J., Birmingham, Eng.
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Rock Island, Que.
Brown, Boggs Co., Hamilton, Ont.
Crescent Mchs. Co., Ltd., Montreal, P.Q.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardner, Robt. & Son, Montreal.
Herbert Ltd., Alfred, Toronto, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Jones & Lamson, Springfield, Vt.
Landis Machine Co., Waynesboro, Pa.
Marshall, Son & Bunney, Toronto.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Acme Co., Cleveland, Ohio.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Rickert-Shafer Co., Erie, Pa.
Stoll Co., Inc., D. H., Buffalo, N.Y.
Strelinger, Chas. A. Co., Windsor, Ont.
Wells Brothers of Canada, Galt, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

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Kimber & Hillier Mfg., Co., St. Catharines, Ont.

DIES, DROP FORGE.

Kimber & Hillier Mfg., Co., St. Catharines, Ont.

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Crescent Mchs. Co., Ltd., Montreal, P.Q.
Elliott & Whitehall, Galt, Ont.

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A. B. Jardine & Co., Ltd., Hespeler, Ont.
Crescent Mchs. Co., Ltd., Montreal, P.Q.
Landis Machine Co., Waynesboro, Pa.

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Butterfield & Co., Inc., Rock Island, Que.
Crescent Machine Co., Ltd., Montreal.
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

DIE SINKERS

Ackworthie Ltd., J., Birmingham, Eng.
Becker Milling Machine Co., Boston
Garvin Machine Co., New York.
Kimber & Hillier Mfg., Co., St. Catharines, Ont.
Pratt & Whitney Co., Dundas, Ont.
Walcott Lathe Co., Jackson, Mich

DIES FOR MACHINES

Ackworthie Ltd., J., Birmingham, Eng.
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Rock Island, Que.
Firth & Sons, Thos., Montreal, Que.
Landis Machine Co., Waynesboro, Pa.
Wells Brothers Co. of Canada, Galt.

DIE HEADS

Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Canada, Galt, Ont.

DIES, SELF-OPENING

Geometric Tool Co., New Haven.
Herbert, Ltd., Alfred, Toronto, Ont.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Wells Brothers Co. of Can., Galt, Ont.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.

DIE FILING MACHINES

Oliver Mach. Co., Grand Rapids, Mich.

DIE STEEL, HOT AND COLD WORK

Armstrong-Whitworth of Can., Montreal.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall, Son & Bunney, Toronto.
Firth & Sons, Thos., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.

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Ackworthie Ltd., J., Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Wells Bros. Co. of Can., Galt, Ont.

DIES, SHEET METAL WORKING

Ackworthie Ltd., J., Birmingham, Eng.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada
Globe Engineering Co., Hamilton, Ont.
Stoll Co., D. H., Buffalo, N.Y.

DIES, SCREW AND THREAD

Ackworthie Ltd., J., Birmingham, Eng.
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
National-Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros., Co., of Can., Galt, Ont

DISCS, LEATHER, STEEL

Graton & Knight Mfg. Co., Worcester, Mass.

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MacGovern & Co., Montreal, Que.

DRAFT, MECHANICAL

Butterfield & Co., Rock Island, Que.
Can. Blower & Forge Co., Kitchener.
A. B. Jardine & Co., Hespeler, Ont.
Pratt & Whitney Co., Dundas, Ont.
Sturtevant Co., B. F., Galt, Ont.

DRAINAGE FITTINGS

Crane, Ltd., Montreal, Que.

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Hughes, Owens Co., Ltd., Montreal, Que.

DRAWING OFFICE SUPPLIES

Hughes, Owens Co., Ltd., Montreal, Que.

DRESSERS, GRINDING AND EMERY WHEEL

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Can. Desmond-Stephan Mfg. Co., Hamilton
Dominion Abrasive Co., Ltd., Mimico, Ont.
Petrie, Ltd., H. W., Toronto.
Wheel Truing Tool Co., Windsor, Ont.

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W. F. & John Barnes Co., Rockford.
Can. Blower & Forge Co., Kitchener.
Canada Machinery Corp., Galt, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machinery Co., Toronto
Garvin Machine Co., New York.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
U. S. Mach. Tool Co., Cincinnati, Ohio.
A. R. Williams Machinery Co., Toronto.

DRILL RODS

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Kayser-Ellison & Co., Ltd., Montreal.
Lincoln Electric Co. of Canada, Ltd. Toronto, Ont.
Marshall, Son & Bunney, Toronto.
Swedish Steel & Importing Co., Ltd., Montreal.

DRILLING MACHINES, GANG

Barnes, W. F. & John, Co., Rockford, Ill
Bilton Mach. Tool Co., Bridgeport, Conn
Canada Machinery Corp., Galt, Ont.
Petrie, Ltd., H. W., Toronto.
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Strelinger, Chas. A. Co., Windsor, Ont.

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John Bertram & Sons Co., Dundas.
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Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Mach. Co., Toronto.
Garvin Machine Co., New York.
Hoefer Mfg. Co., Freeport, Ill.
Henry & Wright Mfg. Co., Hartford, Conn
A. B. Jardine & Co., Hespeler, Ont.
Landis Tool Co., Waynesboro, Pa.
Nat. Automatic Tool Co., Richmond, Ind.
Niles-Bement-Pond Co., New York.
Rockford Drilling Mach Co., Rockford, Ill
Strelinger, Chas. A. Co., Windsor, Ont.

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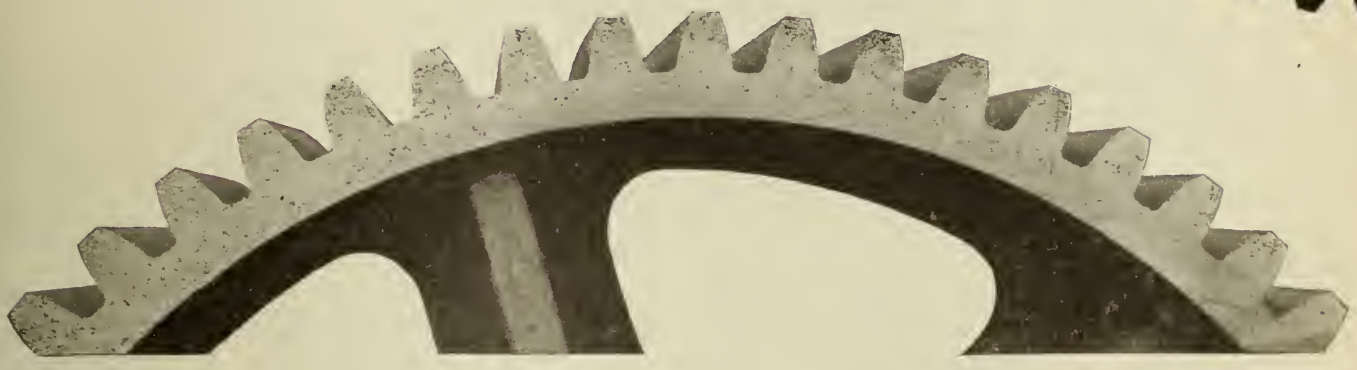
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto
Herbert, Ltd., Alfred, Toronto, Ont
Henry & Wright Mfg. Co., Hartford, Conn
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

For Good Gears



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Canadian Machinery Corp., Galt, Ont.
Geo. F. Foss Mch. & S'ply Co., Montreal.
Garlock-Walker Mach. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert, Ltd., Alfred, Toronto, Ont.
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
United States Mach. Tool Co., Cincinnati
Williams Mchy Co., A. R., Toronto, Ont.

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Garlock-Walker Mach. Co., Toronto, Ont
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Canada Mach. Corp., Galt, Ont.
Garvin Machine Co., New York.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mach. Co., Toronto, Ont.
Herbert, Ltd., Alfred, Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
A. B. Jardine & Co., Hespeler, Ont.
Knight Metal Products, Toronto.
Landis Tool Co., Waynesboro, Pa.
R. McDougall Co., Galt.
Nat. Automatic Tool Co., Richmond, Ind
Rockford Drilling Mach. Co., Rockford, Ill
Niles-Bement-Pond Co., New York.
Silver Mfg. Co., Salem, Ohio.
Strelinger, Chas. A. Co., Windsor, Ont.
A. R. Williams Machinery Co., Toronto

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Hoefer Mfg. Co., Freeport, Ill.

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Aikenhead Hardware Co., Toronto, Ont.
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Aikenhead Hardware Co., Toronto.
W. F. & John Barnes Co., Rockford, Ill
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Can. Fairbanks-Morse Co., Montreal.
Geo. F. Foss Mch. & S'ply Co., Montreal
Garlock-Walker Machinery Co., Toronto.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
U.S. Electrical Tool Co., Cincinnati, O.

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Aikenhead Hardware Co., Toronto, Ont.
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Cleveland Twist Drill Co., Cleveland.
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A. B. Jardine & Co., Hespeler, Ont.
Morrow Screw & Nut Co., John, Ingersoll
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
Whitman & Barnes Mfg. Co., Akron, O.
Wilkinson & Kompass, Hamilton, Ont.
Wilt Twist Drill Co. of Can., Walkerville

DRILLS, CENTRE
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
Morrow Screw & Nut Co., John, Ingersoll
Morse Twist Drill & Machine Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto.
Rice Lewis & Son, Toronto, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
Wilt Twist Drill Co., of Can., Walkerville

DRILLS CORE, INTERCHANGEABLE
Eclipse Counterbore Co., Ltd., Walkerville, Ont.

DRILLS, CARBON
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Marshall, Son & Bunney, Toronto.
John Morrow Screw & Nut Co. Ingersoll

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Holden Co., Ltd., Montreal, Que.

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Cincinnati Electrical Tool Co., Cincinnati
Geo. F. Foss Mch. & S'ply Co., Montreal
Haskins Co., R. C., Chicago, Ill.
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
Pilot Steel & Tool Co., Montreal, Que.
Prest-O-Lite Co., Inc., Toronto, Ont.
Strelinger Co., C. A., Windsor, Ont.
U. S. Electrical Tool Co., Cincinnati, O.
A. R. Williams Mach. Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

DRILLS, HAMMER
Samuel Osborne, Ltd., Montreal, P.Q.

DRILLS, EMERY
Garlock-Walker Mach. Co., Toronto, Ont.

DRILLS, HIGH SPEED TWIST
Aikenhead Hardware Co., Toronto, Ont.
Armstrong-Whitworth of Can., Montreal.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
Canadian Fairbanks-Morse Co., Montreal
H. A. Drury Co., Montreal.
Geo. F. Foss Mch. & S'ply Co. Montreal
Herbert, Ltd., Alfred, Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Marshall, Son & Bunney, Toronto.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
W. F. & John Barnes Co., Rockford, Ill
Osborne, Samuel, Montreal, P.Q.
Pratt & Whitney Co., Dundas, Ont.
Petrie, H. W. Toronto.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.
Strelinger Co., Chas. A., Windsor, Ont.
Taylor J. A. M., Stair Bldg., Toronto.
Wilt Twist Drill Co. of Can., Walkerville
Wilkinson & Kompass, Hamilton, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

DRILLS, OIL TUBE
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.

DRILLS, PNEUMATIC
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co., Toronto.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
Williams Mchy Co, Ltd., A. R., Montreal
Greenfield Tap & Die Corp., Greenfield, Mass.

DRILLS, PNEUMATIC CORNER
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool Co., Chicago.

DRILLS, RATCHET AND HAND
Aikenhead Hardware Co., Toronto, Ont.
Armstrong Bros. Tool Co., Chicago, Ill.
Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cincinnati Electrical Tool Co., Cincinnati.
Cleveland Twist Drill Co., Cleveland.
Garlock-Walker Mchy. Co., Toronto, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Mch. Co., New Bedford Mass.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
Wilt Twist Drill Co. of Can., Walkerville.

DRILLS, ROCK
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co., Toronto.
The Foss Mchy. & Supply Co., Montreal
Holden Co., Ltd., Montreal, Que.
Samuel Osborne Ltd., Montreal, P.Q.
Strelinger, Chas. A. Co., Windsor, Ont.
A. R. Williams Machy. Co. Toronto.

DRILLS, SQUARE & HEXAGON
Globe Engineering Co.

DRILLS, TRACK
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
The Foss Mchy. & Supply Co., Montreal.
Holden Co., Ltd., Montreal, Que.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Wilt Twist Drill Co. of Can., Walkerville.

DRINKING FOUNTAINS, SANITARY
Crane, Ltd., Montreal, Que.
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

DRIVES, CHAIN
See Belting, Chain.

DRIVING TOOLS
The Thos. Pink Co., Ltd., Pembroke, Ont

DRY CLEANING SYSTEM
Bowser Co., Ltd., S. F., Toronto, Ont.

DRYERS, SAND
Lyman Tube & Supply Co., Montreal, Que.
Pangborn Corporation, Hagerstown, Md.

DRYING APPLIANCES
Baird Machine Co., Bridgeport, Conn.
Sturtevant Co., B. F., Galt, Ont.
W. S. Rockwell Co., New York, N.Y.

DRUM CONTROLS
Volta Manufacturing Co., Welland, Ont.

DUMP CARS
Canadian Fairbanks-Morse Co., Montreal.
MacKinnon Steel Co., Sherbrooke, Que.

DUST EXHAUSTER, ARRESTER SYSTEM
Pangborn Corporation, Hagerstown, Md.

DUST HANDLING EQUIPMENT
Pangborn Corporation, Hagerstown, Md.
Sturtevant Co., B. F., Galt, Ont.

DUST SEPARATORS
Can. Blower & Forge Co., Kitchener, Ont.
Sturtevant Co., B. F., Galt, Ont.

DYNAMOS AND ELECTRICAL SUPPLIES
Canadian Fairbanks-Morse Co., Montreal.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
MacGovern & Co., Montreal Que.
Strelinger Co., Chas. A., Windsor, Ont.
A. R. Williams Machy. Co. Toronto.

ELECTRICAL SUPPLIES
Can. General Electric Co., Toronto, Ont.
Lyman Tube & Supply Co., Montreal Que.
Northern Electric Co., Ltd., Montreal Que

ELECTRIC FURNACES
Electric Furnace Construction Co., Philadelphia, Pa.
Hamilton & Hansell, Inc., New York City
Volta Manufacturing Co., Welland Ont

ELECTRIC FURNACE REGULATORS, WINCHES, ROOF COOLERS AND ELECTRODE HOLDERS
Volta Manufacturing Co., Welland, Ont.

ELECTRICAL RESISTANCE MATERIALS, NICHROME, KROMORE, CHROMAX, CLIMAX, NICKEL, SILVER, ADVANCE.

ELECTRIC HOISTS, STATIONARY AND MONO RAIL
Canadian Link-Belt Co., Ltd., Toronto,
Canadian Mead-Morrison Co., Limited, Montreal, Que.
Volta Manufacturing Co., Welland, Ont.

ELECTRIC MOTORS
Lincoln Electric Co. of Canada, Ltd., Toronto, Ont.
Sturtevant Co., B. F., Galt, Ont.
Volta Manufacturing Co., Welland, Ont.

ELECTRIC TRUCKS
Cowan Truck Co., Holyoke, Mass.
Goad Engineering Co., Toronto, Ont.

ELEVATOR, ENCLOSURES
Volta Mfg. Co., Welland, Ont.
Canada Wire & Iron Goods Co., Hamilton

ELEVATOR WEIGHTS
Katie Foundry, Galt, Ont.

ELEVATORS AND BUCKETS
Can. Link-Belt Co., Toronto, Ont.
Curtis Pneumatic Machy. Co., St. Louis.

ELEVATING AND CONVEYING MACHINERY
Can. Link-Belt Co., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Petrie, Ltd., H. W., Toronto.

EMBOSSING PRESSES
Dom. Steel Products Co., Ltd., Brantford.
Oliver Machinery Co., Grand Rapids, Mich

EMERY GRINDERS (PNEUMATIC)
Can. Ingersoll-Rand Co., Ltd., Sherbrooke
Cleveland Pneumatic Tool Co., Toronto.
Ford-Smith Machine Co., Hamilton, Ont
Holden Co., Ltd., Montreal, Que.

EMERY CLOTH
Atkins & Co., E. C., Hamilton, Ont.

EMERY PAPER
Atkins & Co., E. C., Hamilton, Ont.

EMERY AND EMERY WHEELS
Atkins & Co., E. C., Hamilton, Ont.
Brantford Emery Wheel Co., Brantford, Canada.
The Foss Mchy. & Supply Co., Montreal.
Garvin Machine Co., New York.
Canadian Fairbanks-Morse Co., Montreal.
Canada Emery Wheels Co., Hamilton.
Dominion Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Mach. Co., Hamilton, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.
Wilkinson & Kompass, Hamilton, Ont.
Dominion Abrasive Wheel Co., Ltd., Mimico, Ont.

EMERY WHEEL DRESSINGS
Dominion Abrasive Co., Ltd., Mimico, Ont.
Wheel Trueing Tool Co., Windsor Ont.

ENAMELWARE
Crane, Ltd., Montreal, Que.

END MILLS
John Morrow Screw & Nut Co., Ingersoll

ENGINEERS—INDUSTRIAL CLEANING (Free Consultation)
Oakley Chemical Co., New York, N.Y.

ENGINEERS
Samuel Osborne (Canada) Ltd., Montreal.

ENGINES—HOISTING, PILE DRIVING, BRIDGE ERECTING, MINING
Canadian Mead-Morrison Co., Limited, Montreal, Que.

ENGINES, STEAM, GAS, GASOLINE
Furniss, Clarke & Co., Montreal, Que.
Canadian Fairbanks-Morse Co., Montreal.
Holden Co., Ltd., Montreal, Que.
Johnson Mach. Co., Carlyle, Manchester, Conn.
MacGovern & Co., Montreal, Que.
Sturtevant Co., B. F., Galt, Ont.

ENGINES, HORIZONTAL AND VERTICAL
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Johnson Mach. Co., Carlyle, Manchester, Conn.
Petrie, Ltd., H. W., Toronto.
A. R. Williams Machy. Co., Toronto.

ENGINES, OIL
Holden Co., Ltd., Montreal, Que.
Ker & Goodwin Machine Co., Ltd., Brantford, Ont.

ENGINES, HEAVY OIL, DIESEL TYPE
Dom. Steel Products Co., Ltd., Brantford
Holden Co., Ltd., Montreal, Que.

ENGINES, MARINE
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Sturtevant Co., B. F., Galt, Ont.

ENGINES, STATIONARY, FUEL, OIL, GAS OR GASOLINE
Holden Co., Ltd., Montreal, Que.

ESCUTCHEON PINS
Parmenter & Bulloch, Gananoque, Ont.

EXHAUST HEADS AND HOODS
Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Sturtevant Co., B. F., Galt, Ont.

EXHAUSTERS
Can. Blower & Forge Co., Kitchener, Ont.
Pangborn Corporation, Hagerstown, Md.
Petrie, Ltd., H. W., Toronto.
Sturtevant Co., B. F., Galt, Ont.
Can. Driver-Harris Co., Walkerville, Ont.

EXTRACTORS, TAP
Walton Co., The, Hartford, Conn.

EYE BOLTS AND NUTS
Can. Foundries & Forgings, Ltd., Welland, Ont.

EYE PROTECTORS
Standard Optical Co., Geneva, N.Y.

FACTORY GATES
Page Steel & Wire Co., Adrian, Mich.

FACTORY LOCATIONS
City of St. Johns, Quebec.

FACTORY SITES
City of St. Johns, Quebec.

FANS
Baird Machine Co., Bridgeport, Conn.
Can. Blower & Forge Co., Kitchener, Ont.
Sturtevant Co., B. F., Galt, Ont.

FENCING, WIRE
Page Steel & Wire Co., New York, N.Y.

FENCE, IRON AND FACTORY
Can. Wire & Iron Goods, Hamilton, Ont.
Page Steel & Wire Co., Adrian, Mich.

FERRO-TUNGSTEN
Vanadium-Alloys Steel Co., Pittsburgh, Pa

FIBRE, RODS AND SHEETS
Diamond State Fibre Co., Bridgeport, Pa.

FILES
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Wm., Sheffield, Eng.
Ingersoll File Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Marshall, Son & Bunney, Toronto, Ont.
Nicholson File Co., Port Hope, Ont.
Rice Lewis & Son, Toronto, Ont.
Simonds Mfg. Co., Fitchburg, Mass.
Strelinger, Chas. A. Co., Windsor, Ont.
Whitman & Barnes Mfg. Co., Akron, O.
Wilkinson & Kompass, Hamilton, Ont.

FILES, COMMUTATOR SLOTTING
Lyman Tube & Supply Co., Montreal, Que.

FILING MACHINES, BENCH AND MOTOR DRIVEN
Barry Mfg. Co., Chicago, Ill.
Cochrane-Bly Co., Rochester, N.Y., U.S.A

FILTERING AND CIRCULATING SYSTEMS FOR LUBRICATING OIL
Bowser Co., Ltd., S. F., Toronto, Ont.
Can. Wire & Iron Goods, Hamilton, Ont.

FIRE BRICK
Elk Fire Brick Co., Hamilton, Ont.
General Combustion Co., Ltd., Montreal, Que.

FIRE CLAY
Elk Fire Brick Co., Can., Ltd., Hamil-
General Combustion Co., Ltd., Montreal. Que.

FINISHING MACHINES
Brown & Sharpe Mfg. Co., Providence, R.I.

FIRE EXTINGUISHERS
Strong, Kennard & Nutt Co., Cleveland, O.

FITTINGS, CAST IRON, SCREWED, FLANGED
Crane, Ltd., Montreal, Que.

FIXTURES
Brown Engineering Corp., Toronto, Ont.
Crescent Mchy. Co., Ltd., Montreal, Que.
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.
Toronto Tool Co., Toronto, Ont.

FLAT SPRINGS
The Dunbar Brothers Co., Bristol, Conn

FLEXIBLE SHAFT EQUIPMENT
Chicago Flexible Shaft Co., Chicago, Ill.
R. C. Haskins Co., Chicago, Ill.

FLOODLIGHTS, ELECTRIC
Holden Co., Ltd., Montreal, Que.
Northern Electric Co., Ltd., Montreal, Que

FLOTATION MACHINERY
Elec. Steel & Metals, Welland, Ont.

FLUMES
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Williams Hamilton Co., Peterboro, Ont.

FORGES, HAND PORTABLE
Aikenhead Hardware Co., Toronto, Ont
Can. Blower & Forge Co., Kitchener.
A. B. Jardine & Co., Ltd., Hespeler, Ont
Rice Lewis & Son, Toronto, Ont.
Sturtevant Co., B. F., Galt, Ont.

FORGE TOOLS
Kimber & Hillier Mfg., Co., St. Catharines, Ont.

FORGES, OIL
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.

FORGINGS
Meets Machine Co., Pittsburgh, Pa
Can. Found. & Forgings, Ltd., Welland
Nova Scotia Steel & Coal Co., New Glasgow, N.S.

FORGINGS, DROP, AUTOMOBILE AND LOCOMOTIVE FORGING AND WELDING
Dominion Bridge Co., Montreal, Que.
Dom. Forge & Stamping Co., Walkerville
Steel Co. of Canada, Ltd., St. Catharines
Victoria Foundry Co., Ottawa.
Williams & Co., J. H., Brooklyn, N.Y

FORGING MACHINERY
John Bertram & Sons Co., Dundas, Ont.
Ries, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Ont
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Toronto, Ont
National Machy. Co., Tiffin, Ohio.
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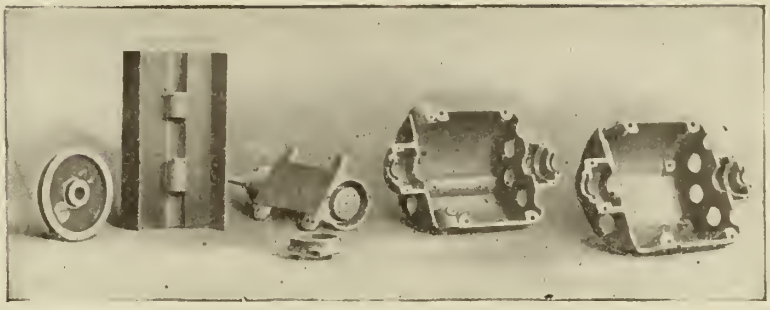

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FRICTION LEATHERS
Graton & Knight Mfg. Co., Montreal.

FRICTION SURFACE BELTING
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Mechanical Eng'r'g Co., Three Rivers, Q.
W. S. Rockwell Co., New York, N.Y.
Petrie, Ltd., H. W., Toronto.

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Bellevue Industrial Furnace Co., Detroit.
Chicago Flexible Shaft Co., Chicago, Ill.
W. S. Rockwell Co., New York, N.Y.
Toronto Iron Works, Ltd., Toronto.

FURNACES — BRASS MELTING
General Combustion Co., Ltd., Montreal.

FURNACES — CRUCIBLE
Chicago Flexible Shaft Co., Chicago, Ill

FURNACES, CYANIDE AND LEAD HARDENING
Chicago Flexible Shaft Co., Chicago, Ill.

FURNACES, ELECTRIC
Electric Furnace Construction Co., Philadelphia, Pa.
Hamilton & Hansell, Inc., New York City

FURNACES, FORGING
Chicago Flexible Shaft Co., Chicago, Ill.
Gen. Combustion Co. of Can., Ltd., Montreal.
W. S. Rockwell Co., New York, N.Y.

FURNACES — HIGH-SPEED STEEL
Chicago Flexible Shaft Co., Chicago, Ill.

FUSE BOXES, STEEL
Dom. Forge & Stamp. Co., Walkerville.

FUSE PLUGS AND FUSES
Northern Electric Co., Ltd., Montreal Que.

GALVANIZING FLUX
British Smelting & Refining Co., Ltd. Montreal, Que.

GANG PLANER TOOLS
Armstrong Bros. Tool Co., Chicago.

GAS AND STEAM ENGINES
Mesta Machine Co., Pittsburgh, Pa.

GASKETS, LEATHER, ETC.
Graton & Knight Mfg. Co., Montreal.
Holden Co., Ltd., Montreal, Que.

GASOLINE METERS
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GASOLINE TANKS
Bowser Co., Ltd., S. F., Toronto, Ont.

GASOLINE PUMPS, SELF-MEASURING
Bowser Co., Ltd., S. F., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.

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Crescent Mach. Co., Ltd., Montreal, P.Q
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.

GAUGERS, CALIPERS
Williams & Co., J. H., Brooklyn, N.Y

GAUGES, DIAL
Herbert, Ltd., Alfred, Toronto, Ont.

GAUGES, MERCURY COLUMN, DRAFT
Taylor Instrument Co., Rochester, N.Y.

GAUGES, HYDRAULIC
Taylor Instrument Co., Rochester, N.Y.

GAUGES, MANUFACTURERS, LIMIT, THREAD
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Can., Galt, Ont

GAUGES, SNAP, THREAD AND CYLINDRICAL
C. E. Johanson, Inc., Toronto, Ont.

GAUGES, VACUUM AND PRESSURE
Bristol Co., Waterbury, Conn.
Taylor Instrument Co., Rochester, N.Y.

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Brown Engineering Corp., Toronto, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Crescent Mche. Co., Ltd., Montreal, Que.
Garvin Machine Co., New York.
C. E. Johanson, Inc., Toronto, Ont.
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Hartford, Conn
Strelinger, Chas. A. Co., Windsor, Ont.
Taylor, J. A. M., 318 Stair Bldg., Toronto
Toronto Tool Works, Toronto, Ont.
Wells Brothers Co. of Canada, Galt, Ont.

GEAR BLANKS
Can. Steel Foundries, Ltd., Montreal.
Dom. Found. & Steel, Hamilton, Ont.
Kaiser-Ellison & Co., Ltd., Montreal.
Williams & Co., J. H., Brooklyn, N.Y.

GEAR BLANKS, CAST
Katie Foundry, Galt, Ont.

GEAR BLANKS, RAWHIDE
Lyman Tube & Supply Co., Montreal, Que.

GEAR BOXES, REDUCTION
Can. Link-Belt Co., Ltd., Toronto, Ont.

GEAR SHAPERS AND CUTTERS
Fellows Gear & Shaper Co., Springfield, V.

GEAR-CUTTING MACHINERY
Bilton Mach. Tool Co., Bridgeport, Conn.
Fellows Gear & Shaper Co., Springfield, V.
Garlock-Walker Mchy. Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto.
A. R. Williams Machy. Co., Toronto.

GEAR-TESTING MACHINE
Gisholt Machine Co., Madison, Wis.

GEARS, CHAIN
Can. Link-Belt Co., Ltd., Toronto, Ont.
Morse Chain Co., Ithaca, New York.
Renold of Canada Ltd., Montreal.

GEARS, COMPENSATING
Morse Chain Co., Ithaca, New York.
Can. Link-Belt Co., Ltd., Toronto, Ont.

GEARS, CUT, MORTISE, ANGLE, WORM
Can. Link-Belt Co., Toronto, Ont.
Diamond State Fibre Co., Bridgeport, Pa.
Dom. Steel Products Co., Ltd., Brantford.
Dominion Bridge Co., Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Elliott & Whitehall, Galt, Ont.
Gardner, Robt., & Son, Montreal.
Hamilton Gear & Machine Co., Toronto.
Hull Iron & Steel Found., Ltd., Hull, Q
Jones & Glassco, Montreal.
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Philadelphia Gear Works, Philadelphia
Victoria Foundry Co., Ottawa.

GEARS, RAWHIDE
Gardner, Robt., & Son, Montreal.
Grant Gear Works, Boston, Mass.
Hamilton Gear & Machine Co., Toronto.
Hamilton Co., Ltd., Wm., Peterborough,
Jones & Glassco, Montreal.
Lyman Tube & Supply Co., Montreal, Que.
Philadelphia Gear Works, Philadelphia.
A. R. Williams Machy. Co., Toronto.

GENERATORS, GEAR
Fellows Gear & Shaper Co., Springfield, V

GEARS, SILENT CHAIN
Can. Link-Belt Co., Ltd., Toronto, Ont.

GEARS, SPRING
Morse Chain Co., Ithaca, New York.

GEARS, SPUN, BENCH, SPIRAL
Brown & Sharpe Mfg. Co., Providence, R.I.

GENERAL MACHINE WORK
Elliott & Whitehall, Galt, Ont.

GENERATORS AND CONVERTORS
Northern Elec. Co., Ltd., Montreal, P.Q.

GENERATORS, MOTOR
MacGovern & Co., Montreal.
Northern Elec. Co., Ltd., Montreal, P.Q.
Sturtevant Co., B. F., Galt, Ont.

GENERATORS, STEAM TURBO
Can. Link-Belt Co., Ltd., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

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GLOVES, ASBESTOS, ACID PROOF, WATERPROOF, ETC.
Strong, Kennard & Nutt Co., Cleveland

GLUE HEATERS
Oliver Machinery Co., Grand Rapids, Mich

GLASSES, SAFETY
Strong, Kennard & Nutt Co., Cleveland.
Willson & Co., Inc., T. A., Reading, Pa.

GRAPHITE
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Rice Lewis & Son, Toronto.

GOGGLES
Consolidated Optical Co., Toronto.
Standard Optical Co., Geneva, N.Y.

GRAB BUCKETS—CLAMSHELL and ORANGE PEEL
Canadian Link-Belt Co., Ltd., Toronto, Ont.
Canadian Mead-Morrison Co., Limited, Montreal, Que.

GRAVITY CARRIERS
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal.
Morris Crane & Hoist Co., Ltd., Herbert Niagara Falls, Ont.

GREASE CUPS, PRESSED STEEL, BRASS
Can. Winkley Co., Ltd., Windsor, Ont.

GREASES (See Lubricants)

GRINDERS, AUTOMATIC KNIFE
Canada Machinery Corp., Galt, Ont.
Foss Mchry. & S'ply Co., G. F., Montreal
Garlock-Walker Machinery Co., Toronto.

GRINDERS, BENCH
Superior Machinery Co., London, Ont.

GRINDERS, CENTRE COLUMN, PEDESTAL AND BENCH
Can. Machinery Corp., Galt, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Haskins & Co., R. C., Chicago, Ill.
Wisconsin Electric Co., Inc., Racine, Wis
Cleveland Pneumatic Tool Co., Toronto.
Ford-Smith Mach. Co., Hamilton, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machinery Co., Toronto.
Holden Co., Ltd., Montreal, Que.
Katie Foundry, Galt, Ont.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford.
Niles-Bement-Pond Co., New York, N.Y.
Perfect Machine Co., Galt, Ont.
United States Elec. Tool Co., Cincinnati.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

GRINDERS, CUTTER
Brown & Sharpe Mfg. Co., Providence, R.I
Cincinnati Milling Mach. Co., Cincinnati.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garvin Machine Co., New York.
Globe Engineering Co., Hamilton, Ont.
Greenfield Machine Co., Greenfield, Mass.
Greenfield Tap & Die Corp., Greenfield, M.
Heald Machine Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.
Manhattan Machine & Tool Co., Grand Rapids, Mich.
Norton Co., Worcester, Mass.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. of Can., Galt, Ont.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

GRINDERS, DIE AND CHASER
Haskins & Co., R. C., Chicago, Ill.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
National-Acme Co., Cleveland, Ohio.

GRINDERS, DISK
Armstrong Bros. Tool Co., Chicago, Ill.
Atkins & Co., E. C., Hamilton, Ont.
Ford-Smith Mach. Co. Hamilton.
Gardner Machine Co., Beloit, Wis.
Heald Machine Co., Worcester, Mass.

GRINDERS, FLEXIBLE CASTING
Manhattan Machine & Tool Co., Grand Rapids, Mich.

GRINDERS, DRILL
Aikenhead Hardware Co., Toronto.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield,
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
United States Elec. Tool Co., Cincinnati.
Wells Bros. of Canada, Galt, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

GRINDERS, CYLINDER, INTERNAL
Barber Mchy. Co., Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I
Foss Mchy. & S'ply Co., G. F., Montreal.
Greenfield Machine Co., Greenfield, Mass.
Heald Machine Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Norton Co., Worcester, Mass.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

GRINDERS, PORTABLE, ELECTRIC HAND, TOOL POST, FLOOR AND BENCH
Baird Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Ford-Smith Mach. Co., Hamilton, Ont.
Haskins & Co., R. C., Chicago, Ill.
Grant Mfg. & Mach. Co., Bridgeport, Con
Garlock-Walker Machinery Co., Toronto.
Greenfield Machine Co., Greenfield, Mass.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool Co., Chicago
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
United States Elec. Tool Co., Cincinnati
Wisconsin Electric Co., Inc., Racine, Wis.
Williams Mchy Co., A. R., Toronto, Ont.
Wilkinson & Kompass, Hamilton, Ont.

GRINDERS, MANUFACTURING
Barber Mchy. Co., Ltd., Toronto, Ont.
Universal Grinding Mach. Co., Fitchburg, Mass.

GRINDERS, HOLE, HOLE AND AND DEEP HOLE
Barber Mchy. Co., Ltd., Toronto, Ont.
Bryant Chucking Grinder Co., Springfield, Vermont.
Heald Machine Co., Worcester, Mass.

GRINDERS, PLAIN CYLINDRICAL
Barber Mchy. Co., Ltd., Toronto, Ont.
Fitchburg Grinding Mach. Co., Fitchburg, Mass.

GRINDERS, PNEUMATIC
Can. Ingersoll-Rand Co., Montreal.
Cleveland Pneumatic Tool Co., Toronto.
Garlock-Walker Machinery Co., Toronto.
Heald Machine Co., Worcester, Mass.
Independent Pneumatic Tool Co., Chicago
MacGovern & Co., Montreal, Que.

GRINDERS, PROFILE
Cleveland Milling Machine Co., Cleveland.

GRINDERS, ROTARY SURFACE
Brown & Sharpe Mfg. Co., Providence, R.I
Bristol Machine Tool Co., Bristol, Conn.
Manhattan Machine & Tool Co., Grand Rapids, Mich.

GRINDERS, TOOL AND HOLDER
Armstrong Bros. Tool Co., Chicago.
W. F. & John Barnes Co., Rockford, Ill.
Blount & Co., J. G., Everet, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I
Ford-Smith Machine Co., Hamilton, Ont.
Greenfield Machine Co., Greenfield, Mass.
Greenfield Tap & Die Corp., Greenfield.
National-Acme Co., Cleveland, Ohio.
Tabor Mfg. Co., Philadelphia, Pa.
Wells Bros. of Canada, Galt, Ont.

GRINDERS, UNIVERSAL, PLAIN
Barber Mchy. Co., Ltd., Toronto, Ont.
Manhattan Machine & Tool Co., Grand Rapids, Mich.
Modern Tool Co., Erie, Pa.
Norton Co., Worcester, Mass.
Williams Mchy Co, Ltd., A. R., Montreal

GRINDERS, VERTICAL, SURFACE
Brown & Sharpe Mfg. Co., Providence, R.I
Can. Fairbanks-Morse Co., Montreal.
Heald Machine Co., Worcester, Mass.
Herbert, Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto.
Pratt & Whitney Co., Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Norton Co., Worcester, Mass.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

GRINDING DISCS
Wausau Abrasives Co., Chicago, Ill.

GRINDING AND POLISHING MACHINES, PORTABLE, PNEUMATIC AND SPRING FRAME
Can. Fairbanks-Morse Co., Montreal.
Cincinnati Elec. Tool Co., Cincinnati, O.
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner & Son, Robt., Montreal.
Garvin Machine Co., New York.
Garlock-Walker Machy. Co., Toronto.
Greenfield Machine Co., Greenfield, Mass.
Haskins & Co., R. C., Chicago, Ill.
Hall & Sons, John H., Brantford, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Niles-Bement-Pond Co., New York, N.Y.
Norton Co., Worcester, Mass.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
Wisconsin Electric Co., Racine, Wis.
Williams Mchy Co., A. R., Toronto, Ont.
Williams Tool Corp. of Can. Ltd., Brantford, Ont.

GRINDING MACHINES, CAR WHEEL, CUTTER, CYLINDRICAL, CRANKSHAFT
Barber Mchy. Co., Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I
Norton Co., Worcester, Mass.

GRINDING WHEELS
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., E. C., Hamilton, Ont.
Brantford Emery Wheel Co., Brantford.
Can. Fairbanks-Morse Co., Montreal.
Carborundum Co., Niagara Falls, N.Y.
Dominion Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Mchy. & S'ply Co. G. F., Montreal
Norton Co., Worcester, Mass.

GRINDING WHEEL DRESSER
Dominion Abrasive Wheel Co., Ltd., Mimico, Ont.

GUARDS, WINDOW AND MACHINE
Canada Machinery Corp., Galt, Ont.
Canada Wire & Iron Goods Co., Hamilton
Dennis Wire & Iron Works, London, Ont.
B. Greening Wire Co., Hamilton, Ont.
Page Steel & Wire Co., Adrian, Mich.

GUTTERS AND SKYLIGHTS
H. H. Robertson, Ltd., Sarnia, Ont.

HACK SAW BLADES
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., E. C., Hamilton, Ont.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Can. Fairbanks-Morse Co., Montreal.
Diamond Saw & Stamping Wks., Buffalo.
Ford-Smith Machine Co., Hamilton, Ont.
Kayser-Ellison & Co., Ltd., Montreal.
Lyman Tube & Supply Co., Montreal, Que.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal
Plewes, Ltd., Winnipeg, Man.
Pilot Steel & Tool Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto.
Racine Tool & Machine Co., Racine, Wis.
Rice Lewis & Son, Toronto, Ont.
Simonds Mfg. Co., Fitchburg, Mass.
L. S. Starrett Co., Athol, Mass.
Standard Machy. & Supplies, Montreal.
Strelinger, Chas. A. Co., Windsor, Ont.
Victor Saw Works, Ltd., Hamilton.
Wilkinson & Kompass, Hamilton.
Williams Mchy Co., A. R., Toronto, Ont.

HANDLES, BALANCE, CRANK AND MACHINE
Williams & Co., J. H., Brooklyn, N.Y.

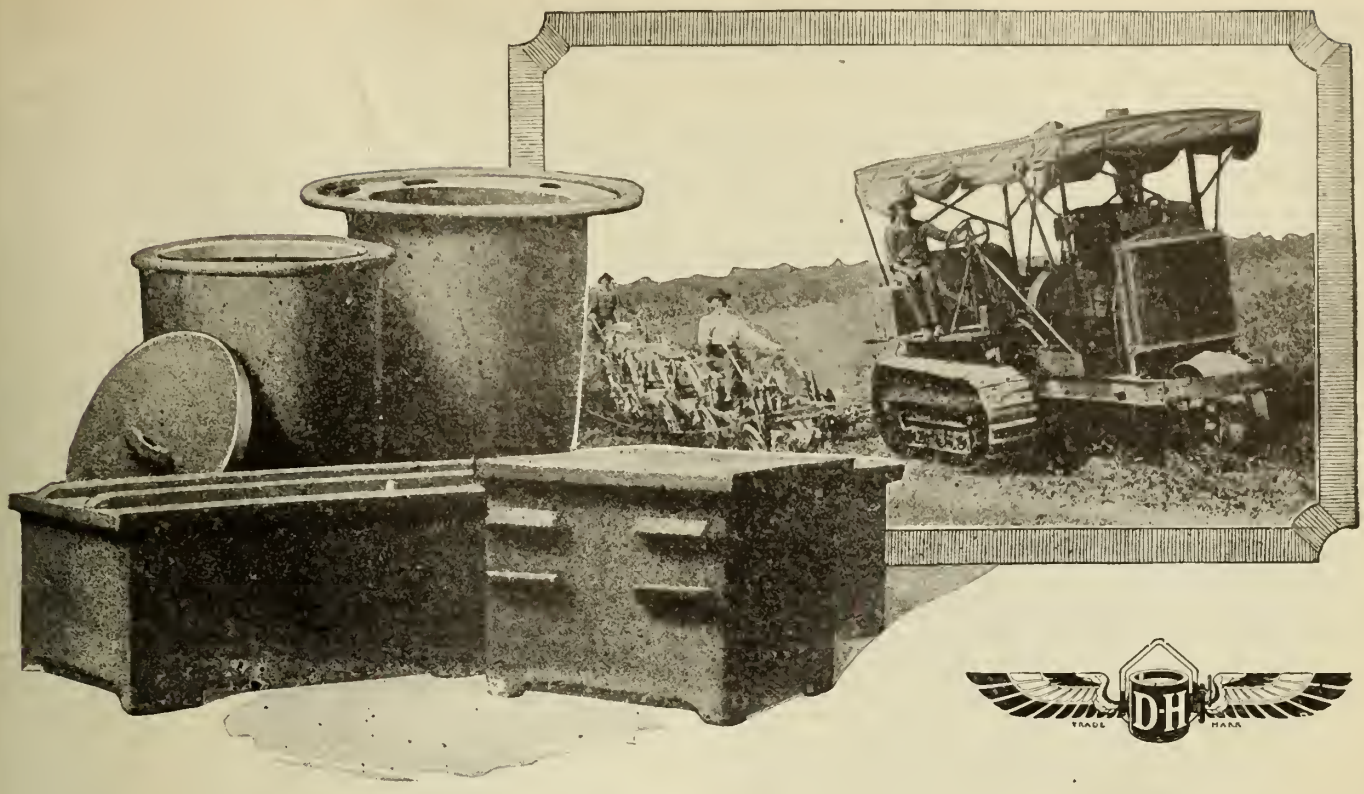
HANGERS, SHAFT
Can. Link-Belt Co., Ltd., Toronto, Ont

HACK SAW FRAMES
Aikenhead Hardware Co., Toronto.
Atkins & Co., E. C., Hamilton, Ont.
Can. Fairbanks-Morse Co., Montreal.
Ford-Smith Machine Co., Hamilton, Ont.
Garvin Machine Co., New York City.
Victor Saw Works, Hamilton, Ont.
Rice Lewis & Son, Toronto, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
Wilkinson & Kompass, Hamilton, Ont.

HACK SAWS, POWER
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., E. C., Hamilton, Ont.
Can. Fairbanks-Morse Co., Montreal.
Diamond Saw & Stamping Wks., Buffalo.
Foss Mchy. & S'ply Co., G. F., Montreal
Ford-Smith Machine Co., Hamilton.
Perfect Machine Co., Galt, Ont.
Starrett Co., L. S., Athol, Mass.
Victor Saw Works, Hamilton, Ont.
Williams Machy. Co., A. R., Toronto.
Williams Mchy Co., A. R., Toronto, Ont

HAMMERS, FORGING
Nazel Eng. & Mach. Wks., Philadelphia.

HAMMERS, ELECTRIC
Hoskins & Co., R. C., Chicago, Ill.



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Petrie, Ltd., H. W., Toronto.
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West Tire Setter Co., Rochester, N.Y.
Williams Mchy Co, Ltd., A. R., Montreal

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HAMMERS, POWER
Nazel Eng. & Mach. Wks., Philadelphia

HAMMERS, STEAM
Canada Machinery Corp., Galt, Ont.
Niles-Bement-Pond Co., New York.

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HAND PLANING AND JOINTING MACHINERY
Oliver Engineering Co., Montreal, P.Q.

HAND LEATHERS OR PADS
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Canadian Link-Belt Co., Ltd., Toronto, Ont.

HANGERS, SHAFT
Algoma Steel Corp., Sault Ste. Marie.
Chapman Double Ball Bearing Co., Toronto.
Gray Ball Bearing Co., Ltd., Toronto.
Baird Machine Co., Bridgeport, Conn.
Can. S K F Co., Toronto, Ont.
Gardner & Son, Robt., Montreal.
Jones & Glassco, Montreal.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co, Ltd., A. R., Montreal

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Sturtevant Co., B. F., Galt, Ont.

HEAT GAUGES, HARDENING AND ANNEALING
Shore Instrument & Mfg. Co., New York

HEAT TREATING EQUIPMENT
Chicago Flexible Shaft Co., Chicago, Ill.

HELMETS, SANDBLAST, AMMONIA
Strong, Kennard & Nutt Co., Cleveland

HIGH SPEED STEEL
See Steel.

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Baird Machine Co., Bridgeport, Conn.

HINGES
Butterfield & Co., Inc., Rock Island, Que.
London Bolt & Hinge Wks., London, Ont.

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Greenfield Tap & Die Co., Greenfield, Mass.
Pratt & Whitney Co., Dundas, Ont.
Taylor, J. A. M., 318 Stair Bldg., Toronto
Wells Bros. of Canada, Galt, Ont.

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HOISTING MACHINERY
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Can. Ingersoll-Rand Co., Ltd., Sherbrooke
Holden Co., Ltd., Montreal, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

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Can. Ingersoll-Rand Co., Montreal, Que.
Garlock-Walker Machinery Co., Toronto.
Ford Chain Block & Mfg., Philadelphia.
Independent Pneumatic Tool Co., Chicago
Lyman Tube & Supply Co., Montreal, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Wright Mfg. Co., Lisbon, Ohio.
Williams Mchy Co, Ltd., A. R., Montreal

HOISTS, ELEC., STATIONARY, MONO RAIL
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
A. Beatty & Sons, Ltd., Welland, Can
Oliver Engineering Co., Montreal.
Volta Mfg. Co., Welland, Ont.

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Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Montreal, Que.
Electric Steels & Metals Ltd., Welland
Kennedy & Sons, Owen Sound, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co, Ltd., A. R., Montreal

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HOLDERS, STEEL DIE FOR MARKING
Matthews & Co., Jas. H., Pittsburgh, Pa.

HOLDERS, ELECTRIC
Electric Steels & Metals, Ltd., Welland

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Clipper Belt Lacer Co., Grand Rapids.

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Dominion Bridge Co., Montreal, Que.
William Hamilton Co., Peterboro, Ont.
Toronto Iron Works, Ltd., Toronto, Ont.

HOSE, FIRE PROTECTION
Quaker City Rubber Co, Philadelphia, Pa
International Mach. Sply, Ltd., Montreal

HOSE, PNEUMATIC
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto.
Gutta Percha & Rubber, Ltd., Toronto.
Independent Pneumatic Tool Co., Chicago.
Quaker City Rubber Co., Philadelphia, Pa.
Wells Bros. Co. of Canada, Galt, Ont.

HOSE, ALL KINDS
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Gutta Percha & Rubber, Ltd., Toronto.
Quaker City Rubber Co, Philadelphia, Pa
International Mach. Sply, Ltd., Montreal
Dunlop Tire & Rubber Goods Co., Ltd., Toronto.

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Pangborn Corporation, Hagerstown, Md.
Goodyear Tire & Rubber Co. of Can., Ltd. Toronto
Quaker City Rubber Co., Philadelphia, Pa.
Intern'l. Machine Tool Co., Indianapolis.

HOSE, STEAM, SUCTION AND WATER
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Quaker City Rubber Co, Philadelphia, Pa
International Mach. Sply, Ltd., Montreal
Dunlop Tire & Rubber Goods Co., Ltd., Toronto.

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Dom. Steel Products Co., Ltd., Brantford
Eastern Production Co., Detroit, Mich.
Garlock-Walker Machinery Co., Toronto
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Metalwood Mfg. Co., Detroit, Mich.
Niles-Bement-Pond Co., New York.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.
West Tire Setter Co., Rochester, N.Y.
Victoria Foundry Co., Ottawa.

HYDRAULIC TURBINES
Que.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,

HYDROMETERS, HYGROMETERS, HYGRODNIKS
Taylor Instrument Co., Rochester, N.Y.

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Atkins & Co., E. C., Hamilton, Ont.
Brown & Sharpe Mfg. Co., Providence.
Starrett Co., L. S., Athol, Mass.

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Ford-Smith Machine Co., Hamilton, Ont.
Garvin Machine Co., New York.
Petrie, Ltd., H. W., Toronto.

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Taylor Instrument Co., Rochester, N.Y.

INDICATING SCALES
Can. Kron Scale Co., Montreal.

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Thomas Moore & Son, Montreal.

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Electric Steel & Metals Co., Welland.

INSULATING COMPOUNDS
Robertson Co., Ltd., H. H., Sarnia, Ont.

INSTRUMENTS, ENGINEERING
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Hanna & Co., M. A. Cleveland, O

IRON, WROUGHT, ROLLED, PIG
Swedish Steel & Impt. Co., Ltd., Montreal

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Can. Fairbanks-Morse Co., Montreal.
Jacobs Engineering Co.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Norton, A. O., Coaticook, Que.
Rice Lewis & Son, Toronto, Ont.
Petrie, Ltd., H. W., Toronto.

JACKS, PIT AND TRACK
Canadian Fairbanks-Morse Co., Montreal
Lyman Tube & Supply Co., Montreal, Que.
Northern Crane Works, Walkerville.

JAWS, FACE PLATE
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Ltd., Brantford.
Skinner Chuck Co., New Britain, Conn.

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Ackworthie Ltd., J., Birmingham, Eng.
Brown Engineering Corp., Toronto.
Crescent Mach. Co., Ltd., Montreal, P.Q.
Elliott & Whitehall Mach. & Tool Co., Galt.
Gishart Machine Co., Madison, Wis.
Globe Engineering Co., Ltd., Hamilton.
Homer & Wilson, Hamilton, Ont.
Jones & Lamson, Springfield, Vt.
Toronto Tool Co., Toronto, Ont.

JOURNAL WEDGES
Canada Foundries & Forgings, Welland.
Dominion Foundries & Steel Ltd., Hamilton, Ont.

KEY SEATERS
Garlock-Walker Machy. Co., Toronto, Ont.
Garvin Machine Co., New York.
Morton Mfg. Co., Muskegon Heights, M.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Machy. Co., A. R., Toronto.

KEYS, MACHINE
Whitney Mfg. Co., Hartford, Conn.
Williams & Co., J. H., Brooklyn, N.Y.

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Can. Blower & Forge Co., Kitchener, Ont.
General Combustion Co., Ltd., Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
Sturtevant Co., B. F., Galt, Ont.

KNIVES, MACHINE
Atkins & Co., E. C., Hamilton, Ont.

LABELS AND TAGS
Matthews & Co., Jas. H., Pittsburgh, Pa.

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LADLES, FOUNDRY
Northern Crane Works, Walkerville.

LACING MACHINES
Clipper Belt Lacer Co., Grand Rapids, M.

LAG SCREW GIMLET POINTERS
National Machy. Co., Tiffin, Ohio.

LATH
Robertson, Ltd., H. H., Sarnia, Ont.

LATHES, CHUCKING
Acme Machine Tool Co., Cincinnati, Ohio.
Petrie, Ltd., H. W., Toronto.
Wood Turret Machine Co., Brazil, Ind.

LATHE CHUCKS (See Chucks)

LATHE DOGS AND ATTACHMENTS
Armstrong Bros. Tool Co., Chicago.
Bendey Machine Co., Torrington, Conn.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

LATHES, AUTOMATIC AND SEMI-AUTOMATIC
Gisholt Machine Co., Madison, Wis.
Herbert, Ltd., Alfred, Toronto, Ont.
Wood Turret Machine Co., Brazil, Ind.

LATHES, AXLE
Barber Mchy. Co., Ltd., Toronto, Ont.
Betts Mach. Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.

LATHES, BORING
Barber Mchy. Co., Ltd., Toronto, Ont.
Bridgeford Mach. Tool Works, Rochester.
Canada Machinery Corp., Galt, Ont.
Lodge & Shipley, Cincinnati, O.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.

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J. G. Blount & Co., Everett, Mass.
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Geo. F. Foss Machy. & Supply Co., Montreal.
Garlock-Walker Machinery Co., Toronto.
Hardinge Bros., Chicago, Ill.
Petrie, Ltd., H. W., Toronto.
Pratt & Whitney Co., Dundas, Ont.
Seneca Falls Mfg Co., Seneca Falls, N.Y.
Strelinger Co., C. A., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

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Ackworthie Ltd., J., Birmingham, Eng.
Acme Machine Tool Co., Cincinnati, Ohio.
Hardinge Bros., Chicago, Ill.
Wood Turret Machine Co., Brazil, Ind.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

LATHES, ENGINE
Acme Machine Tool Co., Cincinnati, O.
Barber Mchy. Co., Ltd., Toronto, Ont.
John Bertram & Sons, Co., Dundas.
Canada Machy. Corp., Galt, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cisco Machine Tool Co., Cincinnati, O.
G. F. Foss, Mchy. & S'ply Co., Montreal
Garlock-Walker Machinery Co. Toronto.
Garvin Machine Co., New York.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Kennedy & Sons, Wm., Owen Sound, Ont.
Lehman Mach. Co., St. Louis, Mo.
R. McDougall Co., Galt.
Niles-Bement-Pond Co., New York.
Perfect Machine Co., Galt, Ont.
Rae Mach. Tool Co., Hamilton.
Smalley-General Co., Inc., Bay City, Mich.
Standard Equipment & Tool Wks. Montreal, P.Q.
Seneca Falls Mfg. Co., Seneca Falls, N.Y.
Sidney Tool Co., Sidney, Ohio.
Strelinger Co., C. A., Windsor, Ont.
Walcott Lathe Co., Jackson, Mich.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
Rae Mach. Tool Co., Hamilton.
A. R. Williams Machy. Co., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

LATHES, FOOT POWER
Seneca Falls Mfg. Co., Seneca Falls, N.Y.

LATHES, HORIZONTAL
Intern'l. Mchy. Supplies Ltd., Montreal.
Wood Turret Machine Co., Brazil, Ind.

LATHES, JOURNAL TRUEING
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.

LATHE MANDRELS, HARDENED AND GROUND
Elliott & Whitehall, Galt, Ont.

LATHES, PATTERNMAKERS'
J. G. Blount Co., Everett, Mass.
Can. Machinery Corp., Galt.
Wood Turret Machine Co., Brazil, Ind.
G. F. Foss Mchy. & S'ply Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.

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Wells Bros. of Canada, Galt, Ont.

LATHES, SCREW CUTTING
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Bertram & Sons Co., John, Dundas, Ont.
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Cisco Machine Tool Co., Cincinnati, O.
Foss Mchy. & Sply Co., G. F., Montreal
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Hepburn Ltd., John T., Toronto, Ont.
Lehman Machine Co., St. Louis, Mo.
Niles-Bement-Pond Co, New York.
Rae Mach. Tool Co., Hamilton.
Seneca Falls Mfg. Co., Seneca Falls, N.Y.
Strelinger Co., C. A., Windsor, Ont.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
Williams Machy. Co., A. R., Toronto.
Wood Turret Machine Co., Brazil, Ind.

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Bliss Co., E. W., Brooklyn, N.Y.

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Rae Mach. Tool Co., Hamilton.
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LATHES, TURRET
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LIDS, SCREW TOP AND HINGE
Can. Wintley Co., Ltd., Windsor, Ont.

LINK BELTING
See Belting, Chain.

LIFT TRUCKS
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Swan & Finch, Inc., New York.

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LUBRICATORS
Trabon Pump Co., Rockford, Ill.

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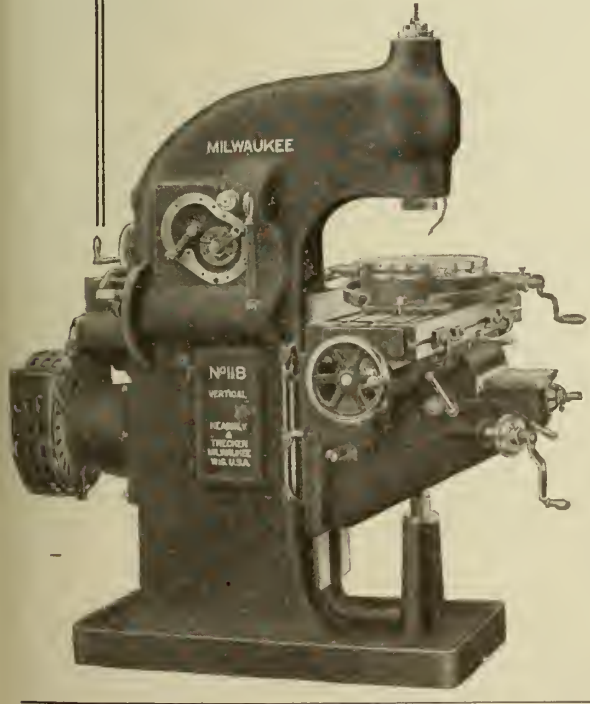
Continuous milling of 10-inch adjustable wrenches on a Milwaukee Vertical Milling Machine. These parts are turned out at the rate of 3,000 a day and the finished surface bears a constant and accurate relation to other selected points on the part.

Rapid Milling

Manufacturing milling by the continuous process is an advanced step in milling machine practice and is worthy of the serious consideration of the management of any plant. The motion in this milling process is continuous. It is reasonable, therefore, that in this way maximum production is secured. This sort of milling is most desirable in the machining of parts in large quantities. The rotary table, with chucking fixture holding the work, revolves and the cutter is in operation and in work at all times. The operator removes the finished piece and puts another unmilled one in its place.

Milwaukee Vertical Milling Machines are particularly well adapted to continuous milling. The spindle is adjustable for wear only as sufficient adjustment can be obtained by the adjustment of the knee alone, the same as it is in the horizontal type milling machines.

Have you any milling that would be well adapted to continuous milling? Let us help you.



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Canadian Representatives: Williams & Wilson, Ltd., Montreal;
F. F. Barber Machy. Co., Toronto;
A. R. Williams Machy. Co., Vancouver and Winnipeg.

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Barber Mchy. Co., Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Elliott & Whitehall, Galt, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Machy. Co., A. R., Toronto.

MACHINERY GUARDS (See Guards)

MACHINERY SUPPLIES

Crescent Machine Co., Ltd., Montreal.
Globe Engineering Wks., Hamilton, Ont.
Knight Metal Products, Toronto.

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Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Crescent Machine Co., Ltd., Montreal, Que.
McClean Machine & Tool Co., Ltd., Hamilton, Ont.

MACHINISTS' TOOLS

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Brown & Sharpe Mfg. Co., Providence, R.I.
Starrett Co., L. S., Athol, Mass.

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Volta Mfg. Co., Welland, Ont.

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Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Jardine & Co., A. B., Hespeler, Ont.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
McCrosky Tool Corp., Meadville, Pa., U. S. A.
Pratt & Whitney Co., Dundas, Ont.

MARKING DEVICES

Matthews & Co., Jas. H., Pittsburgh, Pa.

MARKING MACHINERY

Brown, Boggs Co., Hamilton, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
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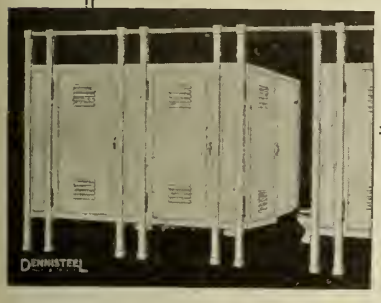

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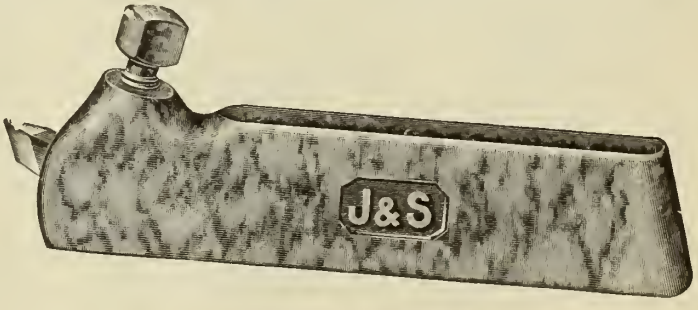

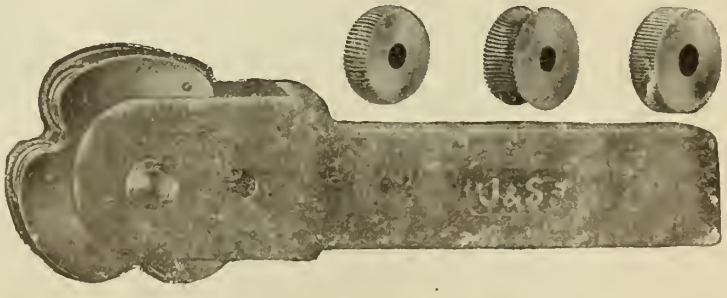

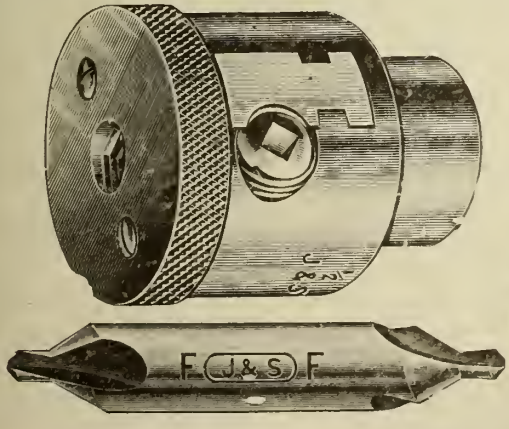

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Bliss Co., E. W., Brooklyn, N.Y.
Toledo Machine & Tool Co., Toledo.
Stoll Co., D. H., Buffalo, N.Y.

PRESSES, FILTER
Perrin, Ltd., William R., Toronto.
Smalley-General Co., Inc., Bay City, Mich.

PRESSES, PNEUMATIC
Dom. Steel Products Co., Ltd., Brantford.
Eastern Production Co., Detroit, Mich.
Metalwood Mfg. Co., Detroit, Mich.
Toledo Machine & Tool Co., Toledo.

PRESSES, DROP AND FORGING
Barber Mchy. Co., Ltd., Toronto, Ont.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs Co, Ltd., Hamilton.
Can. Fairbanks-Morse Co., Montreal.
Niles-Bement-Pond Co., New York.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co, Toledo.

PRESSES, HYDRAULIC
Barber Mchy. Co., Ltd., Toronto, Ont.
Bertram & Sons Co., John, Dundas.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Dom. Steel Products Co., Ltd., Brantford.
Eastern Production Co., Detroit, Mich.
Lourie Manufacturing Co., Springfield, Ill.
Metalwood Mfg. Co., Detroit, Mich.
Niles-Bement-Pond Co., New York.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.
Toledo Machine & Tool Co., Toledo.
Stoll Co., Inc., D. H., Buffalo, N.Y.
Williams Mchy. Co., A. R., Toronto.

PRESSES, HYDRAULIC, HORIZONTAL
Eastern Production Co., Detroit, Mich.

PRESSES, HYDRAULIC, VERTICAL
Eastern Production Co., Detroit, Mich.

PRESSES, HYDRO-PNEUMATIC
Eastern Production Co., Detroit, Mich.

PRESSES, BALING
Perrin, Ltd., William R., Toronto.

PRESSES, POWER
Baird Machine Co., Bridgeport, Conn.
Barber Mchy. Co., Ltd., Toronto, Ont.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machinery Co., Toronto.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy. Co. A. R., Toronto.

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Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Ont.
Toledo Machine & Tool Co., Toledo.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., Ltd., A. R., Montreal

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Barnes & Co., W. F. & Jno., Rockford, Ill
Bliss Co., E. W., Brooklyn, N.Y.
Manhattan Machine & Tool Co., Grand Rapids, Mich.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.

PRESSES, TIRE
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,

PRESSES, TRIMMING
Bliss Co., E. W., Brooklyn, N.Y.
Canada Machinery Corp., Galt, Ont.
Petrie, Ltd., H. W., Toronto.
Stoll Co., D. H., Buffalo, N.Y.

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Herbert Ltd., Alfred, Toronto, Ont.

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Holden Co., Ltd., Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que

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Taylor Instrument Co., Rochester, N.Y.

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Algoma Steel Corp., Sault Ste. Marie, Ont
American Pulley Co., Philadelphia.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., Fortierville, Que.
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Diamond State Fibre Co., Bridgeport, Pa.
Ford-Smith Machine Co., Hamilton, Ont.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Kennedy & Sons, Ltd., W., Owen Sound.
Positive Clutch & Pulley Works Ltd., Toronto.
Petrie, Ltd., H. W., Toronto.

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American Pulley Co., Philadelphia, Pa.

PULLEYS, FRICTION, CLUTCH
American Pulley Co., Philadelphia, Pa.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., A., Fortierville, Q.
Can. Link-Belt Co., Toronto, Ont.
Carlyle Johnson Mch. Co., Manchester, Ct.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Jones & Glassco, Montreal.
Positive Clutch & Pulley Works, Toronto.
Petrie, Ltd., H. W., Toronto.

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Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Hamilton Co., Ltd., Wm., Peterborough, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

PUMPS, AIR LIFT
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Holden Co., Ltd., Montreal, Que.

PUMPS, BOILER FEED
Can. Ingersoll-Rand Co., Ltd. Sherbrooke,

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Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Ingersoll-Rand Co., Montreal, Que.
Darling Bros., Ltd., Montreal, Que.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

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Darling Bros., Ltd., Montreal, Que.
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Globe Engineering Co., Hamilton, Ont.

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Garlock-Walker Machinery Co., Toronto.
Darling Bros., Ltd., Montreal, Que.
Elec. Steel & Metals, Welland, Ont.
Metalwood Mfg. Co., Detroit, Mich.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

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PUMPS, RETURN AIR
Can. Ingersoll-Rand Co. Ltd., Sherbrooke,

PUMPS, SPECIAL
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Marshall, Son & Bimmer, Toronto.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, O.
Williams Mchy Co., A. R., Toronto, Ont.

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John Bertram & Sons Co., Dundas, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd. Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machinery Co., Toronto.
A. B. Jardine & Co., Hespeler, Ont.
Long & Allstatter, Hamilton, Ohio.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
D. H. Stoll Co., Buffalo, N.Y.
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Brown, Boggs Co, Ltd., Hamilton, Ont.
Garlock-Walker Mach'y. Co., Toronto.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

PUNCHES, HAND
Niles-Bement-Pond Co., New York.

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Shaw Instrument & Mfg. Co., New York
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QUARRY HOISTS
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Holden Co., Ltd., Montreal, Que.
Niles-Bement-Pond Co., New York.
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Williams Mchy Co., A. R., Toronto, Ont.

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Pilewes, Ltd., Winnipeg, Man.
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Pilot Steel & Tool Co., Montreal, Que.
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Samuel Osborne, Ltd., Montreal, P.Q.
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Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

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Greenfield Tap & Die Corp., Greenfield.
Ingersoll Machy. Co., Ingersoll, Ont.
Marshall, Son & Bunney, Toronto.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
Wells Bros. of Canada, Galt, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

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Ackworthie Ltd., J., Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Elliott & Whitehall, Galt, Ont.
Greenfield Tap & Die Corp., Greenfield.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wells Bros. of Can., Galt, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

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Ackworthie Ltd., J., Birmingham, Eng.
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Greenfield Tap & Die Corp., Greenfield.
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Wells Bros. of Can., Galt, Ont.
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Garlock-Walker Machy. Co., Ltd., Toronto
Jones & Glasseo, Montreal.
Niles-Bement-Pond Co., New York.
Can. Drawn Steel Co., Hamilton.
Peckovers, Ltd., Toronto, Ont.
Petrie, Ltd., H. W., Toronto.
Pratt & Whitney Co., Dundas.
Rice, Lewis & Son, Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
A. R. Williams Machy. Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

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Rice, Lewis & Son, Toronto.

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Bertrams Ltd., Edinburgh, Scotland.
Canada Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford
Garlock-Walker Machy. Co., Ltd., Toronto
A. B. Jardine & Co., Hespeler, Ont.
Long & Allstatter Co., Hamilton, Ohio.
Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co., Toledo, O.

SHEARS, POWER
John Bertram & Sons Co., Dundas.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co. Ltd., Hamilton.
Can Blower & Forge Co, Kitchener.
Canada Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machy. Co., Ltd., Toronto
Long & Allstatler, Hamilton, Ohio.
A. B. Jardine & Co., Hespeler, Ont.
National Machy. Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
H. D. Stoll Co., Inc., Buffalo, N.Y.
Strelinger, Chas. A. Co., Windsor, Ont.
Toledo Machine & Tool Co., Toledo, O.
Williams, White & Co., Moline, Ill.
Williams Mchy Co., A. R., Toronto, Ont.

SHEARS, ROTARY
The Quickwork Co., St Mary's, Ohio.

SHEARS, PNEUMATIC
Toledo Machine & Tool Co., Toledo, Ohio

SHEARS, PLATE CUTTING, SLITTING
Dom. Steel Products Co., Ltd., Brantford.
Quickwork Co., St. Mary's, Ohio.

SHEARS, SPLITTING
Dom. Steel Products Co., Ltd., Brantford.

SHEARS, IRREGULAR AND CIRCLE CUTTING
The Quickwork Co., St. Mary's, Ohio.
D. H. Stoll Co., Inc., Buffalo, N.Y

SHEARS, SERPENTINE
The Quickwork Co., St. Mary's, Ohio.

SHEARS, SQUARING
Brown, Boggs & Co., Hamilton, Ont.
D. H. Stoll Co., Inc., Buffalo, N.Y.

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D. H. Stoll Co., Inc., Buffalo, N.Y

SHEET METAL WORKING TOOLS
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Barber Mchy. Co., Ltd., Toronto, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton.
Peck, Stow & Wilcox Co., Southington, C.
Petrie, Ltd., H. W., Toronto.
D. H. Stoll Co., Inc., Buffalo, N.Y.
Strelinger, Chas. A. Co., Windsor, Ont.

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Kayser-Ellisen & Co., Ltd., Montreal.

SHEETS, BLACK AUTO AND GALVANIZED
Peckovers, Ltd., Toronto, Ont.

SHEETS, NICKEL RESIST. ALLOY
Can. Driver-Harris Co., Ltd., Walkerville.

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Dennis Wire & Iron Works, London.

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Armstrong Bros. Tool Co., Chicago.
J. H. Williams & Co., Brooklyn, N.Y.

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Can. Link-Belt Co., Toronto, Ont.
Jones & Glasseo, Montreal.
Renold of Canada Ltd., Montreal.

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Aikenhead Hardware Co., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.
Wilkinson & Kompass, Hamilton, Ont.

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Peck, Stow & Wilcox Co., Southington Conn.

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Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

SLOTTERS
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
Herbert, Ltd., Alfred, Toronto, Ont.
National-Acme Co., Cleveland, Ohio.
Niles-Bement-Pond Co., New York.

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MacKinnon Steel Co., Sherbrooke, Que

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Keystone Mfg. Co., Buffalo, N.Y.
Modern Tool Co., Erie, Pa.
J. Morrow Screw & Nut Co., Ingersoll, Ont
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.

SOIL PIPE FITTINGS, CAST IRON
Katie Foundry, Galt, Ont.

SOLDERING IRONS
Aikenhead Hardware Co., Toronto, Ont.
Brown, Boggs & Co., Hamilton, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.

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British Smelting & Refining Co., Ltd. Montreal, Que.
Aikenhead Hardware Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Hoyt Metal Co., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.
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Cleveland Wire Spring Co., Cleveland.
Dunbar Bros. Co., Bristol, Conn.
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Barber Mchy. Co., Ltd., Toronto, Ont.
Bertram, John, & Sons Co., Dundas.
Bliss, E. W. Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada.
Brown Engineering Corp., Toronto, Ont
Dom. Steel Products Co., Ltd., Brantford
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Machinery Co., Toronto
Garvin Machine Co., New York.
Globe Engineering Co., Ltd., Hamilton.
Hamilton Co., Ltd., Wm., Peterborough
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Katie Foundry, Galt, Ont.
Ker & Goodwin Machine Co., Ltd., Brantford, Ont.
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Mesta Machine Co., Pittsburgh, Pa.
Rae Mach. Tool Co., Hamilton.
Stoll Co., D. H., Buffalo, N.Y.
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William R. Perrin, Ltd., Toronto.
Williams Tool Corp. of Can. Ltd., Brantford, Ont.

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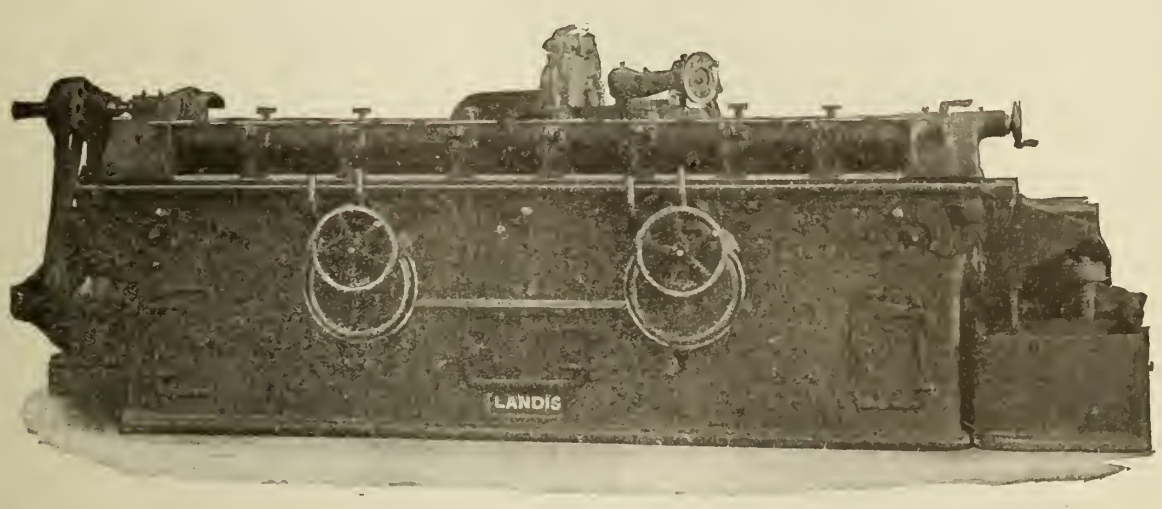

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Canadian Agents: A. R. Williams Machinery Co., Toronto, Winnipeg, Vancouver
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Plewes, Ltd, Winnipeg, Man.
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Ralph B. Norton, Montreal, Que.
Rice Lewis & Son, Toronto, Ont.
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Lincoln Electric Co. of Canada, Ltd., Toronto, Ont.

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Baines & David, Toronto.
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Kayser-Ellison & Co., Ltd., Montreal.
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TANK WAGONS
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Marshall, Son & Bunney, Toronto.
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Wells Bros. of Canada, Galt, Ont.

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Morse Twist Drill & Mchy. Co., New Bedford, Mass.
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Landis Machine Co., Waynesboro, Pa.
National-Acme Co., Cleveland, Ohio.
National Machy. Co., Tiffin, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
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Butterfield & Co., Inc., Rock Island, Que.
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Landis Machine Co., Waynesboro, Pa.
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Williams & Co., J. H., Brooklyn, N.Y.

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Cleveland Twist Drill Co., Cleveland.
Deloro Smelting & Refining Co., Ltd Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

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Williams & Co., J. H., Brooklyn, N.Y.

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Ford-Smith Machine Co., Hamilton, Ont.
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Strelinger, Chas. A. Co., Windsor, Ont.
Williams Machy. Co., A. R., Toronto.
U. S. Electrical Tool Co., Cincinnati, O.

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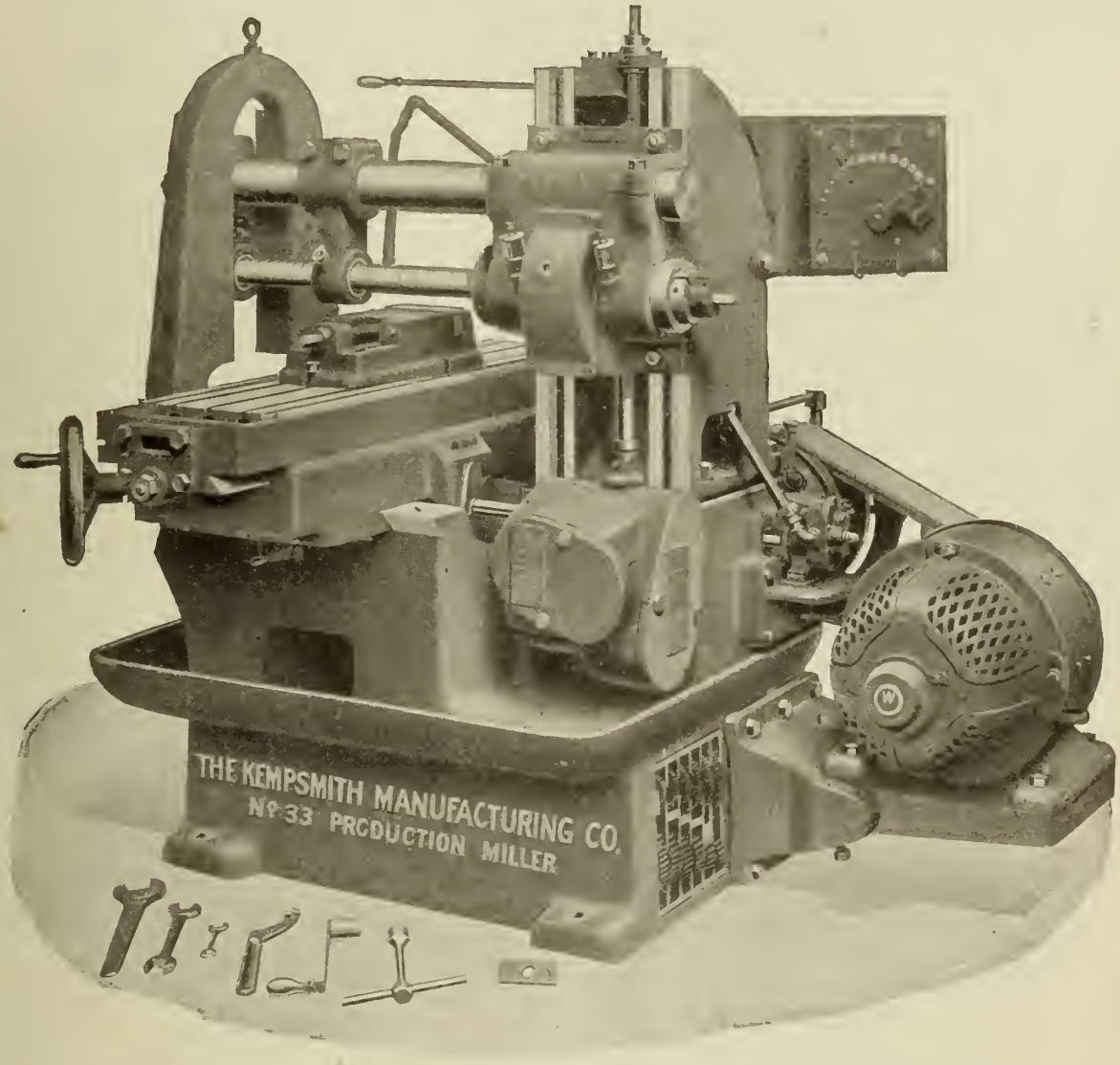
KEMPSMITH



KEMPSMITH No. 33 Production Miller

Paramount in Production

A machine designed for the rapid production of duplicate parts.
Our literature will tell you all about it. Write for it.

THE KEMPSMITH MANUFACTURING CO.

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CANADIAN MACHINERY AND MANUFACTURING NEWS

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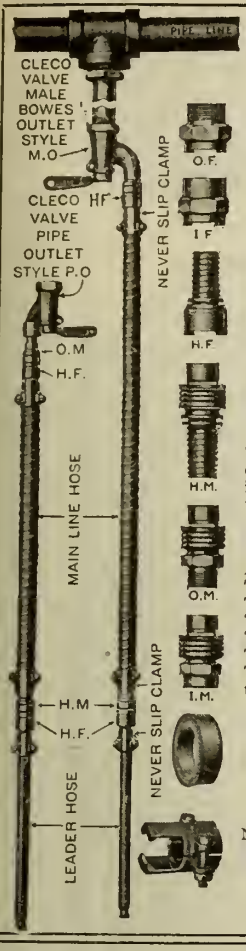


Cleco Pressure-Seated Air Valves

Bowes Air Hose Couplings—Cleco Never Slip Hose Clamps and Cleco Grooved Hose Nipples and Hose Clamp Tool

STYLE O.F. is an Outside Thread Female Pipe End. Made in sizes ⅜-inch to 1½-inch.

STYLE I.F. is an Inside Thread Female Pipe End. Made in sizes ¼-inch to 1½-inch.

STYLE H.F. is a Female Hose End with spiral shank to insert into the hose and has groove for the Never Slip Hose Clamp. Made in sizes ¼-inch to 1½-inch.

STYLE H.M. is a Male Hose End with spiral shank to insert into the hose and has groove for the Never Slip Hose Clamp. Made in sizes ¼-inch to 1½-inch.

STYLE O.M. is an Inside Thread Male Pipe End. Made in sizes ¼-inch to 1½-inch.

STYLE I.M. is an Inside Thread Male Pipe End. Made in sizes ⅜-inch to 1½-inch.

The Male and Female Ends of Bowes Couplings interchange in sizes ¼-inch to ¾-inch. Sizes 1-inch and 1¼-inch interchange. The 1½-inch ends interchange only with themselves.

BOWES COUPLINGS

Are instantly connected or disconnected.
They are absolutely air-tight under all pressures.
They quickly pay for themselves by stopping costly leaks.
They interchange in sizes most commonly used.
They have no loose parts to be mislaid or lost.
They are made of brass and will not rust.
The U-shaped Gasket interchanges in couplings ¼-inch to ¾-inch.

CLECO VALVES

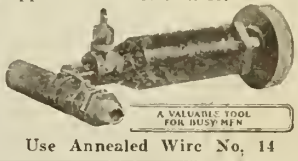
Style P.O. Style M.O. Style A.

Style P.O. Made in sizes ¼ in., ⅜ in., ½ in., ¾ in., 1 in., 1¼ in., 1½ in., 1¾ in., and 2 in. Pipe Outlets. Inlets are one pipe size larger.
Style A—30° Angle Valves, are made in sizes ½ in., and ¾ in.
Style M.O. Valve—Has 1 in. Inlet and Bowes Coupling Outlet, Connects with Bowes sizes ¼ in. to ¾ in.

CLECO GROOVED HOSE NIPPLES

Grooved Nipples when attached to the Hose with Wire Clamps as illustrated cannot "blow out." Wire clamp tool shown below applies the wires to hose.

The Lightening Hose Clamp Tool illustrated applies wire clamps at a cost of 1½ cents each.



In stock: Riveting and Chipping Hammers, Air Drills, Emery Grinders, Sand Rammers, etc.

Use Annealed Wire No. 14

IMPORTANT:—The Small Leaks in your "AIR LINE" mean serious loss in DOLLARS. Have you any idea of the amount of "Air" wasted in small leaks at your connections? Air Leakage through 1-16 in. opening equals 5.32 cu. ft. per minute at 80 lbs. It will pay you to install Bowes Couplings and Cleco Valves, which will stop costly leaks.

Bulletins Nos. 43, 44, 46 and 47 mailed on request.

The Model Hose Line illustrated shows correct styles of couplings and valve to use and proper way to attach the Cleco Never Slip Hose Clamps to Bowes Couplings. No "blow-offs" can occur when "Cleco" Clamps are used.

CLEVELAND PNEUMATIC TOOL CO. OF CANADA, LIMITED

84 Chestnut St., TORONTO, ONT. 337 Craig St. W., MONTREAL, QUE.

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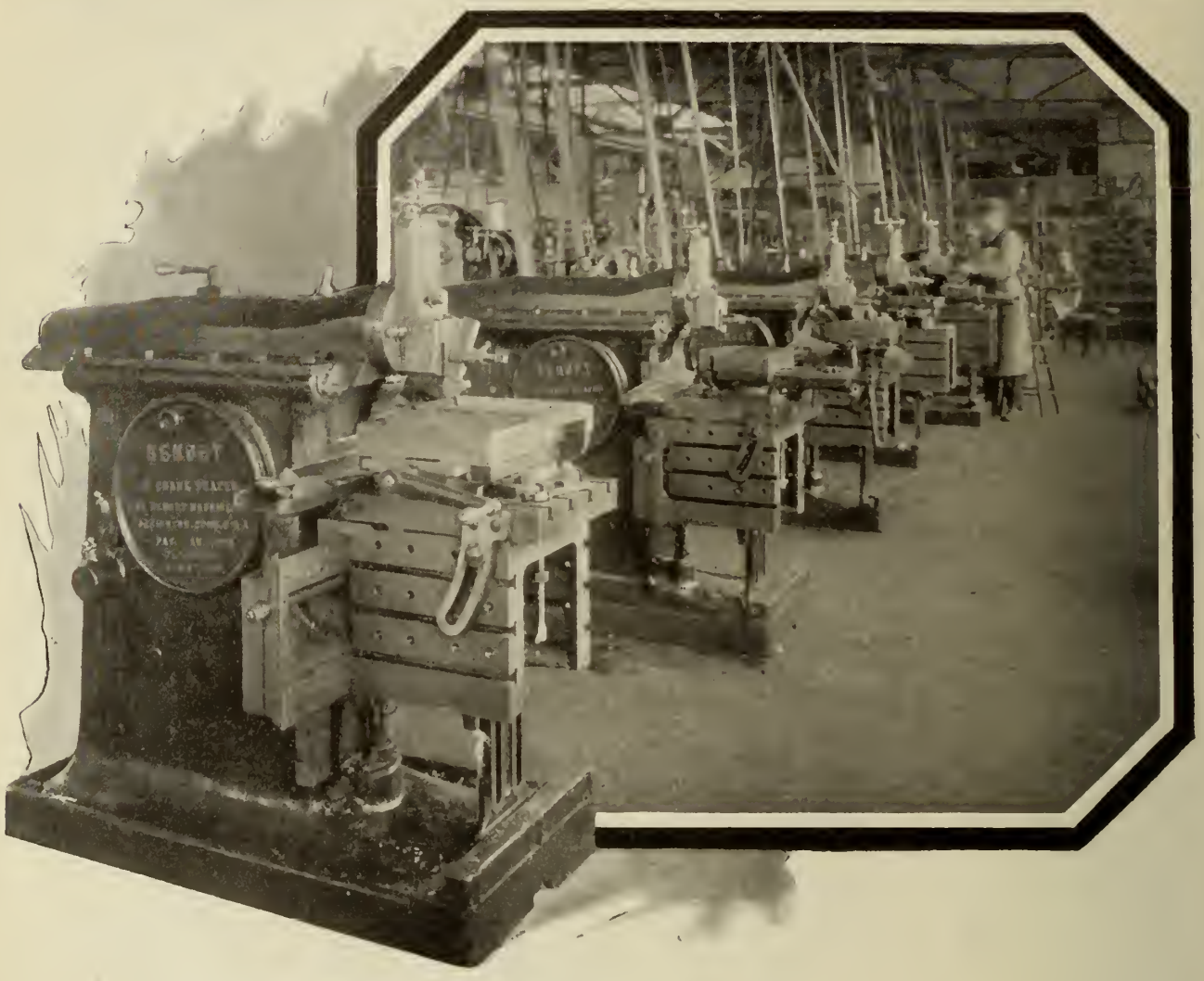
HENDEY



The Jamestown Die & Tool Corporation use these Hendey 16-in. Crank Shapers for facing dies and other such machining operations connected with die and tool manufacture.

Work of this class requires working within exceedingly close limits of accuracy. What the Jamestown Die & Tool Corporation think of Hendey Shapers is indicated in that they have already purchased **seven** machines.

Bear in mind the satisfaction which Hendeys are giving their users, when considering additional crank shapers, lathes or milling machines.

THE HENDEY MACHINE COMPANY

Torrington, Conn., U.S.A.

Canadian Agents :

A. R. Williams Machinery Co., Toronto. A. R. Williams Machinery Co., 260 Princess St., Winnipeg
A. R. Williams Machinery Co., Vancouver A. R. Williams Machinery Co., St. John, N.B.
Williams & Wilson, Montreal.

Foss QUALITY Foss SERVICE Foss

List of Machine Tools in Stock

LATHES—NEW

1—20″ x 10′ Boye & Emmes, 3-step cone and double back gear and quick change gear.
1—19″ x 10′ Sidney, 3-step cone, double back gear.
1—18″ x 8′ Perfect Machine, quick change gear and taper attachment.

LATHES—SECOND-HAND.

4—28″ x 12′ Boye & Emmes, 3-step cone and double back gear, quick change gear, rebuilt and guaranteed to be in first-class condition.
2—24″ x 12′ C.M.C. Lathes, 3-step cone and double back gear.
1—26″ x 10′ C.M.C. Lathe, 3-step cone and double back gear.
1—22″ x 10′ Milwaukee Lathe, semi-quick change.
2—20″ x 8′ American Lathes, all geared head, quick change gear.
1—24″ x 8′ Boye & Emmes.
1—18″ x 8′ Greaves Klusman Lathe, second-hand, 3-step cone and double back gear and standard change gear, taper attachment.
4—21″ x 8′ LeBlond Lathes, quick change gear, double back gear, complete with regular equipment.
4—21″ x 10′ LeBlond Lathes, quick change gear, double back gear, complete with regular equipment.
2—19″ x 10′ Sidney Lathes, 3-step cone, quick change gear and double back gear.
4—20″ x 10′ Walcott Lathes, 3-step cone, quick change gear and double back gear.

PLANERS

1—30″ x 30″ x 14′ Putnam Planer, second-hand.
1—Preston Pony Planer, 16″ x 8′.
1—16″ Preston Buzz Planer.
1—12″ Round Cylinder Buzz Planer, second-hand.

SHAPERS

1—28″ Smith & Mills single pulley gear box drive shaper. New.
1—25″ Smith & Mills, cone pulley drive. New.
1—16″ Smith & Mills cone pulley drive back geared crank shaper. New.
1—24″ Back Geared Bertram Shaper, second-hand.
1—26″ Back Geared Kelley Shaper, second-hand.

DRILLS—NEW

1—4′ Mueller Single Pulley gear box drive radial drill.
2—12″ Class "B" Henry & Wright high-speed ball-bearing drill presses.
1—18″ Edlund High Speed ball-bearing drill press.

DRILLS—SECOND-HAND

1—30″ American Tool Works Sliding Head Drill.
1—24″ Sibley, back geared.

BOLT THREADERS—NEW.

1—2″ Hall Pipe Threading Machine.

MILLING MACHINES—NEW.

1—No. 2 Kempsmith Full Universal Milling Machine, complete with regular equipment.
1—No. 1 Kempsmith Full Universal Milling Machine, complete with regular equipment.

MILLING MACHINES—SECOND-HAND

1—No. 2 Ford Smith Plain Milling Machine in first-class condition.
1—No. 21 Garvin Plain Milling Machine.
1—No. 2 Rockford Plain Milling Machine, complete with vise and dividing head, regular equipment.
1—No. 2 Cincinnati Miller (plain), complete with vise and regular equipment.

RACINE SAWS

3—No. 7 Racine Saws, having a capacity of 12 x 12″. New.
1—No. 4 Racine High Speed Metal Cutting Machine, capacity 6 x 6, 3-speed gear box drive. New.
2—Racine 6″ standard machines. New.
1—Peerless 6 x 6 standard machine. New.
1—14″ band saw (Crescent pattern), second-hand.
50—No. 1 Racine hack saws, rebuilt, 6″ capacity.

DRILL GRINDER

1—Wilmarth & Morman Twist Drill Grinder, style "B" point. New.
Also the following rebuilt machines which we have just purchased, all of which are guaranteed to be in first-class condition:
2—21″ x 8′ LeBlond Lathes, 3-step cone, double back gear and quick change gear.
2—21″ x 10′ LeBlond Lathes, 3-step cone, double back gear and quick change gear.
10—19″ x 8′ LeBlond Lathes, 3-step cone, double back gear and quick change gear.
6—20″ x 8′ Walcott Lathes, 3-step cone, double back gear and quick change gear.
3—20″ x 10′ Walcott Lathes, 3-step cone, double back gear and quick change gear.
2—20″ x 10′ Sidney Lathes, 3-step cone, double back gear and quick change gear.
2—22″ x 10′ Reed Prentice Lathes, 3-step cone, double back gear and quick change gear.
1—22″ x 10′ Milwaukee Lathe, semi-quick change.
All the above machines are fitted with 4-jaw Independent Chucks.

Send for full particulars and prices to

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305 St. James St. MONTREAL

Foss QUALITY Foss SERVICE Foss

C.M.C. LATHES

We manufacture Engine Lathes in sizes from
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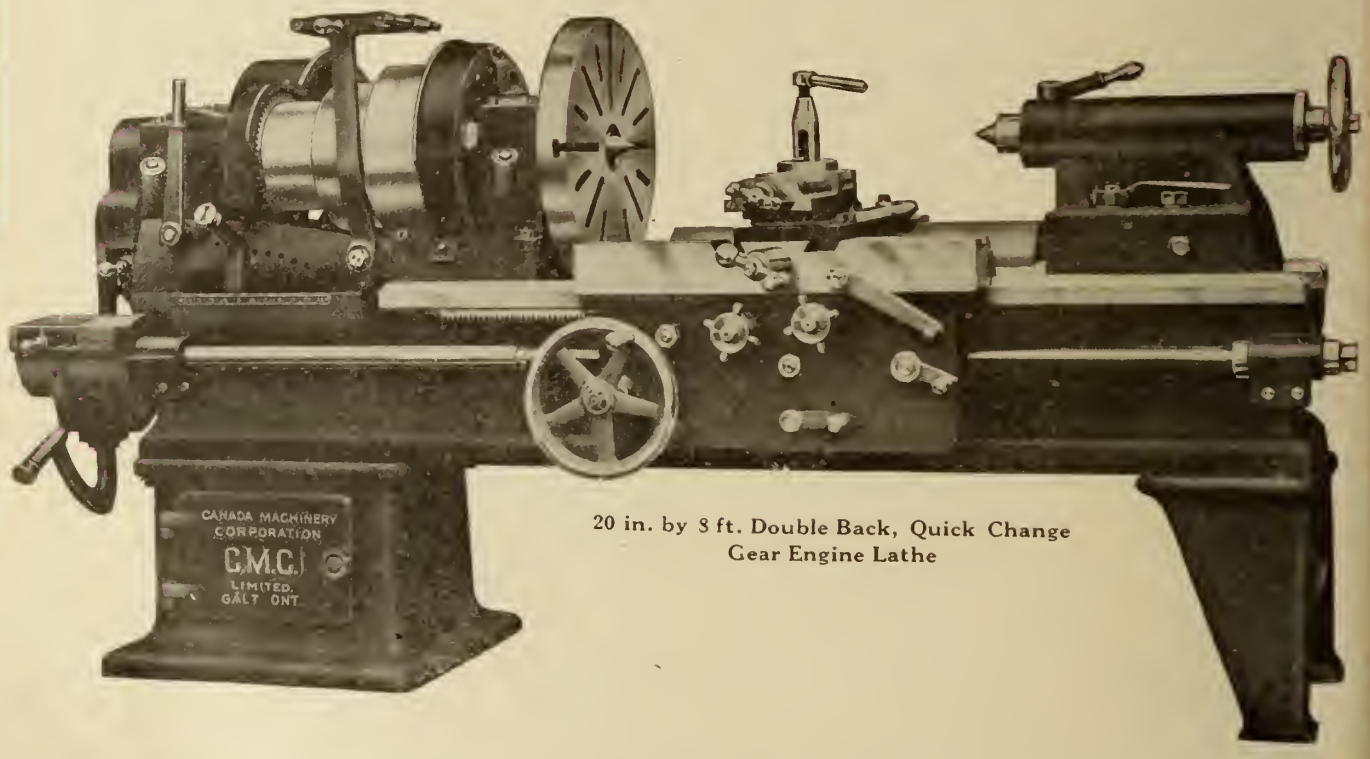
All embody improved features that ensure larger output.

Each is built with great accuracy to ensure less rejected work.

All are built well from best materials and give long, severe service with little up-keep.

For continued satisfactory lathe service insist on our lathes.



20 in. by 8 ft. Double Back, Quick Change Gear Engine Lathe

In addition to Engine Lathes we build Gap Lathes, Break Lathes, Tool Room Lathes, Extension Bed Engine Lathes and Face Lathes.

Full Description of Any Sent on Request

CANADA MACHINERY CORPORATION, GALT, ONTARIO
LIMITED

CANADIAN MACHINERY AND MANUFACTURING NEWS

Vol. XXIV., No. 12 Published by the MacLean Publishing Company, Limited, Toronto September 16, 1920 $4.00 a Year Subscription Price

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You Can Tell a File by Its Teeth

Are they properly shaped? Are they absolutely uniform and evenly set? Are they of steel sufficiently hardened for the strenuous work they must do?

File efficiency depends largely on these points.

In Famous Five Files, you will find teeth that meet all these requirements.

They do a clean job, and they give long service before wear is apparent. They have been the Standard for over fifty years. Specify them when ordering.

The Famous Five Are:

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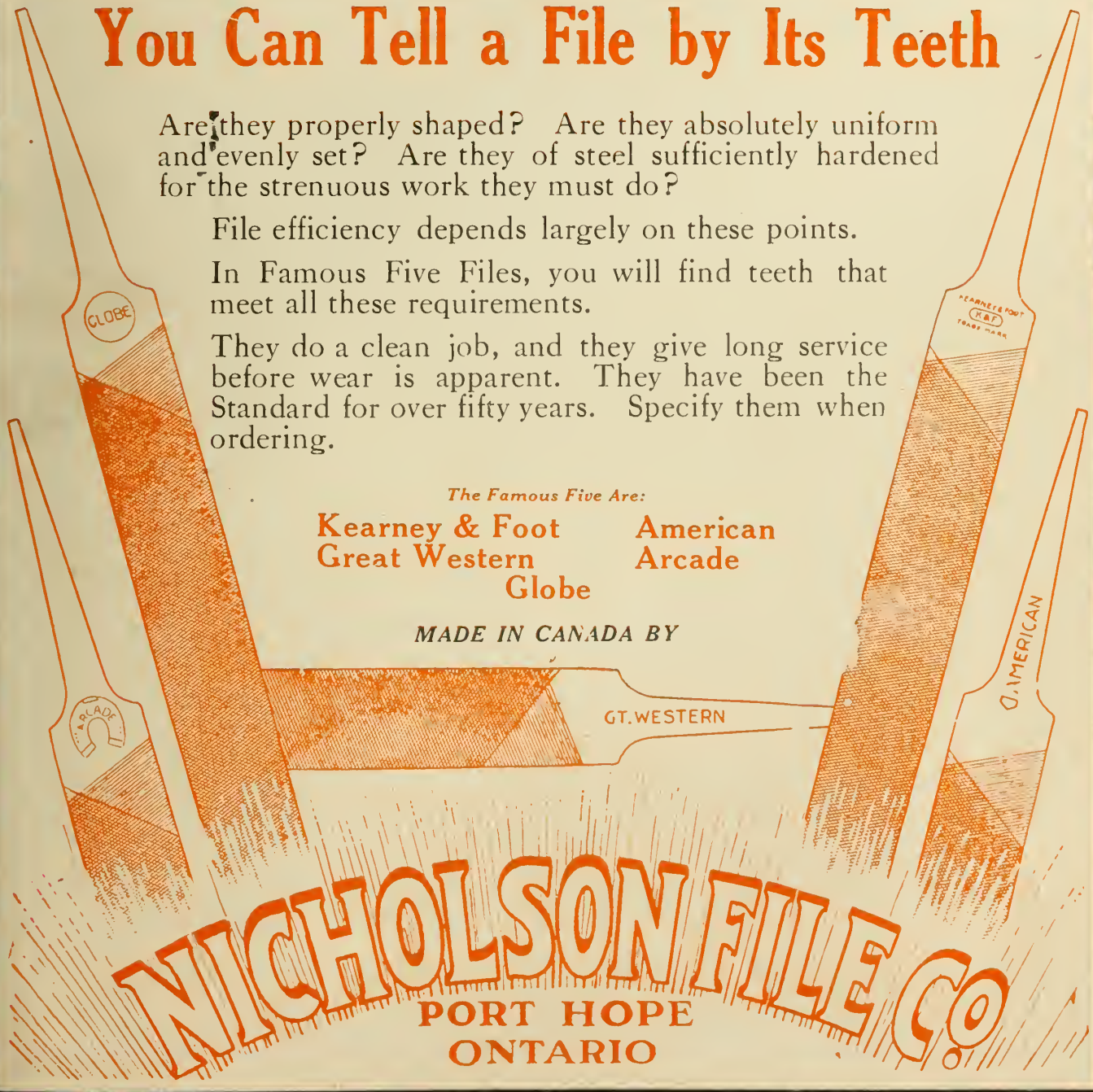

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PORT HOPE
ONTARIO

You Need a Good Die Stock Set

if you need one at all.

Because a **GOOD** Die Stock Set embodies:

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2. Adjustment for wear.
3. Free cutting qualities.
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5. Ample adjustment for oversize or undersize.

P. & W. Die Stock Dies **ARE GOOD DIES.**

BETTER than most because of the interchangeabe feature in their chasers. A broken chaser in a P. & W. Die doesn't mean a new set of chasers. You can get a new chaser to replace a breakage and the new one "fits in" perfectly in your old set. That's the 6th point, **"ECONOMY IN OPERATION."**

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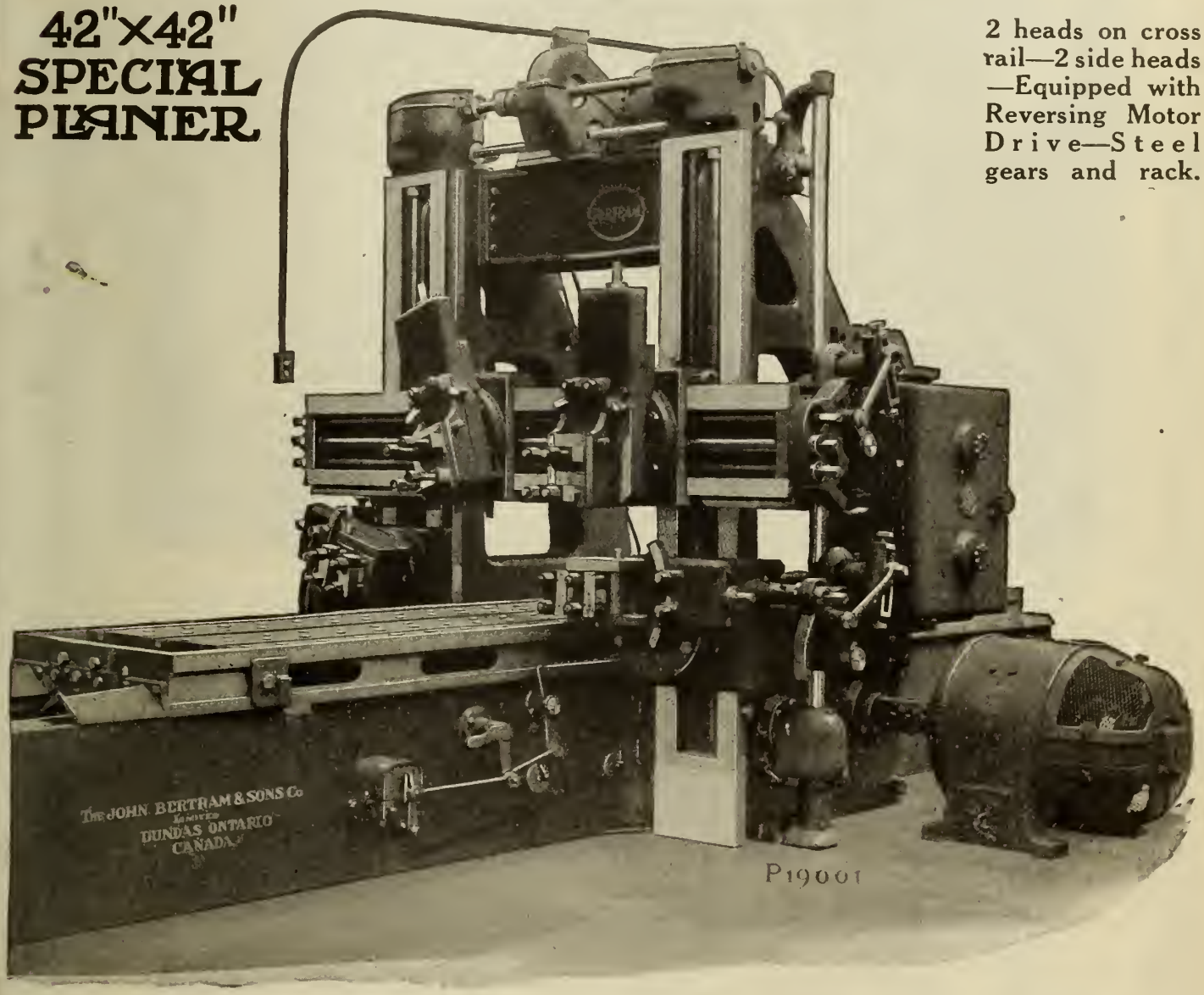
42"x42" SPECIAL PLANER

2 heads on cross rail—2 side heads—Equipped with Reversing Motor Drive—Steel gears and rack.



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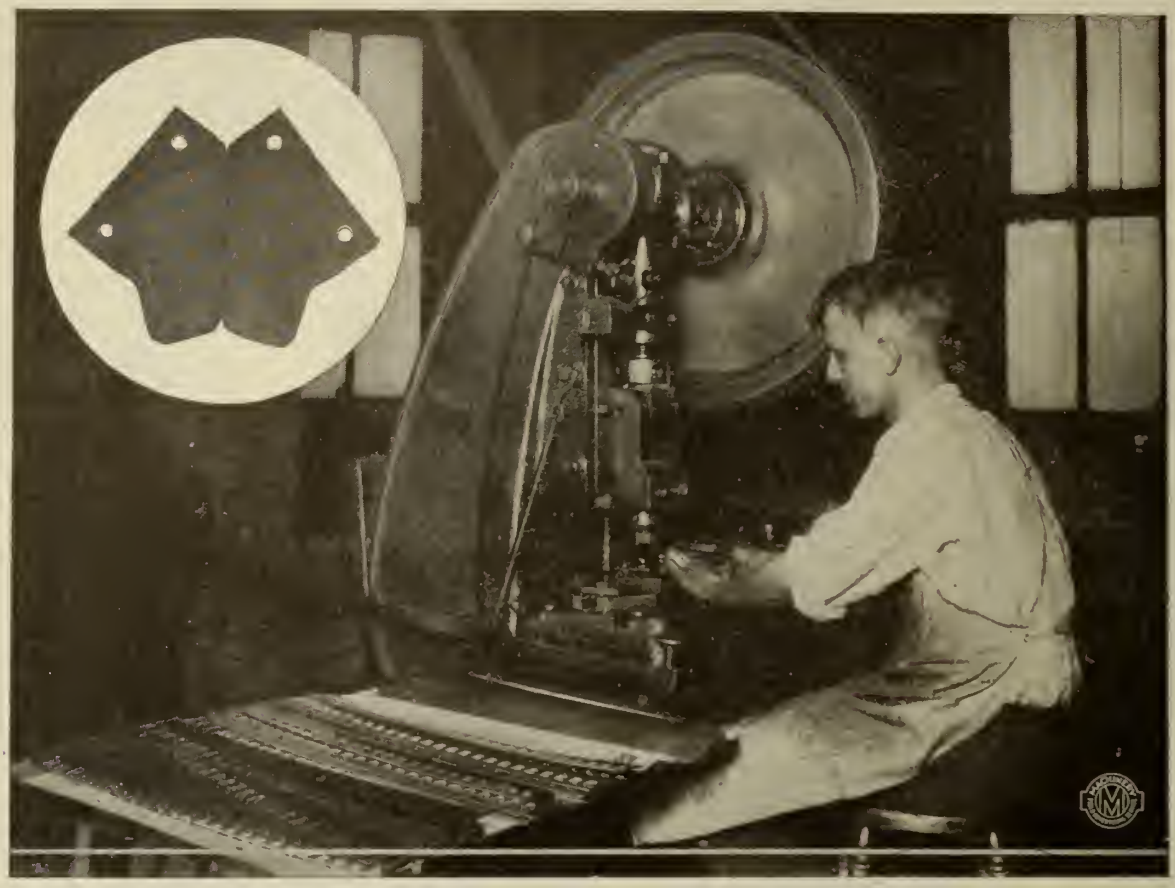
"BLISS" PRESSES—



One Thousand "Rests" Per Hour

This No. 19½ "BLISS" Press has been used for six years in making dies, tools and special machines in the Scalbom Mfg. Co.'s shop, Chicago, Ill. It has not once needed repairs or replacements. When photographed it was punching brass "rests"—parts of a special machine for making fiber talking machine needles—at a little better than sixteen per minute, hour after hour.

"Something is learned every time a book is opened," as the Chinese say. Perhaps this particular performance suggests a new application of press work in *your* shop. If so, a "BLISS" Press can handle it to best possible advantage. "BLISS" Presses are rigid, convenient and adaptable, made in a wide variety of styles and sizes and equipped with simple, practical attachments which give them almost unlimited range.

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BLISS

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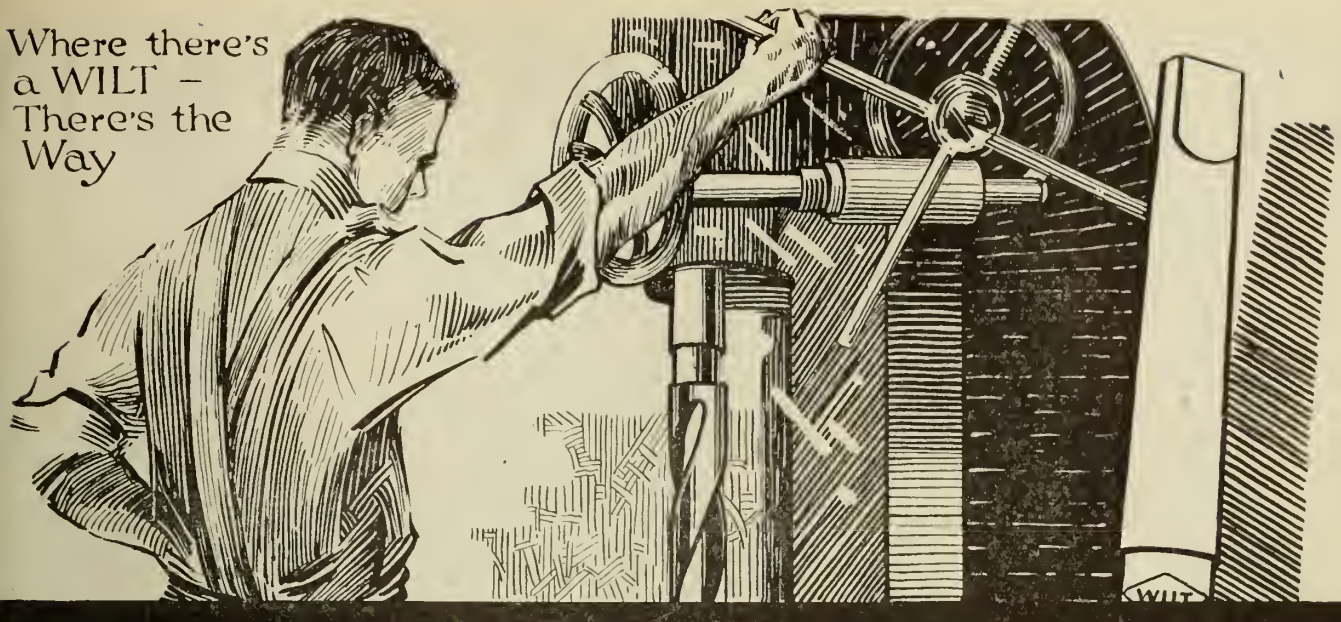
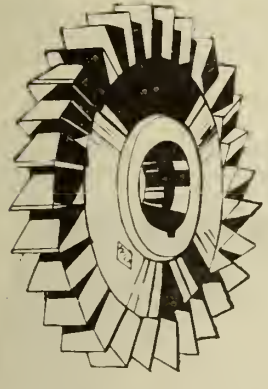
Where there's a WILT – There's the Way



WILT HIGH SPEED & CARBON TWIST DRILLS, REAMERS & MILLING CUTTERS

Canadian manufacturers must be up and doing! Big production is Canada's big need. Every manufacturing firm must do its level best. Tools of ordinary quality won't do, and this applies to Drills, Reamers and Milling Cutters as well as all other tools.

Many of Canada's largest manufacturing plants learned during the strenuous days of the war that their Drilling, Reaming and Milling operations reached the highest point of efficiency and production when they were using WILT Drills, Reamers and Milling Cutters.



The excellent reputation for quality and productive ability conceded to WILT products by manufacturers during the war is not only being adhered to but every effort is being made to further improve them by the use of the most modern and scientific methods available.

For big production put your faith in tools of the highest quality — use WILT High Speed and Carbon Drills, Reamers and Milling Cutters.

Ask your dealer or write direct for our Catalogue "C"

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MALLEABLE
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AMMONIA
BLOOMS, BILLETS

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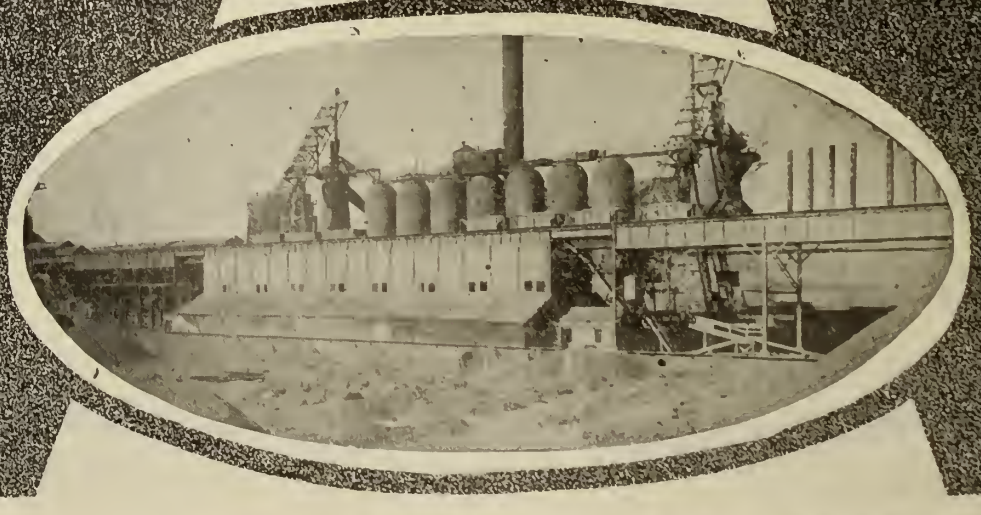
Order from us and you'll get both quality and prompt service.
A trial is convincing.



For Continuous Production Install "Clipper" Belt Lacing

ASK the production manager of any big manufacturing plant how he got to the front and he will tell you it was by "keeping the wheels of production turning." Power belts must be laced, when occasion arises, in the quickest way. Delays are expensive.

The Clipper Belt Lacer
Laces a Belt in Three Minutes

Old lacing methods took from fifteen minutes to half an hour. The "Clipper" is not only speedy, but it is thorough. It makes a joint that lasts, is smooth on both sides, is safe, and enables belts to deliver maximum power. Any factory workman can lace a belt with the simple "Clipper." The cost is a mere trifle, the saving great.

On request, we will send the "Clipper" to manufacturers for a free trial. It is permanently guaranteed.

"The Connecting Link Between Power and Production"

Most mill supply houses sell the "Clipper"

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1920 FOUNDRY & MACHINE EXHIBIT
COLUMBUS, OHIO
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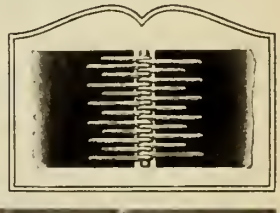

Clipper Belt Lacer Company
GRAND RAPIDS, MICHIGAN, U.S.A.

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1. The Little David will handle loads without the slightest jar.
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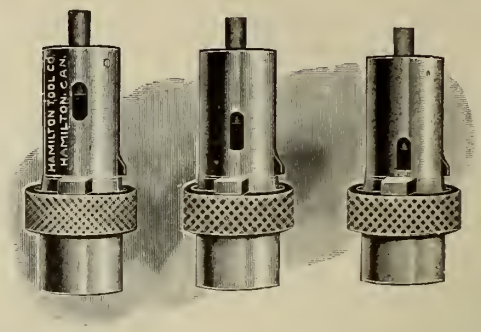
Beaver Chuck and Collet



Interchange Your Tools Without Stopping the Machine

Think of the valuable time this will save! A single spindle machine practically converted into a multiple with as many spindles as you have operations on any piece of work.

The Beaver Chuck and Collet enables you to change from one tool to any other with hardly any pause in the work. A self-contained device releases the tool and collet instantly. The change is made easily with one hand.

Write for full particulars

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HIGH SPEED TWIST DRILLS

High-class Drills with IRRESISTIBLE PIERCING FUNCTIONS that stand the WEAR and TEAR—in other words, the DRILLS that are EFFICIENT and ECONOMICAL—are the DRILLS with the "DORMER" Brand.

We are manufacturing SPECIALISTS—Carry large STOCKS—Give PROMPT deliveries, and rely upon our products for REPEATS.

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THE
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1856

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RALPH B. NORTON, AGENT
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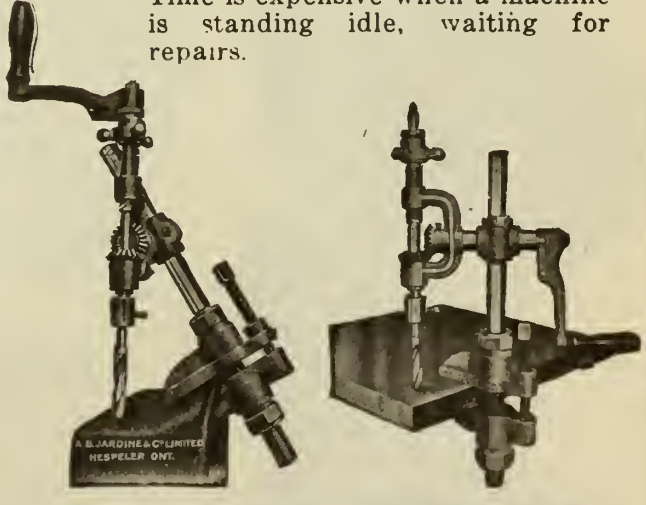
Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.



On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, $26.50 net.
Sold by all Machinery and Supply Houses

A. B. JARDINE & CO., Limited
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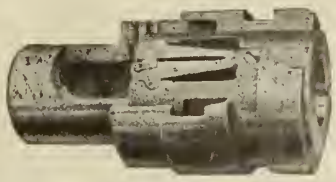
THE JOHNSON FRICTION CLUTCH

The Clutch for Your Machine Made to Order



Single Clutch—Interior—Clutch Disengaged

Double Clutch

Where space is limited and conditions are exacting, the clutch problem presents difficulties —unless you know about Johnson clutches. We offer you an efficient clutch made in any size or form that your machine requires. When you are designing a new machine, it will be worth while to consult us. Our facilities are at your disposal without any obligation to you.

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FRICTION CLUTCH
THE CLUTCH OF A THOUSAND USES

WRITE TO-DAY FOR OUR YELLOW DATA SHEETS

CANADIAN AGENTS:
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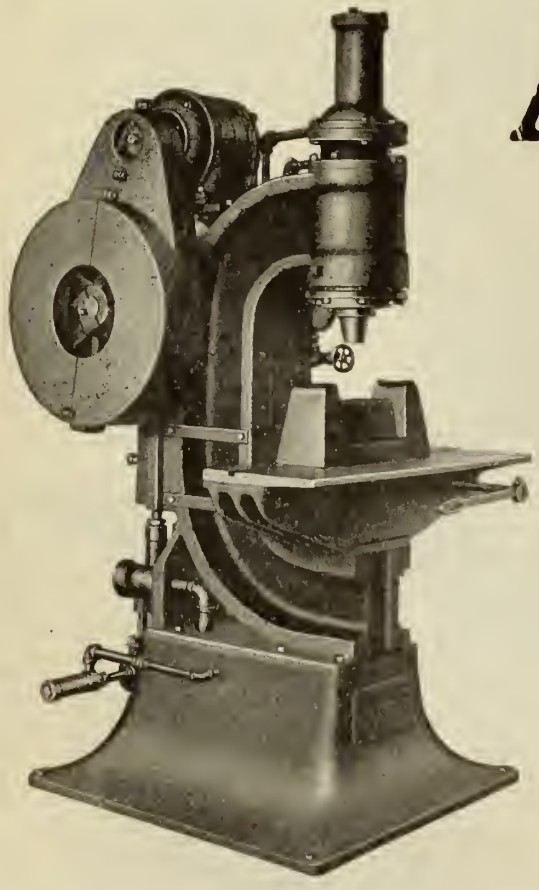
CANADIAN FAIRBANKS-MORSE CO., LIMITED, Montreal, Toronto and Winnipeg

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.



A SELF-CONTAINED HYDRAULIC UNIT

EASTERN UNIVERSAL HYDRAULIC PRESS. Supplied in 20-35 and 50 ton capacities, full hydraulic depending on no springs or weight for return of ram delivering pressure instantly at a speed of 1½" per second, return of ram 3" per second.

Length of Ram Travel	**6 in.**
Depth of Throat	**10 in.**
Length of Table	**8 ft.**
Width of Table	**10 in.**
Table to Ram	**10 to 14 in.**

EASTERN UNIVERSAL PRESSES are tested before leaving our plant at 33 1/3% overload. They are furnished with rolling centers and are unexcelled for straightening of motor crankshafts, heavy wheel shafts, broaching splines in drive plate, differential gears, and others. Straightening front axles and spindles.

Write for details.

EASTERN PRODUCTION CO.
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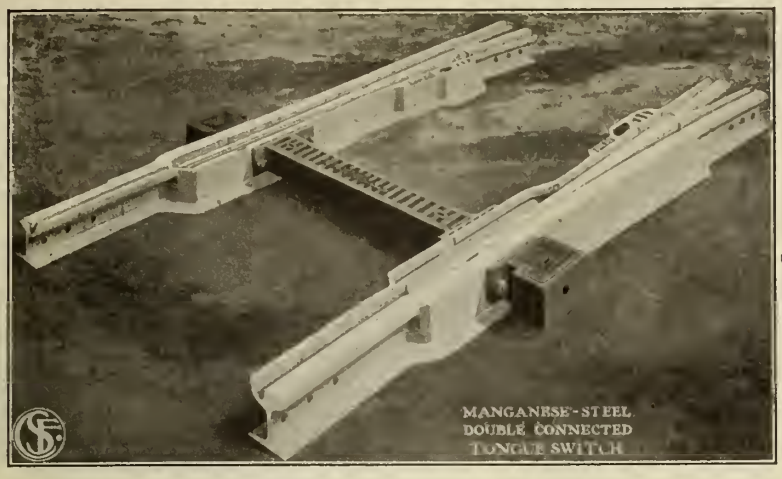
Eastern Representative: Swind Machinery Company, Widener Building, Philadelphia, Pa.
Canadian Representative: F. F. Barber Machinery Co., Limited, Foy Building, Toronto.



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for

Steam and Electric Railways

Manufacturers of Balkwill Articulated Manganese-Steel Crossings

CANADIAN STEEL FOUNDRIES LIMITED

Transportation Building, Montreal

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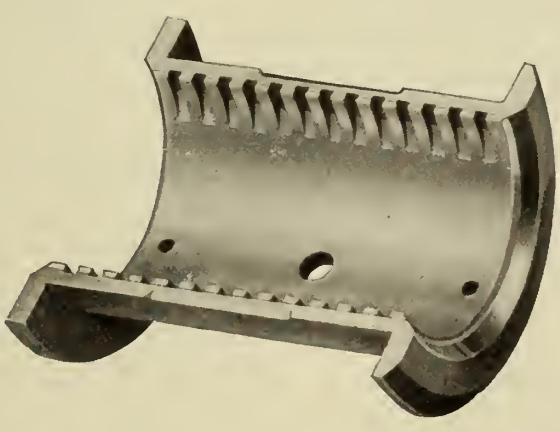

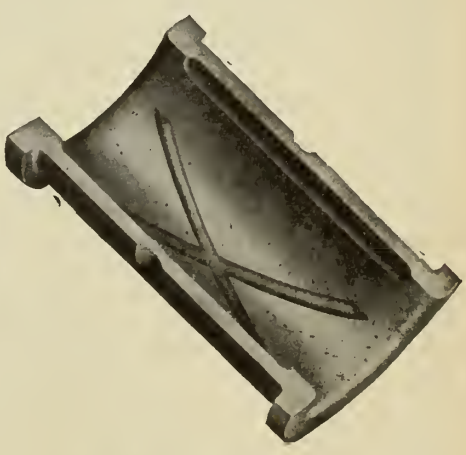

DIE CASTINGS

DOEHLER PROCESS

Manufactured by

Tallman Brass & Metal Limited

HAMILTON, ONT.

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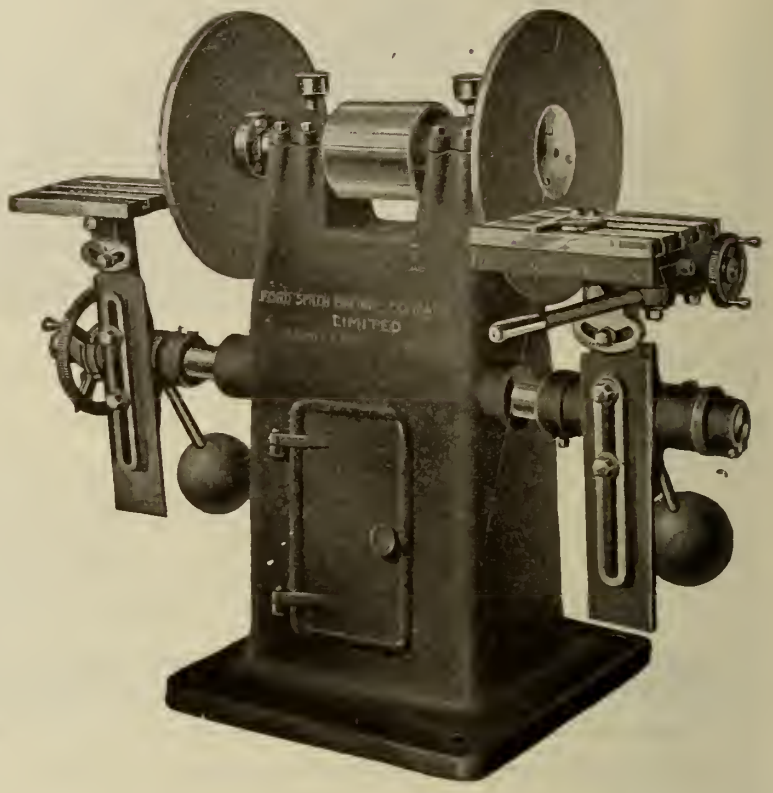
Ford-Smith Grinders

Made in Canada



MACHINES which bear a reputation for doing quicker, better work, and whose upkeep expenses are practically nil, merit investigation.

Such machines are Ford-Smith Grinders. Every model of the Ford-Smith line —and there's a model for practically every purpose — is designed to give *quality* production as well as *quantity*.

Before leaving the factory all Ford-Smith Grinding Machines are subjected to a series of exacting tests, covering every detail of their construction. This is why the Ford-Smith guarantee has become a mere matter of form — these tests *prove* that the machine is capable of filling all our claims.

Any information with regard to Ford-Smith Grinders will gladly be furnished.

Many manufacturing operations show possibilities of exceptional economies by the use of suitable grinding processes. Have one of our engineers call and see just what saving grinders would effect on your work.

The Ford-Smith Machine Co., Limited, Hamilton, Canada

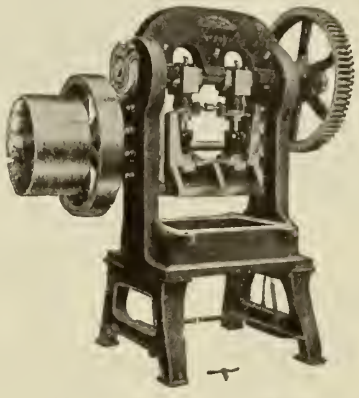
FOREIGN AGENTS:

W. E. Storey, London, England.
McLeod & Co., Calcutta, India
Gollin & Co., Melbourne, Australia.
British & Canadian Hydraulic Tube Co., Johannesburg, S.A.

BROWN-BOGGS B-B

Volume production is largely a matter of the steady, continuous work of efficient machinery.

It is not sufficient that a machine be speedy and accurate on a short trial run—it must be fast, accurate and able to withstand the excessive stress of actual service. The losses of breakdowns cannot be made up by "spurts" of efficiency.



No. 20½—Power Press

No. 126—Deep Throat Power Punch

The durability of Brown-Boggs products is proven in the service they give their users. Years of manufacture and exhaustive experiment have enabled various improvements to be made in their designs. Every article is manufactured with great care by thoroughly competent workmen and is rigidly tested by experts before leaving the factory.

The "B-B" line comprises tinsmiths' tools and sheet metal working machines of every description; canners' and evaporators' machinery, shears of all kinds, power presses for punching, forming, embossing, blanking; etc.

Specify "Brown-Boggs" and you are assured of long, efficient service.

THE BROWN-BOGGS CO., LIMITED
HAMILTON, CANADA

If interested tear out this page and place with letters to be answered.

ELECTRIC STEEL AND ENGINEERING, LIMITED *Head Office:* Welland, Ont.

Works

ELECTRIC STEEL & METALS COMPANY, LIMITED, Welland, Ont.

Steel Castings

of Any Analysis

Carbon, Manganese, Nickel, Chrome and Forging Ingots, etc.

WABI IRON WORKS COMPANY, LIMITED, New Liskeard, Ont.

Mining Machinery

Iron Castings, Crushers, Rolls, Tanks, Pumps, etc.

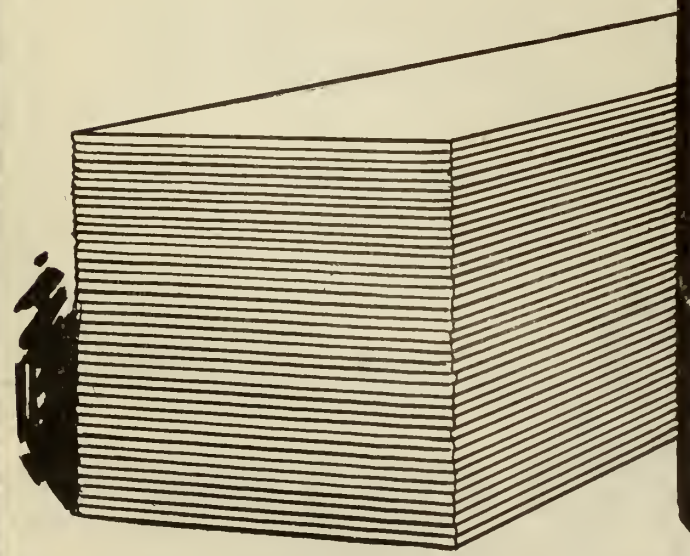
BOVING HYDRAULIC AND ENGINEERING COMPANY, LIMITED

Lindsay, Ont.

Turbine Water Wheels

Pumps for pulp and paper mills, Pumping Engines for municipal purposes, Centrifugal Pumps.

Deep Drawing Plate



WE manufacture plates of various drawing qualities for such work as

AUTOMOBILE FRAMES
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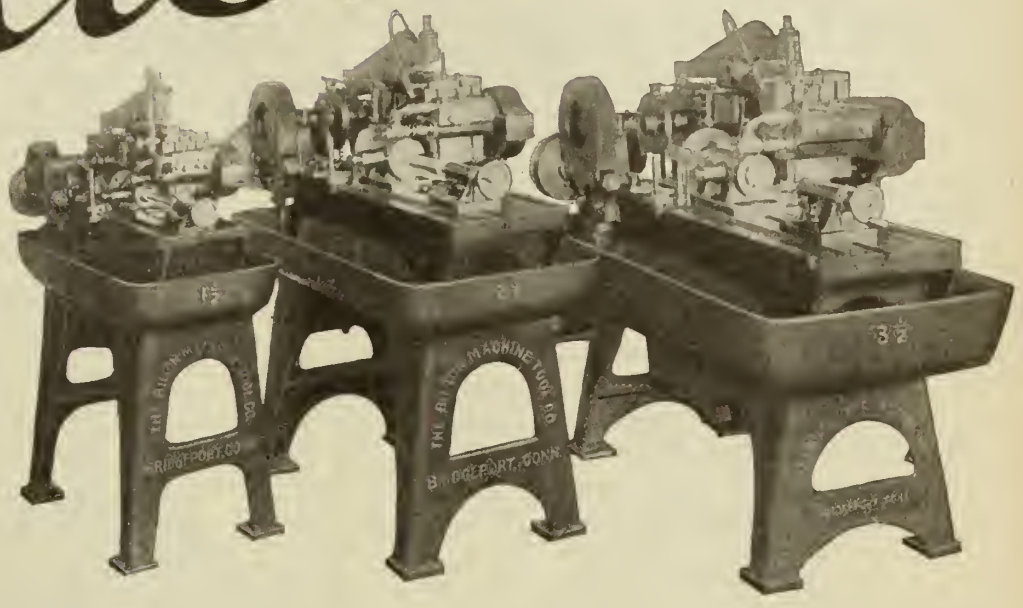
BRAKE DRUMS
and
PRESSED STEEL PARTS
of all descriptions

DOMINION FOUNDRIES and STEEL, LIMITED

HAMILTON, ONTARIO

Bilton GEAR MILLERS



Fully Automatic

Their adaptability is almost unlimited on small work—such as cutting spur, bevel, miter, angle gears, saws, ratchets, sprockets, cutters, knurls, taps, cylinders, form cutting, manufacturing, milling, etc.

A big time saver, as indexing takes place during return stroke of cutter — which is removing metal 90% of the time.

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Over 500 leading manufacturers now use the Bilton for high production on accurate work

Bilton Machine Tool Co. Housatonic Avenue **Bridgeport, Conn., U.S.A.**

Foreign Agents: Alfred Herbert, Ltd. Chas. Churchill & Co., Ltd.

"Hisco" Machine—Molded Gears

The fact that "Hisco" Machine Molded Gears require no pattern is a factor of considerable importance when the price of lumber and labor is so high. "Hisco" quality insures accurate dependable gears. Remember—the price of "Hisco" gears does not include the cost of patterns.

We are also manufacturers of Steel, Chrome, Manganese and Nickel Steel Castings, Annealed and Unannealed; Cement Mill and Mining Machinery; Castings; Stamp Mills; Crushing Plants; Excavating Outfits; Steel Car Wheels; Locomotive Driving Wheels and Frames, etc.

Let us know your requirements—we do the rest

Hull Iron & Steel Foundries, Limited

HULL, Quebec

ROCKFORD

—the best for varied work

General manufacturing plants prefer the **Rockford Miller** because they require a machine which they can depend on to do any work within its range to the complete satisfaction of the inspection department.

Simplicity of operation and **absolute rigidity under every condition** are distinctively **Rockford** features. They have made this the very best machine for general manufacturing.

Full details on request

Rockford Milling Machine Co.
Rockford, Illinois

Agents:
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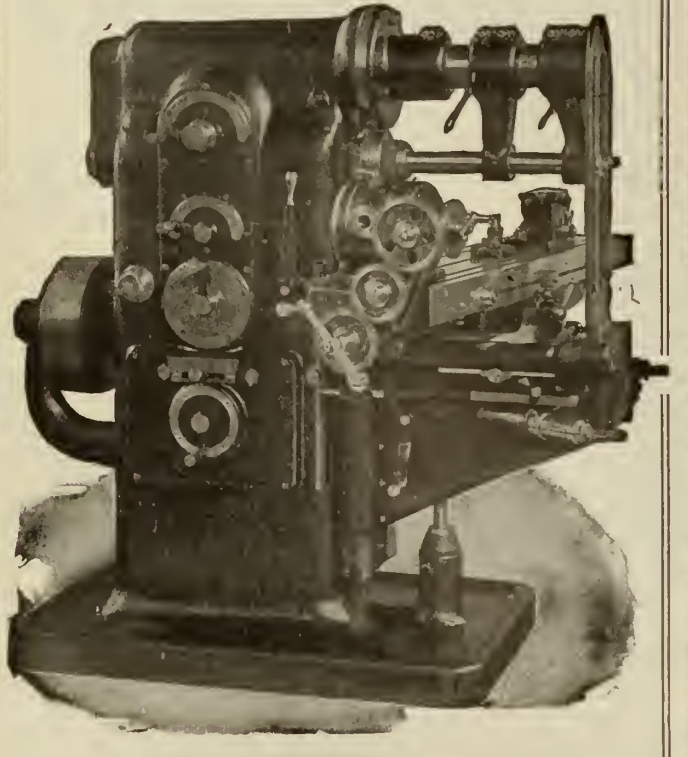
Toronto

A. A. Jones & Shipman, Ltd., Leicester, England, Great Britain; Louis Besse, Paris, France and Belgium; Societa Anonima Adler & Co., Milano, Italy, Italy and Colonies; Rylander & Asplund, Stockholm, Sweden, Scandinavia; Casamitjana Hermanos, Barcelona, Spain, Spain and Portugal; Selson Engineering Co., Melbourne, Australia; M. Mett Engineering Co., Petrograd, Russia.



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Engineers, Manufacturers and Erectors of Steel Structures

Industrial Bridges, Buildings, Towers, Smoke Flues and Stacks, Chutes, Coal Bins, Ore Bins, Tanks, Cranes, Engine Houses, Grain Elevators, Derricks.

Structural Steel and Steel Plate Work, and a combination of the two lines.

Prompt Deliveries Assured

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ACCURACY ASSURED

You can always depend upon Dunbar Springs being accurate. Before proceeding with any order the first few springs are carefully tested and checked up for this very purpose.

Seventy-two years' experience making flat and spiral springs of every description enables us to furnish you with springs of the highest quality, that can be depended upon under all conditions.

Send blue prints for estimates.

The Dunbar Brothers Co.
BRISTOL, CONN.

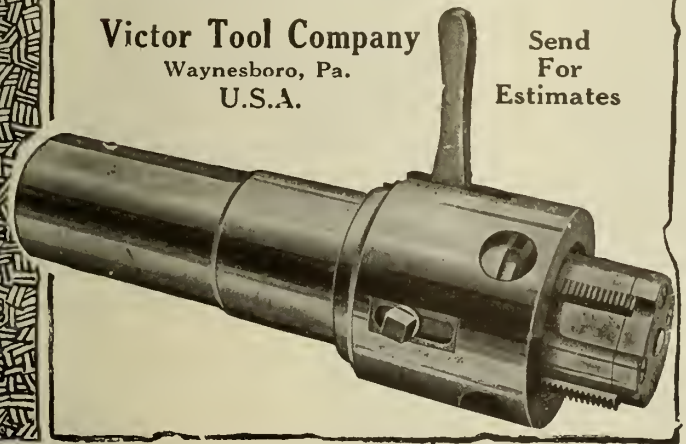
We wanted something original—this is what we got

"BOTH of these operations and half another — I'll show you later—completed in the time our old taps took to do one; that, I guess, is why we continue to use your Victor Collapsible Taps."

It was the often-heard story of time saved, of costs lowered, of all threads clean and smooth. And it was pleasant to hear.

Victor Tool Company
Waynesboro, Pa.
U.S.A.

Send For Estimates



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FOR TRUEING GRINDING WHEELS

QUALITY SERVICE SATISFACTION
INDUSTRIAL GEMS

Tools For All Mechanical Purposes
FURNISS CLARKE & COMPANY
364 University St.
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Sole Canadian Agents for
THE JOYCE-KOEBEL COMPANY, INC.
Formerly Geo. A. Joyce Co., Ltd.
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Pittsburgh, Pa. U.S.A.

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Tools that Assure Maximum Production

The design, quality of material and workmanship represented in **Butterfield** Tools have placed them in the front rank.

Many manufacturers thought their machines were producing all the work they could expect until they tried the **Butterfield** Taps, Dies, Drills, Reamers and Milling Cutters.

You give them a trial order and watch results!

Butterfied & Co., Inc. Division

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Rock Island, Que., Canada

Toronto Office: 220 King Street West

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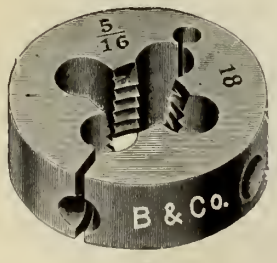
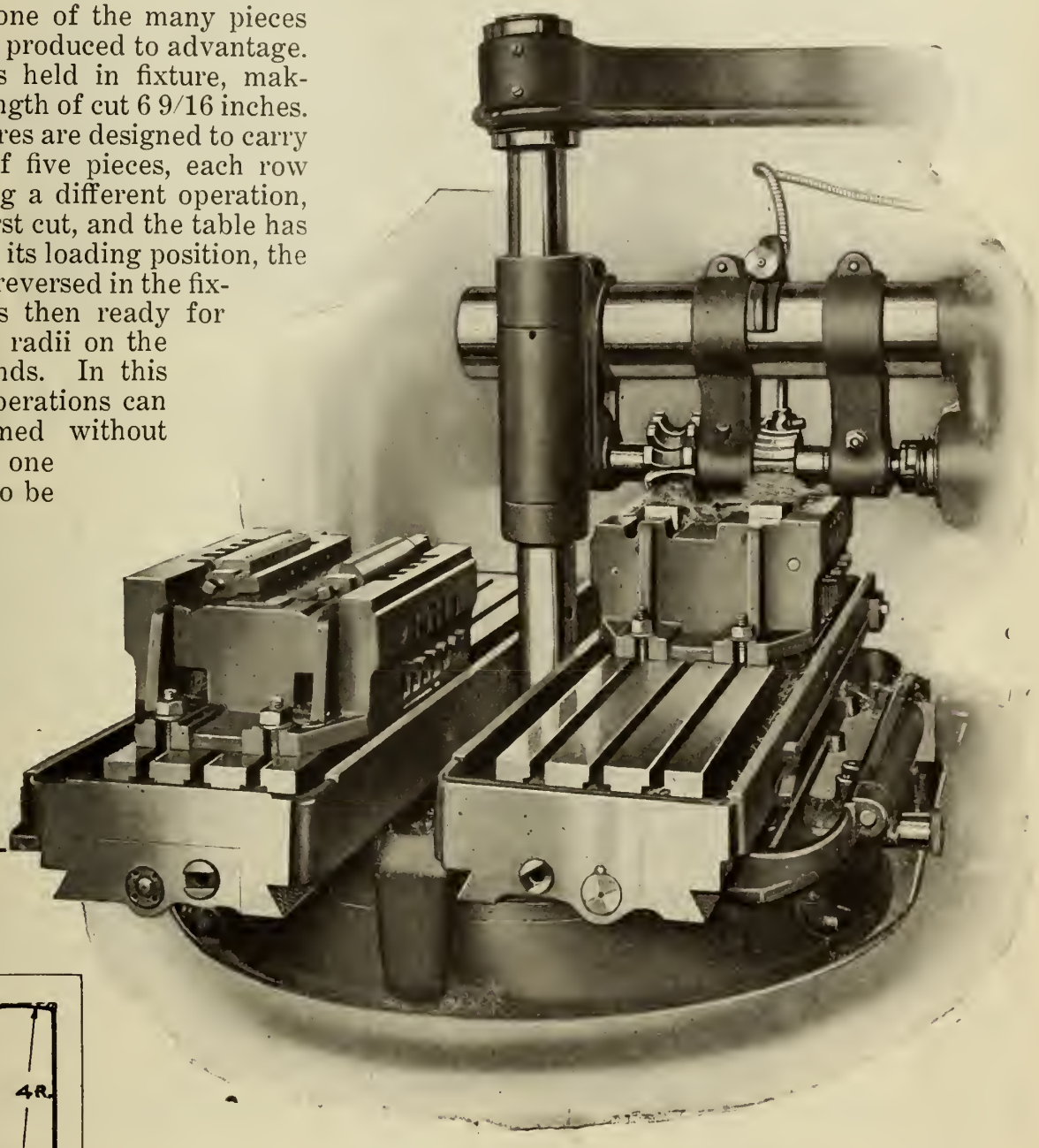
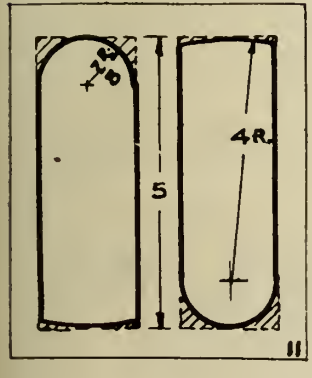
"The Tools You Buy Again"



Two Operations
at the same time

Here is one of the many pieces that can be produced to advantage. Five pieces held in fixture, making total length of cut 6 9/16 inches. These fixtures are designed to carry two rows of five pieces, each row representing a different operation, after the first cut, and the table has revolved to its loading position, the pieces are reversed in the fixture and is then ready for milling the radii on the opposite ends. In this way two operations can be performed without waiting for one operation to be completed.





Compare this with your work and investigate this manufacturing proposition.

Canadian Offices: POTTER & JOHNSTON MACHINE CO.

ROELOFSON MACHINE & TOOL CO., LIMITED

Head Office and Showrooms: 11 Wellington Street East, Toronto, Canada

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STAR HACK SAWS ARE NOW SOLD BY THE MAKERS

For 37 years we have made Star Hack Saws and owned the famous Star name and brand—selling our saws through the Millers Falls Co.

This arrangement is terminated August 15th by mutual consent and we will hereafter market Star Saws ourselves direct to the trade. This development from sales agency representation to direct selling has been going on in every line of business. Factories have found out that when they sell their own products they are in a position to give the most effective trade and users' service on the goods they make.

This is exactly what the Clemson selling service now means to Star Saw users and the trade. It means a closer understanding and a more constructive service, because the same organization that makes Star Saws will now be in direct contact with the customers who buy and use them.

Star Saws themselves will continue the quality leadership that for 37 years has made them the standard blades. Star reputation has cost us a life-time of effort that makes us guard it jealously and concentrate our every resource and energy in maintaining and increasing it.

The high speed qualities of the steel—the undercut hook on the teeth—and the toughness secured by special heat treatment—these recognized points of Star Saw superiority are thus standardized by uniform methods of production. Thus you can be sure of securing satisfactory service from every blade you buy in the famous green box —whether it is a power or hand blade —all hard or flexible.

Star Hack Saw Blades are made of tungsten steel.
Machine and Hand Blades---Flexible and Hard
Clemson representatives cover the country in giving Star service. Write our office at Middletown, N.Y.

CLEMSON BROS. INC.

MIDDLETOWN, N.Y.

Canadian Office and Warehouse:
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Cable Address:
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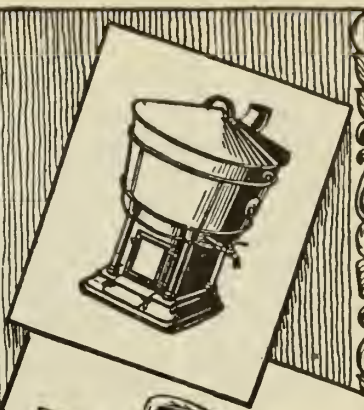
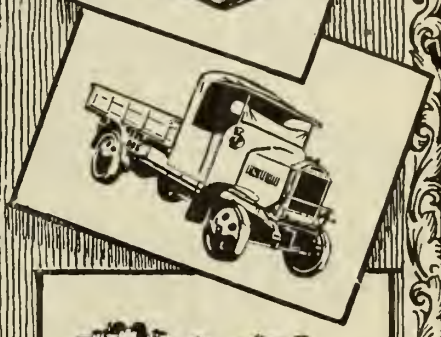
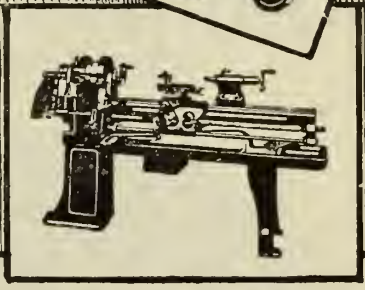
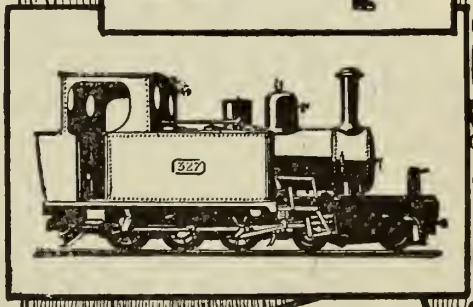
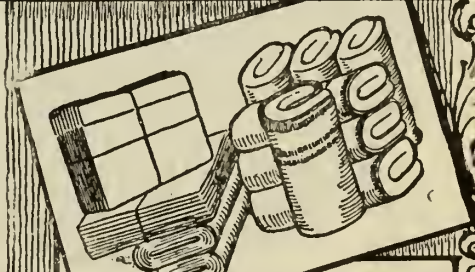

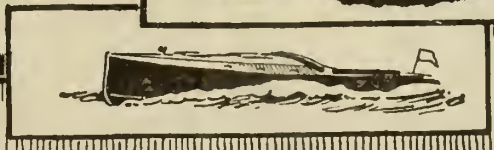
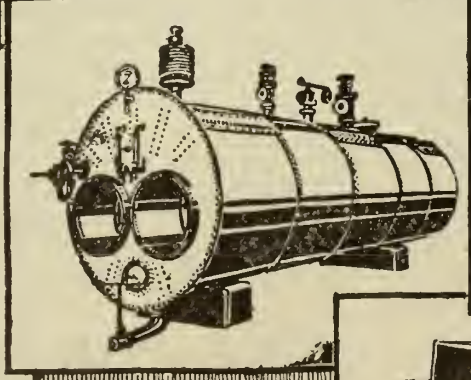
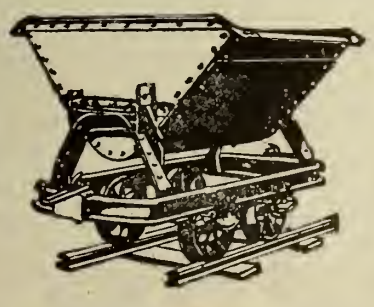

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John T. Hepburn, Limited, will give you satisfaction in every way.
Have us advise you on the type of pump you need, estimate the cost and build your pump.
Your requirements of special machinery, cranes, derricks, presses, planers, grey iron castings and blacksmith work will receive our careful attention.

JOHN T. HEPBURN, LIMITED
Engineers and Iron Founders
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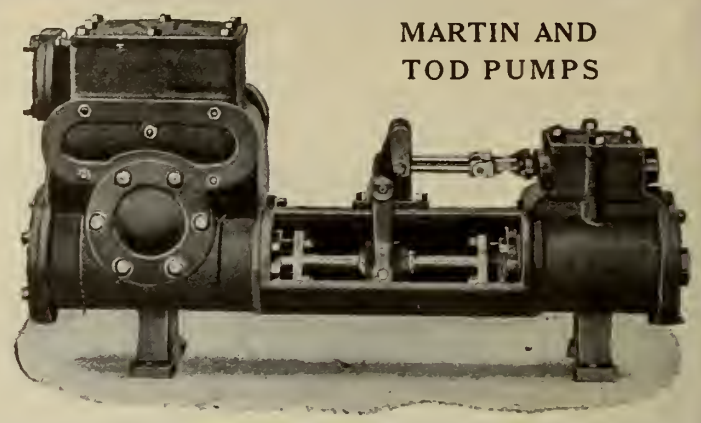
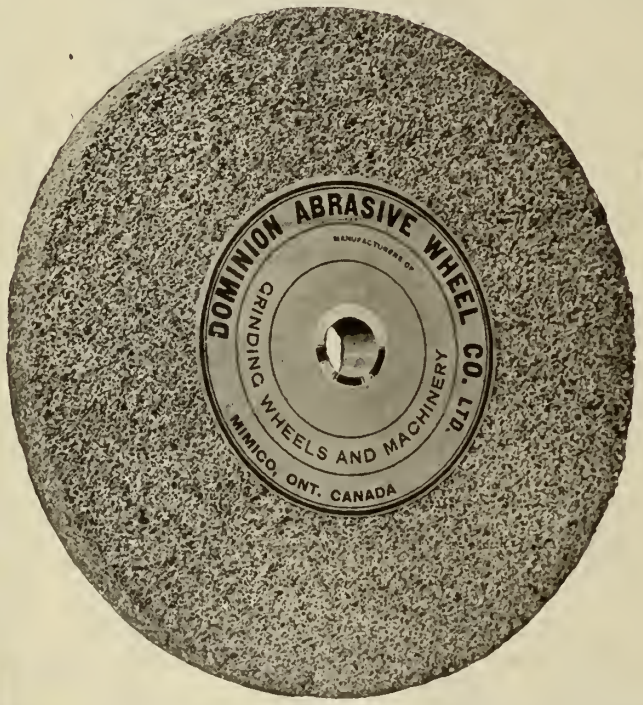


MARTIN AND TOD PUMPS

DOMINION GRINDING WHEELS



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We know you have no use for wheels which will not stand up and do high-class work, even though they do cost you less to buy. You want quality at the lowest price. And that means Dominion Wheels!

Dominion Wheels are made of abrasive from our own factory, thus ensuring uniform grade and grain.

By purchasing Dominion Wheels you save duty and exchange. When the quality is right, is there any reason for sending your money out of the country?

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HOLES THAT ARE STRAIGHT
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The "MORSE" DRILLS
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Why?

Morse Chain possesses the exclusive
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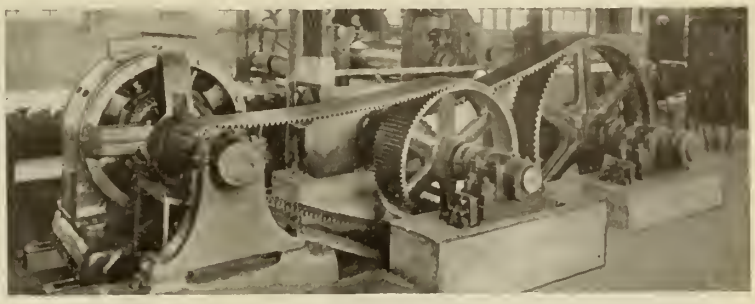
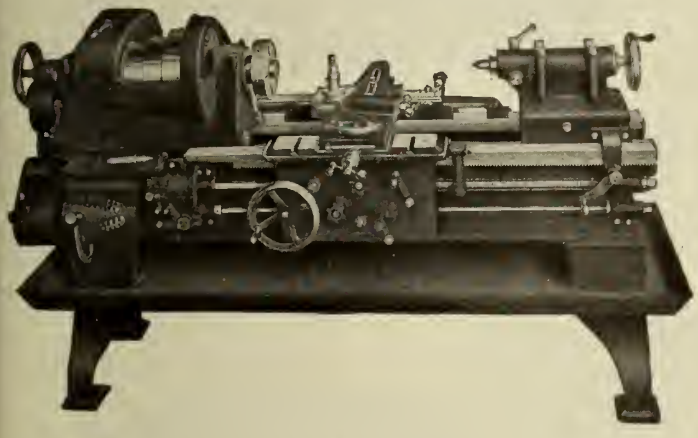


80 H.P. Morse Drive to Rolls, reverses direction every 45 seconds

"LEHMANN LATHES"

Will Put the Same Degree of Efficiency Into *Your* Shops as They Have in Many Others



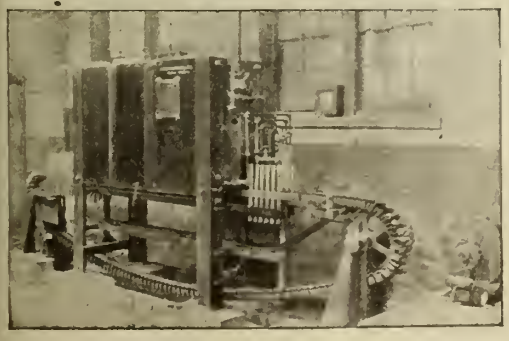
TWO SIZES—16", Swing 18¼" and 18", Swing 20¼"

Because they are constructed "right" of the best material, workmanship and design, and therefore are adaptable to all conditions, whether it be work requiring accuracy to the highest standards or for the heavy duty where power, strength and rigidity are required.

Convince yourself of these facts! Let us send you complete specifications of this superior lathe and the names of some of the larger concerns who are using "LEHMANN LATHES" for better results.

We know you are interested, so don't put off writing us. Do it to-day. Now!

LEHMANN MACHINE COMPANY, 612 S. BROADWAY, ST. LOUIS, U. S. A.



Automatic Tube Annealing Furnace.
An example of "Quantity Production of Quality Product" made possible by use of Automatic Furnace.

AUTOMATIC FURNACES

will they help ME?

That depends on the kind and quantity of material you handle per day, the regularity of its flow, layout of plant and machinery, fuel available, etc.

Having designed and built hundreds of Automatic Furnaces for many industrial heating requirements, we can help you determine whether the automatic furnace and continuous method of heat-treating would improve your product and lower its cost.

Many interesting applications of the continuous method to the field of industrial heating are shown in Bulletin 217-T. This bulletin illustrates and describes both the furnaces and the heating and handling methods employed in a great variety of manufacturing operations.

Write for copy of bulletin to

Canadian Representative
R. J. McLEAN, 604 SOUTHAM BLDG., MONTREAL, P.Q.

We Make Industrial Heating Furnaces for Every Requirement.

"Furnace and Fuel to Suit the Work"

W. S. ROCKWELL CO. INDUSTRIAL FURNACES ESTABLISHED 1888 50 CHURCH ST. NEW YORK

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Prompt shipments of all Standard Sizes in
Cap Screws, V or U.S.S.
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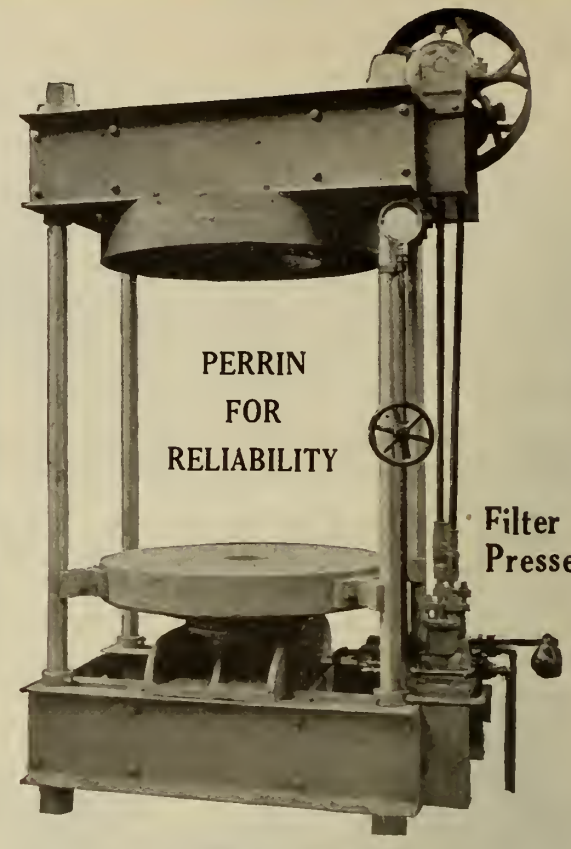
Send us your rush orders.

THE
GALT MACHINE SCREW CO., LIMITED
GALT, ONTARIO

Eastern Representatives: The Canadian B. K. Merton Company Limited, 49 Common St., Montreal, Que.



Hydraulic Truck Tire Press

WILLIAM PERRIN LIMITED - TORONTO

The Acknowledged Leader

In every field of industry there is one acknowledged leader by which all others of its type are judged.

The Chasers of the HARTNESS AUTOMATIC DIE hold this enviable position. Their superior efficiency is not a mere claim, but the verdict of expert mechanics based upon exhaustive tests covering many years of service.

For precision work, we can furnish chasers with a lead guaranteed within 0.001 inch per inch of thread.

Quantity and quality of output are the predominant factors upon which their reputation is built.

Jones & Lamson Machine Company

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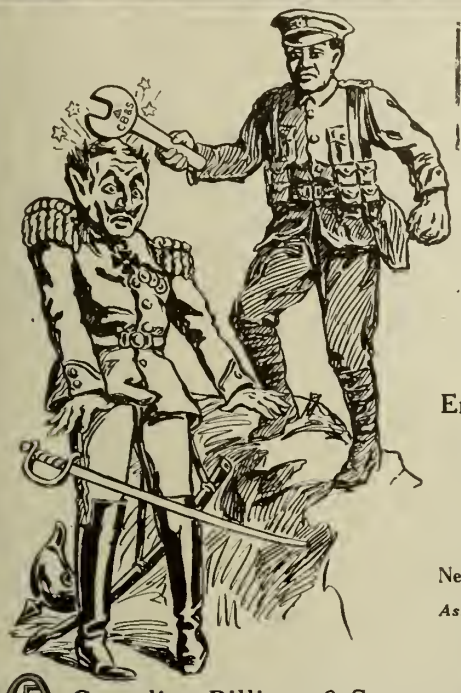

If a Bad "Nut" Gets Loose —Use a Wrench

Endurance Brand

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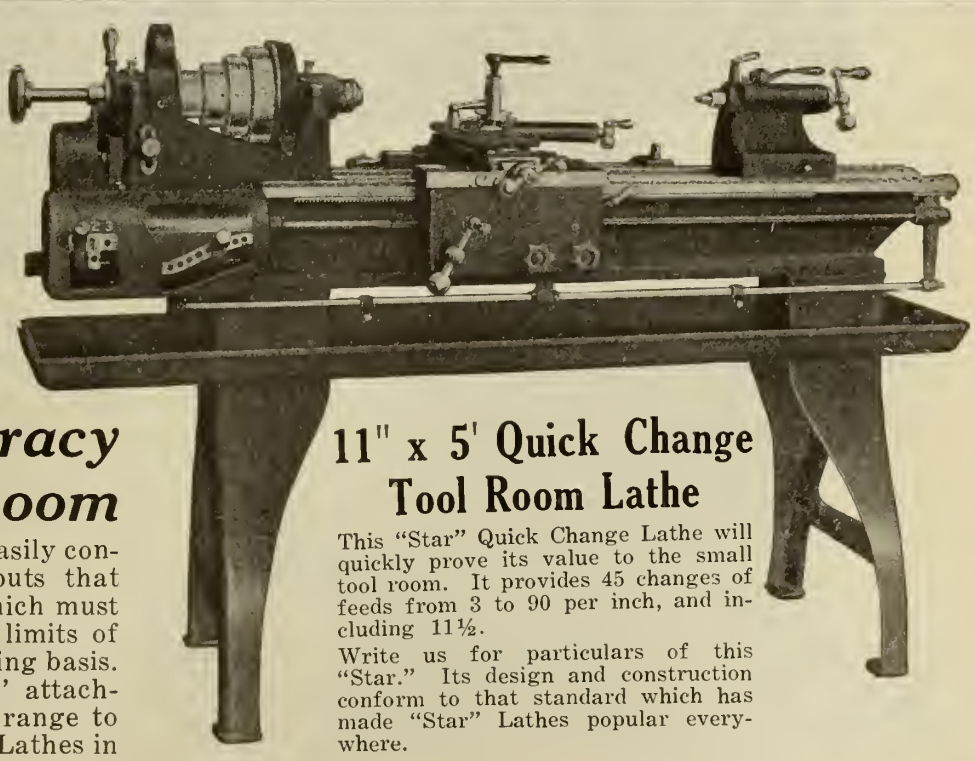

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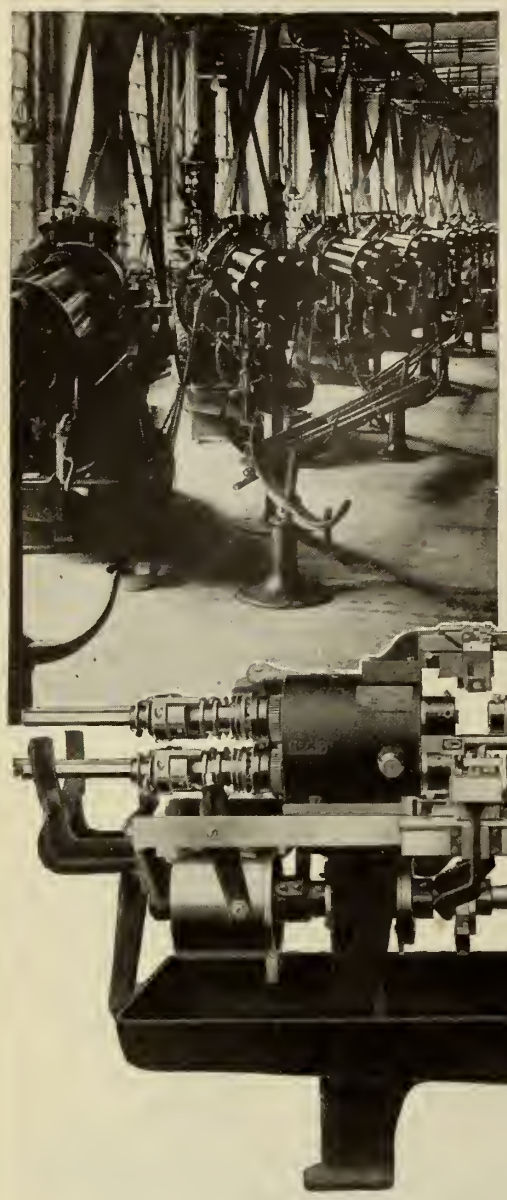

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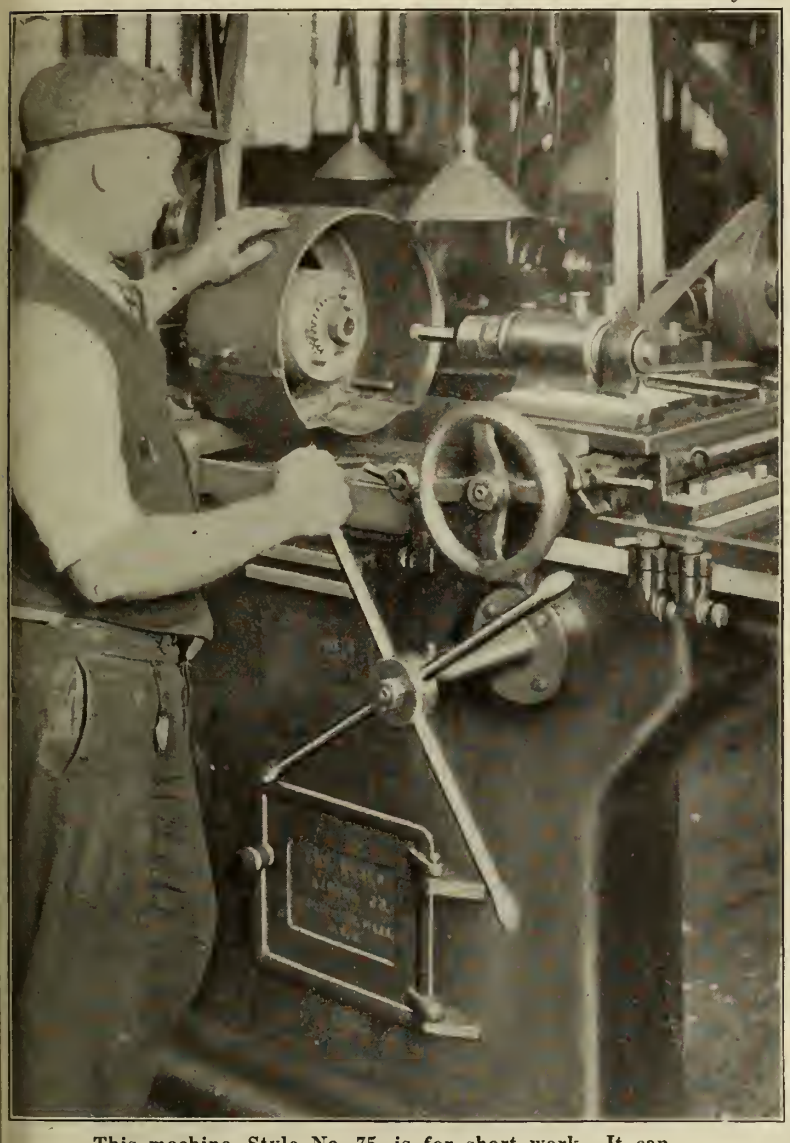

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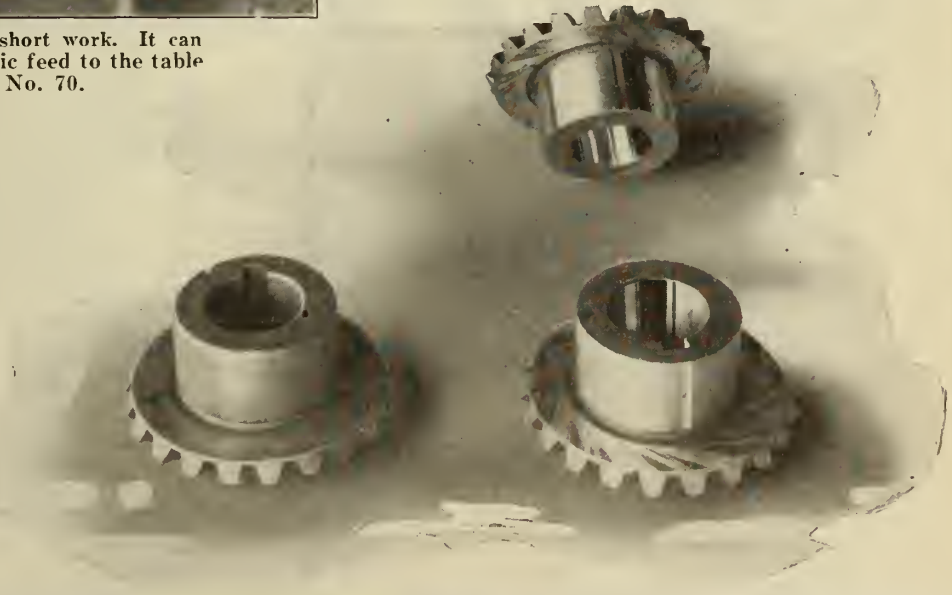

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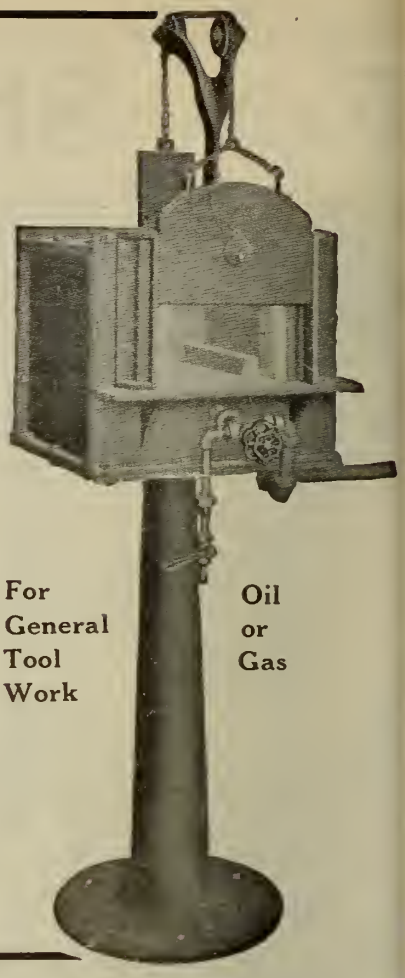

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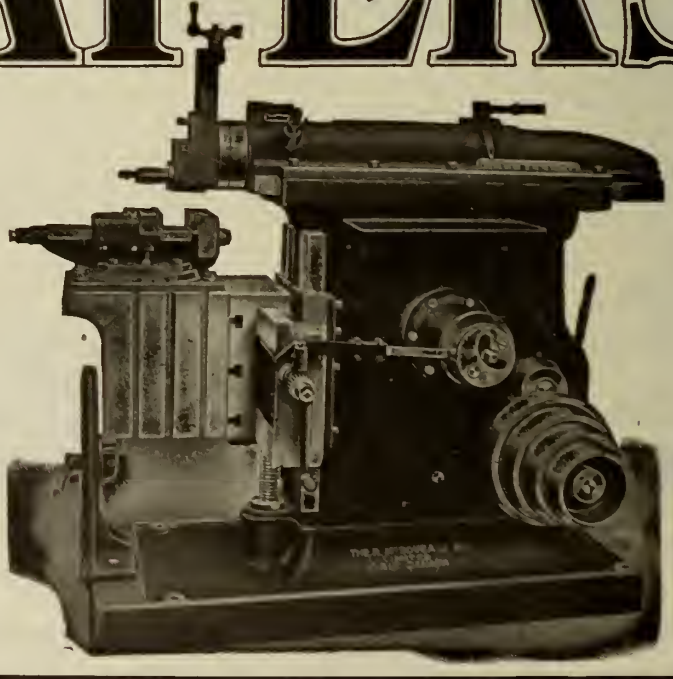

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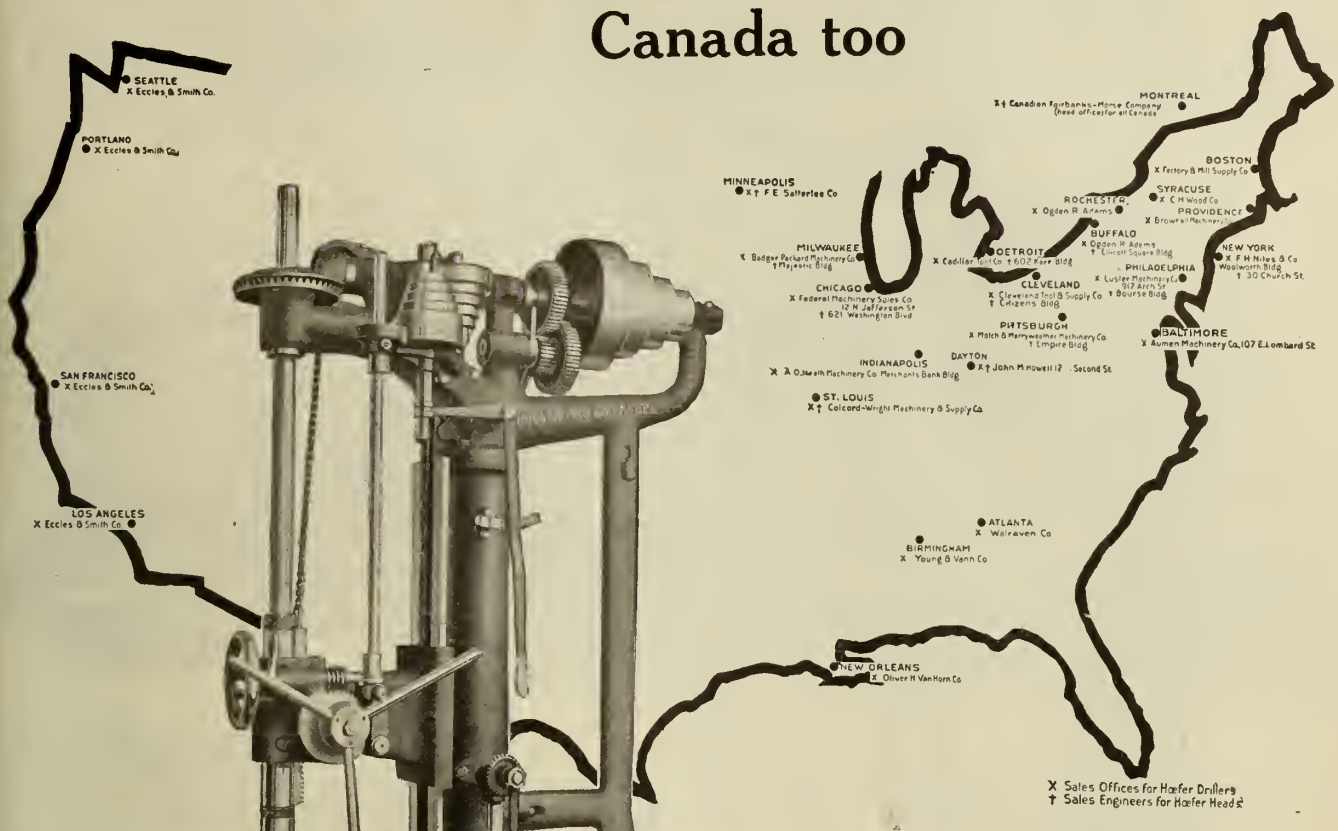

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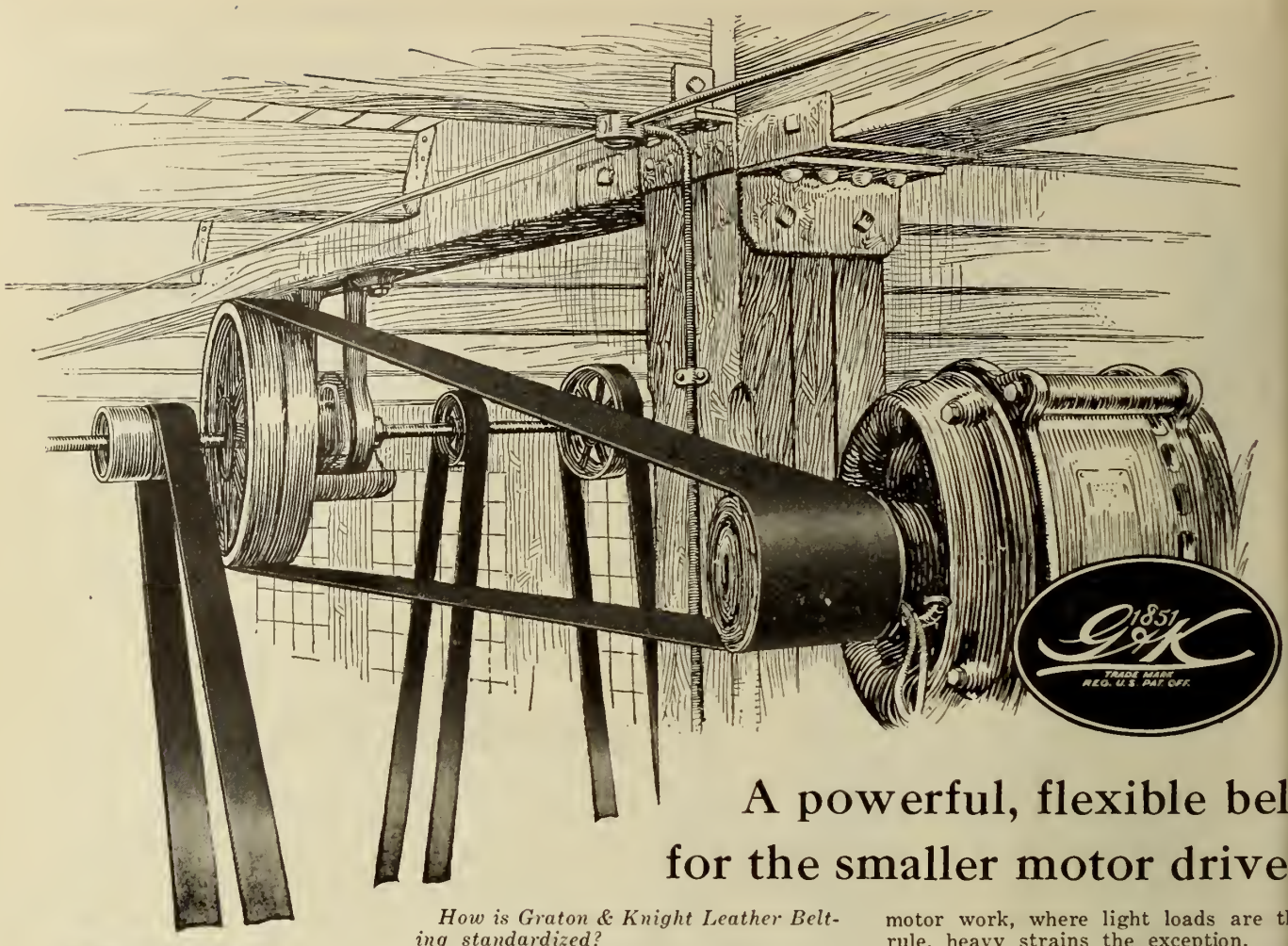

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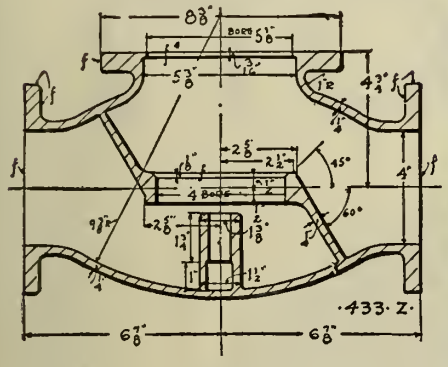

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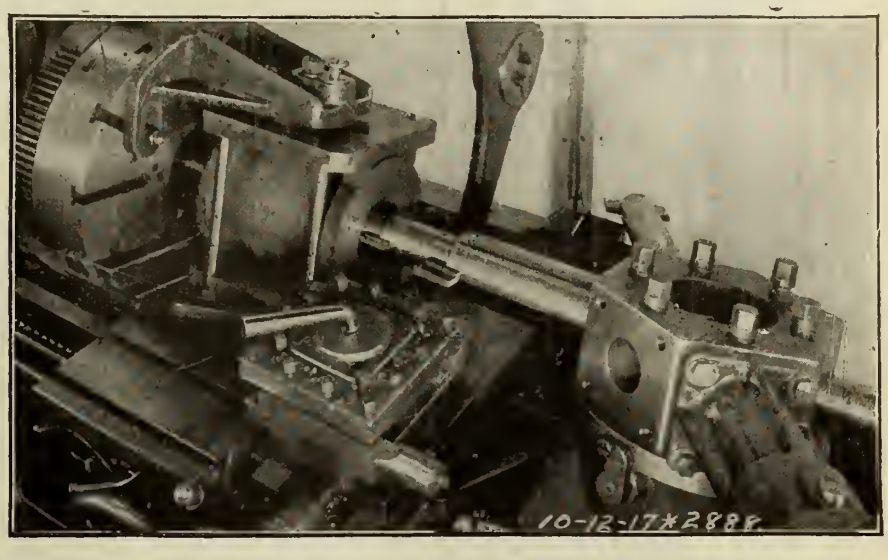

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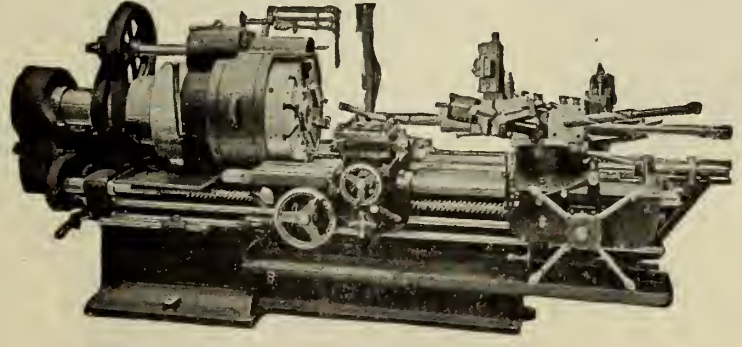

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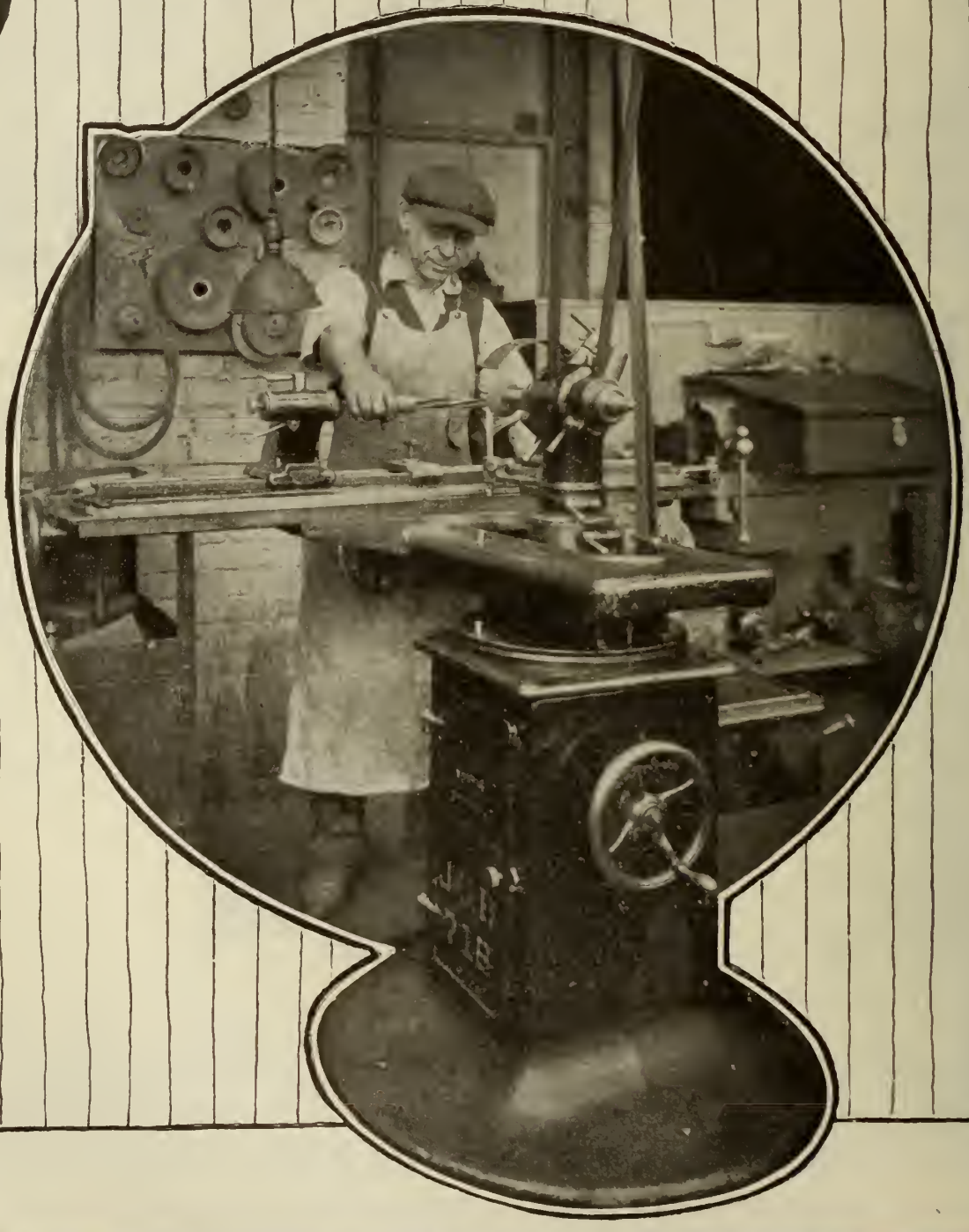

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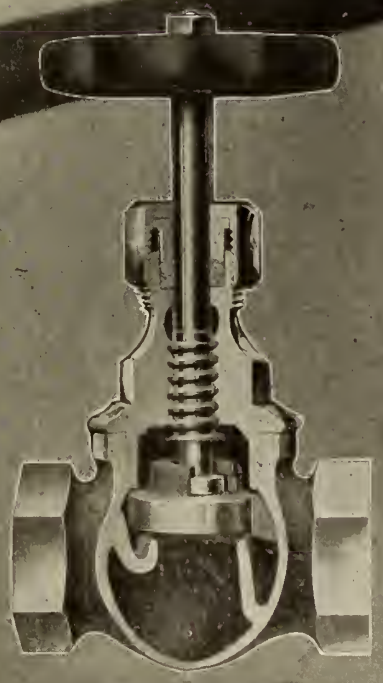

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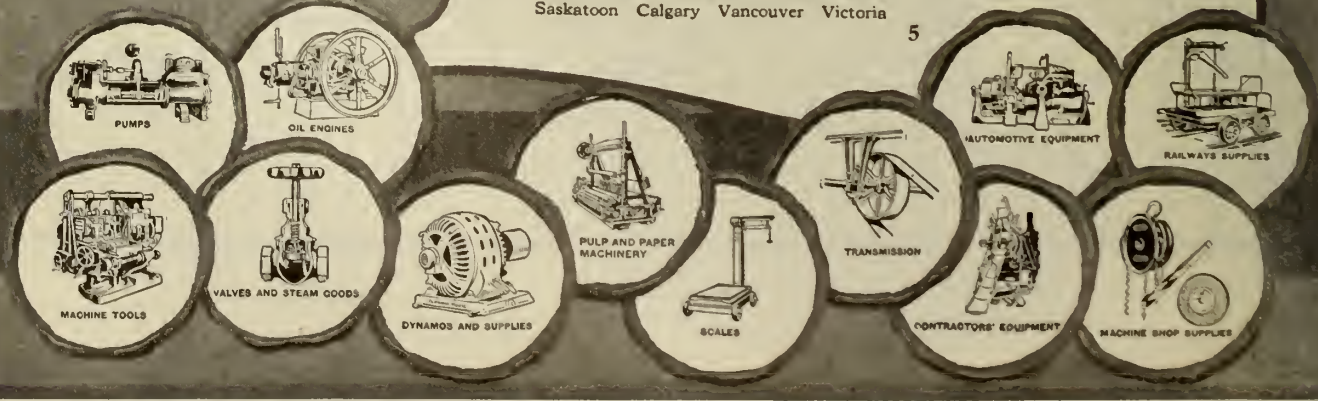


CANADIAN MACHINERY
AND
MANUFACTURING NEWS

Vol. XXIV. No. 12 September 16, 1920

Various Devices Which Have Proved of Value

The Fixtures as Explained Herein Have Proved Themselves to Be Both Time and Money Savers—It May Be Possible that You Can Adapt the Same Principle to Your Line.

By J. H. MOORE

WE will make no attempt in the following article to confine ourselves to any one type of fixture, but will illustrate and describe four distinctly different devices which we noticed on a short tour through the plant of the Willys-Overland Co., Ltd., at Weston, Ont.

Of course, everyone understands that this concern manufactures the Overland Four automobile, therefore the devices shown are used in the manufacture of the various parts going into the completed product.

The first of these fixtures, Fig. 1, is a simple, yet very efficient milling jig, used on a vertical spindle miller. The work being performed is the milling of the crank shaft bearing caps, and ten caps are held in the fixture. One station is, of course, used for loading, as is the general practice. Note the fact that this fixture has a plate on its side fastened by four button head screws. On the plate is stated the name of jig, what it is for, etc., etc.

The scheme of marking fixtures in this way is one that should be more generally carried ont. The tool and fixture room attendant has no trouble in giving out the correct fixture, and when a great amount of somewhat similar fixtures are used, as in this particular plant, the idea becomes still more valuable. As the fixture shows up so clearly in the photograph we need go into no further details.

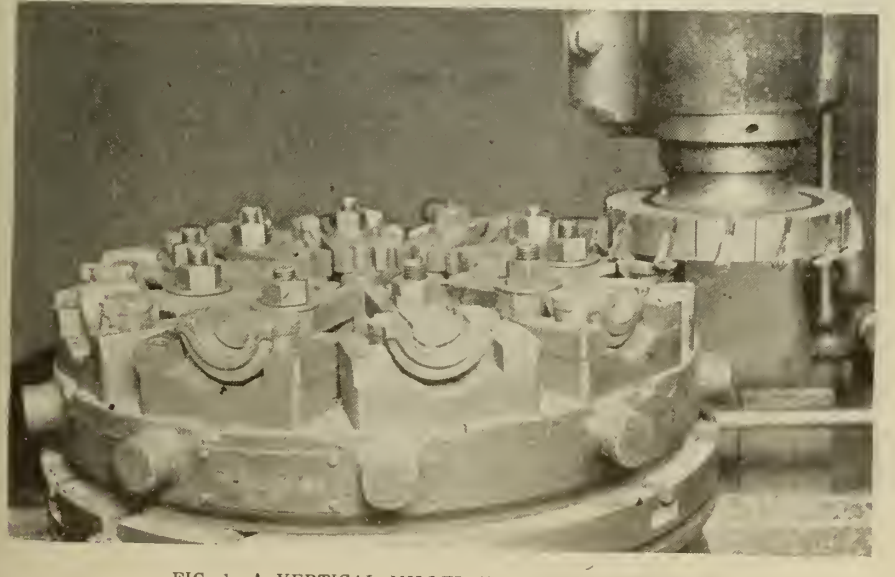


FIG. 1—A VERTICAL MILLER FIXTURE OF INTEREST.

Still another milling fixture is shown at Fig. 2. In this case the work being performed is the milling of the bosses on what is known as the Front Spring Yoke. These yokes are made of forged steel, which later goes through a hole in the yoke, rests on this step, and is thus prevented from turning while tightening the nut. Twelve cutters are used on the arbor, and six yokes are placed in the fixture, three to each side.

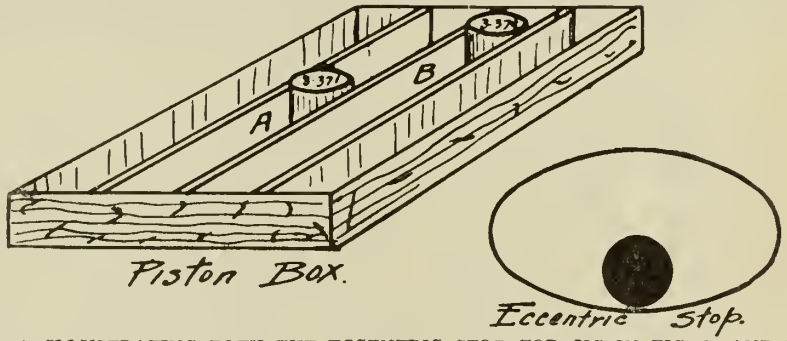


FIG. 4—ILLUSTRATING BOTH THE ECCENTRIC STOP FOR JIG IN FIG. 3, AND THE STYLE OF PISTON BOX AS USED IN TESTING.

The fixture is of the revolving type, being locked in position by a spring pier actuated from a convenient handle. While the machine is performing the work on one side of the fixture, the operator loads the other. The turned portion of the yoke rests in Vee blocks, and the clamps shown have a spring behind them in order to aid quick release. Note that good lubrication of cutters is provided for, as the lubricant tube stretches entirely across the gang of cutters. In 8¾ hours somewhat over 200 of these yokes are machined.

Boring Fixture

The third photo, Fig. 3, illustrates a fixture very much out of the ordinary. The portion shown is the rear axle housing, and the operation is that of boring out, on a Bullard mill, the hole in which one of the boring heads is shown.

It is absolutely essential that this hole be central with bosses on the inside of the partially assembled casting, for it is in the inside that the gears perform their duty. A little deviation from the

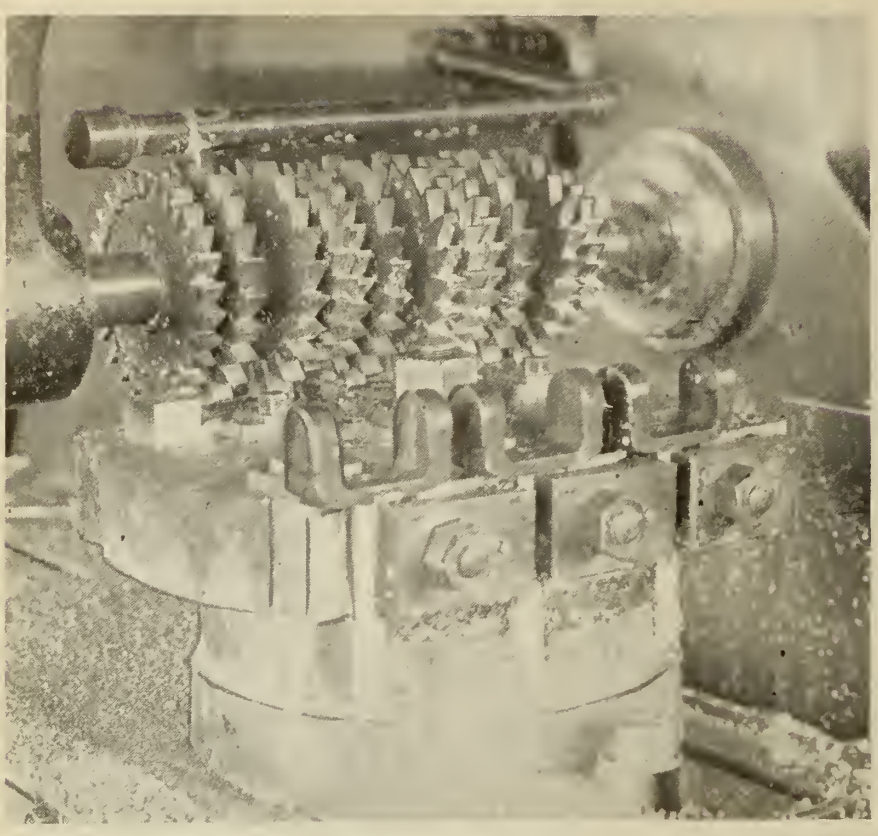


FIG. 2—MILLING FRONT SPRING YOKES ON DOUBLE JIG.

correct measurement means that the gears will not meet properly, and readers know what such a condition leads to.

Picture to yourself two bosses in the interior, approximately about E and F. It is the boss E that we are particularly interested in. An eccentric oval shaped disc, as shown at Fig. 4 is fastened to the shaft on which the handle A is placed. In loading the jig, the end C is placed in the guide bush as shown, and the other end is placed on a similar shaped guide, attached to the starwheel B.

The handle A is now used to bring up into position the eccentric disc already spoken of. The wheel B, which has a threaded portion working in the boss of jig, is screwed up until the complete housing is tightened and set in position from the inside, boss E resting against the eccentric disc.

The adjustable screw D is merely a leveller and chatter stopper, and the clamp at right hand end of the fixture swings out of position when you wish to unload the work.

Assembling Stand

The stand shown at Fig. 5 is one used with great success in making any necessary repairs or adjustments to the engines after testing. It will be noted that the complete engine is swung on the moving member and that this portion of the stand can be locked at various angles. No matter what part of the engine you wish to get at, the use of this stand makes it easily accessible. The remaining details being so self-apparent, we will not dwell further on the matter.

Other Items of Interest

In our little tour through the plant we saw various other features of interest, one of which was the quantity of single spindle drills made into multiple spindle machines, through the use of multiple spindle drilling heads. In some cases two spindles were used, while in other cases all distances of centres and numbers of spindles up to as high as seven were used. On special duplicate work, such as is accomplished in this plant, the use of multiple heads is a splendid idea, for you secure at low cost, a double purpose machine.

We noticed a very novel tapping fixture for tapping the holes on the rear axle housing. This housing is shown at Fig. 3. The fixture was nothing but a flat plate on which run a series of balls. These balls, of course, ran in a circular race. Another plate, which was of correct shape to hold the housing, rested on these balls and floated, so to speak, with no appreciable effort. The operator simply brought down his spindle, the tapping chuck accomplished the work, and, as the tap entered the hole, the fixture floated itself central to the tap.

Another scheme we saw that was worthy of note was the method of segregating the pistons after testing. It might be well to add that all pistons are tested on a Prestwich fluid gauge, and must be correct to size. So important are they in this regard that they have arranged a box, shown at Fig. 4, to accommodate the different sizes encountered.

For example, suppose a batch of pistons measure 3.371" to 3.373". They are placed in section A, but should the pistons measure exactly 3.370" they are placed at B, and so on. Every piston is stamped as to its measurement, and there can be no mistake on this point.

From these few examples one can readily draw the conclusion that when you have a standard product to manufacture the answer to maximum production is efficient fixtures, and the Willys-Overland Co. have certainly paid good attention to this very essential detail.

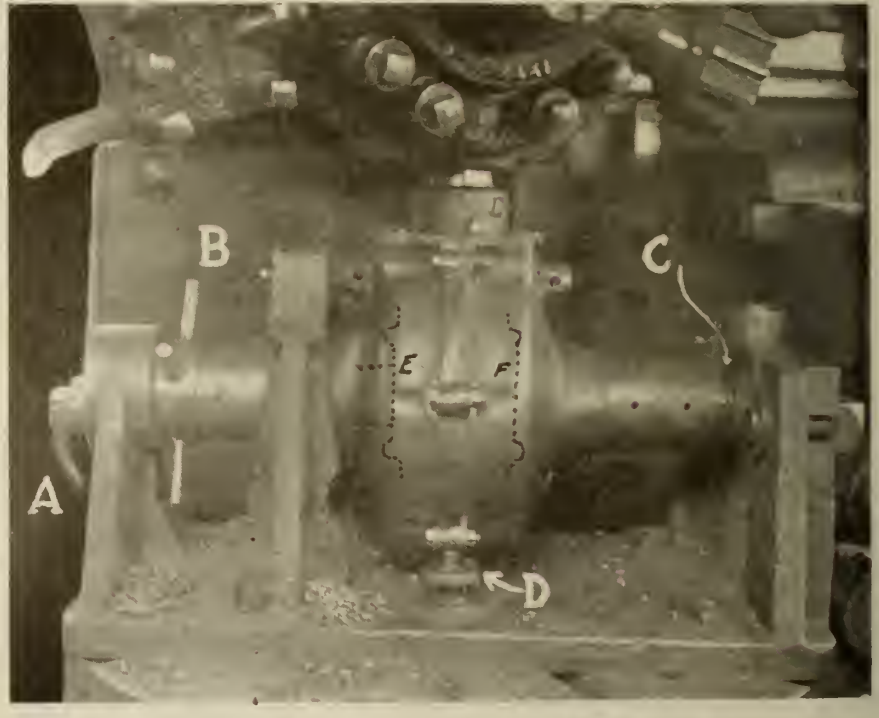


FIG. 3—BORING FIXTURE FOR REAR AXLE HOUSING.

CARE OF PATTERNS

By H. Bentley

The treatment usually accorded to patterns is far from what it should be, considering the time and money that are expended on them. In recent years some of the larger engineering works have paid particular attention to this department, but with the exception of these the methods usually adopted are very haphazard, so says the author in "Mechanical World." Possibly the explanation for this state of affairs is to be found in the fact that patterns, like drawings, are considered a necessary evil, and only a means to an end, and so expenses in connection with same are cut down to a minimum. The time and money that are wasted, and the annoyance that is caused, due to the bad handling and misplacement of patterns, have caused many a manager to think furiously. With the large works, where an elaborate system is in operation and a man has control of the patterns both in and out of the stores, we need not deal. But, obviously, when such a system is in vogue successfully in a large works, one can reasonably expect a less elaborate system to work satisfactorily in the smaller shop. The works which allows its patterns to be huddled together, large and small, cannot realize the wastage of time caused by this lack of system. If once the care and storage of the patterns were allocated to some responsible person, the saving effected would many times outweigh the extra cost involved.

Where the foundry is integral with the engineering works the consequences are perhaps not so serious as in the case of general iron foundries. At the present time, when castings are so difficult to obtain and patterns are being duplicated and sent all over the country to try to keep up with the requirements, one can readily understand the irritation and delay which are caused by an incomplete or a dilapidated pattern being despatched. The proper provisions for storing the patterns systematically are, of course, just as essential in the foundry as in the works. The usual practice is to maintain patterns at the foundry that are in constant use, while those that are only used occasionally may be returned to the works. It appears rather strange that many firms with excellent stores for finished parts consign their patterns to any dark old corner in the works. Proper care and attention to the patterns mean better and quicker work in the foundry, for dilapidated patterns usually produce unsatisfactory castings.

An Essential

One of the first essentials to a satisfactory system is, of course, a proper record of all patterns, and for this purpose a record book should be kept, with full particulars as to loose bosses, coreboxes, etc. This book should be divided into sections for the different types of machines that are manufactured, and some system of numbering adopted which allows of easy reference by person, telephone, or letter. The writer prefers the method which adopts an initial letter for the type of machine—say, A for lathe, B for drilling machine, C for planing machine—and where various sizes of these machines are built a figure should precede the letter—say, 1A for 6 in. centre lathe, 2A for 7 in., 3A for 8 in. centre lathe, etc., and simliarly with the other types of machines. The arrangement allows the type and size of machine to be quickly determined. Further, the separate patterns for each machine should have an individual number, which should follow the letter, and as far as possible the similar part in each machine should have the same number. For example, for 8 in. lathe parts the following system may be followed: Bed, A1, gap-piece, 3A2; large cabinet, 3A3; small cabinet, 3A4.

Brass figures can be obtained which can readily be fastened to the patterns, and each loose boss and corebox should have the numbers imprinted by metal letters and figures in an unmistakable manner. If proper supervision is made of the numbering, no difficulty should be found in allocating the proper pattern with bosses and coreboxes. The pattern-maker usually marks both loose pieces and coreboxes in such a way that no mistake will occur in fixing either the loose pieces or arranging the cores.

In addition to the proper identifying of the patterns, a simple plan of storing is necessary unless considerable time is to be wasted sorting through a mass of patterns. The writer is familiar with stores where provision is made for both the patterns that are in regular use as well as those which have been discarded, due to improved design, but which have to be occasionally utilized on account of renewals and breakdowns. The arrangement in each case is identical, the stores being divided into the two sections—up-to-date and out-of-date patterns. These sections are subdivided for the various types of machines. Each subdivision has the patterns arranged on the general principle of large patterns on the floor, medium-sized patterns on shelving, and the smallest patterns in lockers. This arrangement allows ready access to any of the patterns, and between the two main sections sufficient floor space is provided for the fitting together and laying out of any patterns prior to their being sent to the foundry. Similarly, sufficient space is provided to allow for the withdrawal of any pattern without upsetting the others. Pattern numbers should not be transferred from a discarded pattern to a new one, or trouble will result. New patterns should have new numbers.

Considerable Saving

The system is equally good for works or the foundry, and if the issue and care of the patterns are placed in the hands of a responsible person the consequent smooth working which is bound to follow will mean considerable saving in a year's time. If the pattern store is placed in the hands of a person whose only knowledge of them is that they are of wood, then failure will result. Immediate attention and overhaul of incoming and outgoing patterns are essential so that errors and omissions may be quickly rectified.

This arrangement is probably as simple as possible, and for this reason is to be recommended in preference to some of the more elaborate arrangements, which, while answering quite well in a large works, are too expensive to uphold in the smaller works. Printed sheets, with list of parts suitably arranged, facilitate the checking of patterns in and out.

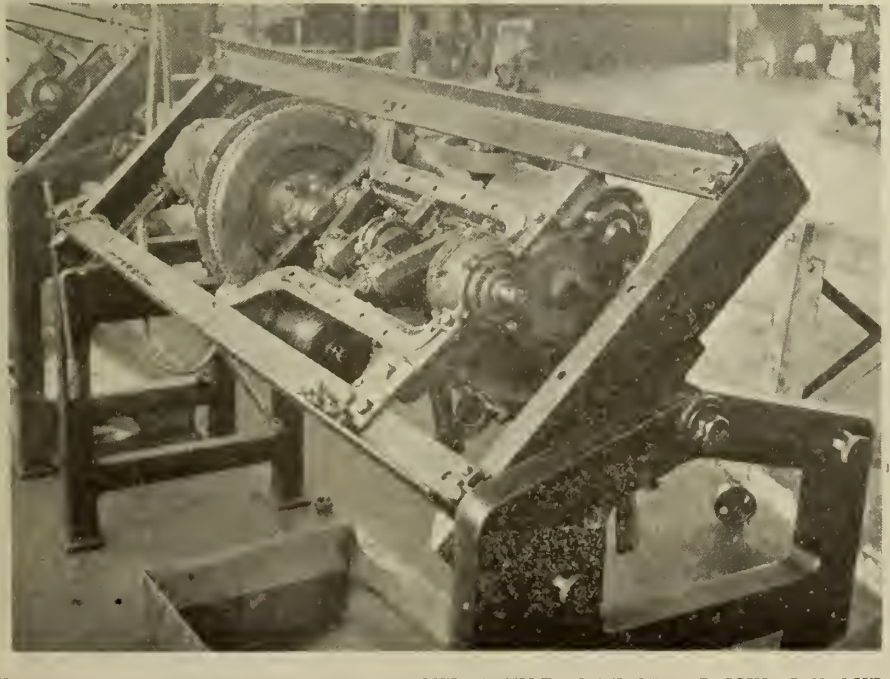


FIG. 5—THIS ADJUSTABLE STAND HAS PROVED ITSELF TO BE OF PARTICULAR VALUE.

Various Examples of Efficient Safeguarding

The Punch Press is Perhaps the Chief Offender as Far as Accidents Are Concerned, and This Article Describing Safety Devices Should Be of Particular Interest.

By A. L. KEAMS, Safety Engineer Simmons Company

PUNCH presses have always been one of my hobbies, because they are the most dangerous. They cut off more fingers than any other machine. The reason for this is that the operator is compelled to place the material into the die, and also to take it out with his hands. For that reason, my plan has always been to do this work in such a way that this will not be necessary, and I have found that you can push it or slide same into the die, and have the material taken out automatically.

You will have two things to contend with. First, the superintendent and the foreman, who are thinking of production, and second, the operator, who believes it interferes with his work. The only way to convince is to show them an easier method of doing the job. I always pick an operation which is very easy to change. You know, nothing hurts more than to find something that is easily changed, especially if you have been doing it the other way for a long time.

Take for example Fig. 1. This illustrates a piece of work that was manufactured exactly the reverse of the method depicted. That is, they placed the part with the round portion in first, which was very dangerous. By turning it around, and cutting part of the die away, I could then slide this piece in, as the round part was the widest and would not go through. It is kicked out automatically, and all the operator does is to set it on the slide and let go, without any danger to himself.

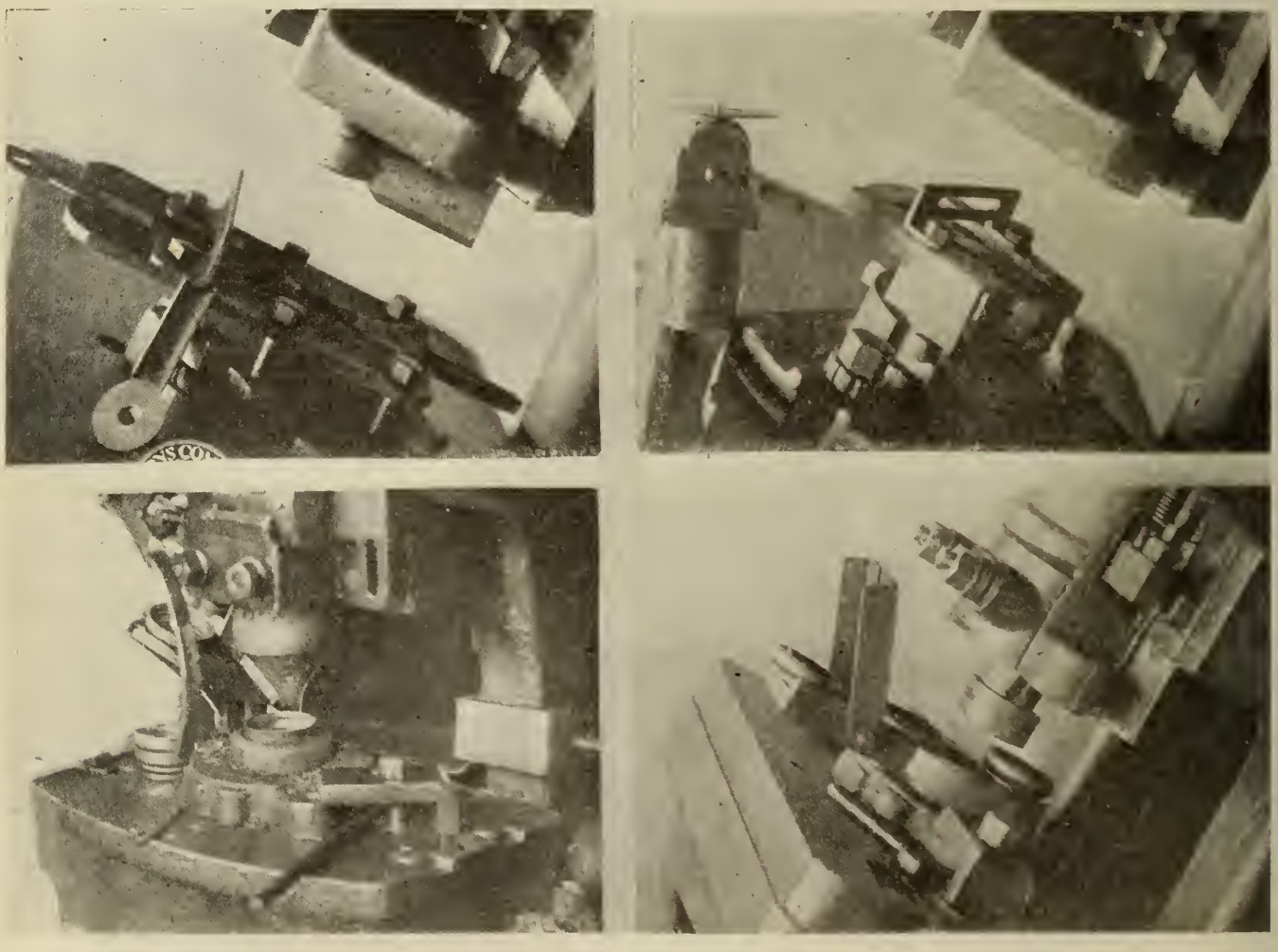
Another example is shown at Fig. 2. In this case, the work was accomplished with the portion shown standing up on the press with a straight piece on top of same. This was in the bottom of the press, and the die was in the crosshead. I simply took the part out of the bottom, and placed it in the top, and put the forming die in the bottom, attached the slide to same, and instead of having to place it on the pin as heretofore, we simply slid it in, and it is kicked out automatically. This was a forming job, and is now done in a safe way.

At Fig. 3 is shown a forming job. We were unable to tilt the press in this particular instance, because it had such a short stroke, so could not kick out the finished piece. We made a slide, however, and the operator knocks out the piece with a stick.

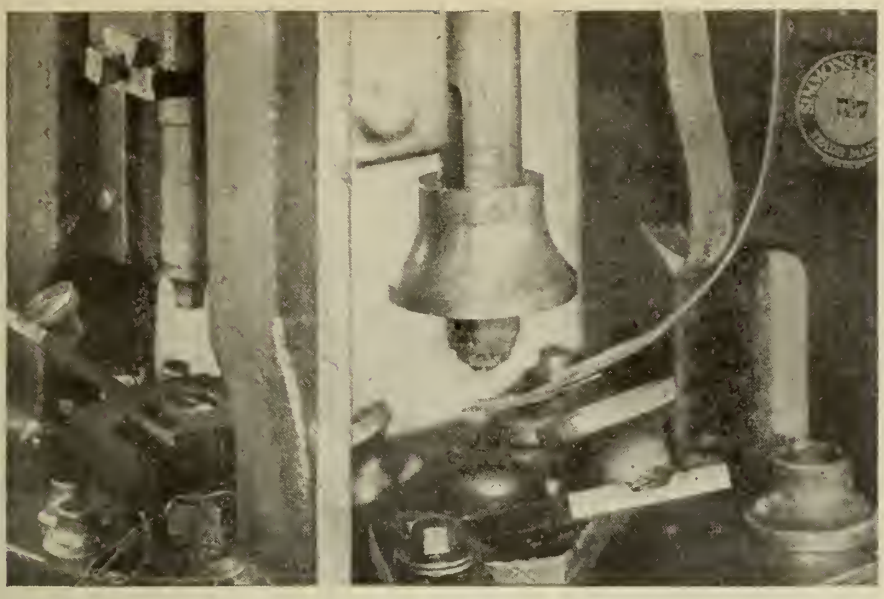
Fig. 4 is doing a similar job as Fig. 3, except that the press had a longer stroke, and we were able to tilt it, kicking out the finished piece. Once more the operator merely places the piece on the slide, and has nothing more to think of.

Fig. 5 illustrates a job that allowed the material to pass through the die. The operator was compelled to set the piece into the die, but we built a slide for this, and now he has only to place the piece on the slide.

At Fig. 6 is shown a re-drawing job. A stripper was placed over the die, and the operator was compelled to place the piece in the die, underneath the stripper,



ILLUSTRATING FIGS. 1, 2, 3, AND 4—FIGS. 1 AND 2 ARE AT TOP, FIGS. 3 AND 4 AT THE BOTTOM.



FIGS. 5 AND 6—SEE TEXT FOR EXPLANATION.

and take it out in the same way. We removed the stripper, and placed it on the ram, but we found that when the piece stripped, it would fall directly back into the die; so some way had to be devised to get rid of it. We took a piece of spring steel, fastened it to the side of the press by a brace, and found when the piece stripped, it would strike this and bound off, but as the piece had to be out of the way when the ram descended, we placed an extra part and fastened it to the cross-head, as shown. This pushed it out of the way, clearing the ram. We next built a slide, sliding the piece into the die where it was kicked out automatically as shown in the photograph. We used scrap to try this scheme out, and its success was beyond our expectations.

Fig. 7 depicts a case where re-drawing work is being done in such a manner as to allow the piece to go through the die. The nearest the operator's hand can get within the danger zone is about 21 inches in this particular example.

Fig. 8 is a very difficult proposition. This is a re-drawing job, but if you will note the bottoms of the cups are round When we tried to push them into the dies, we found that they would tip. A great deal of comment was made on this operation, and many said it was a fool thing to try. After several different things were tried, a tray was made, the bottom hollowed out for the cups to fit on, and to overcome the tipping we placed an extra piece on one side, and put tension springs in between same. This had the desired effect of holding up the heads of the cups, and stopping the tipping. We placed a piece across the tray, close to the die; for when the cup left the tray it again had the desire to tip. This piece held them up so that they would fall properly into the die.

Fig. 9 depicts a trimming operation Where, heretofore, a man had set the piece into the die, we now place it in a slide which takes it to an automatic pusher which in turn places it into the die. We do this work without first making blue prints, it being all experimental, as it is impossible to tell the angle these slides must be to allow the piece to drop properly into the die. Each job is just a little different from the others, and must be worked out for itself. Quite often we merely take a piece of tin, keep bending same until the proper angle and shape have been found, then make a permanent one from this model.

We have learned with these simple devices that the spoiled work has decreased wonderfully, simply because the pieces get into the die in a more perfect way than when placed by the hand. We have instances of men working for several days without making a single piece of scrap.

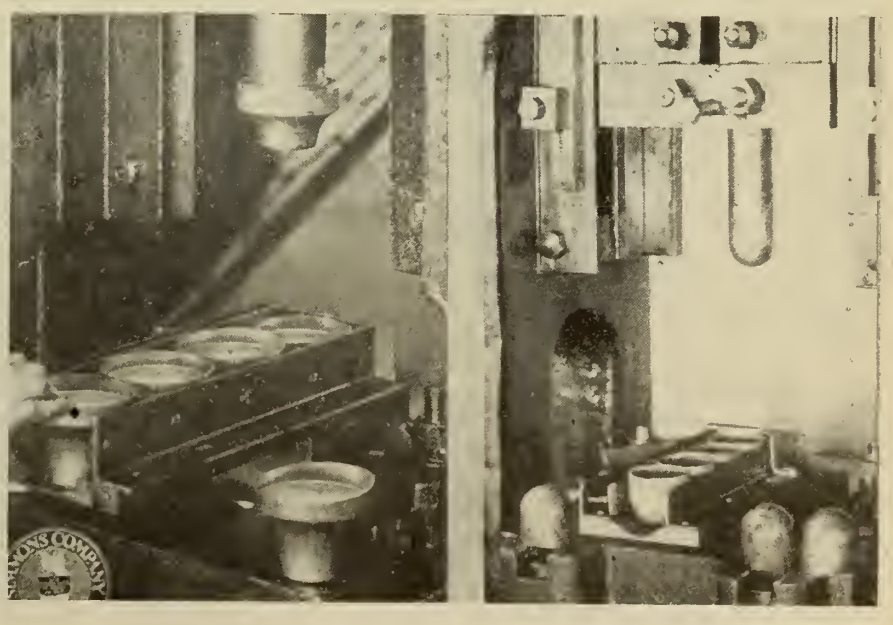
Some there are who still claim production cannot be increased by press safeguarding, but I believe otherwise. I have tried to get my increased production out of the machine, and not out of the man. Heretofore, the man was doing 2-3 of the work, and the machine, 1-3. I make the machine do 2-3, and the man, 1-3. The operator places his material on slides, instead of into the die, and in most cases he does not have to bother about the piece after it is finished; so his mind is only occupied with one thing.

Following are the figures of the increases of production on the different operations, as they were taken at the time when installed. I feel confident that these have increased since that time for the simple reason that the operators have become accustomed to the same. In some instances, we have new men put on these jobs who had never operated presses before.

The increased production on Fig. 1 was 55 per cent.; on Fig. 2, 37 per cent.; on Fig. 3, 26 per cent.; on Fig. 4, 50 per cent.; on Fig. 5, 100 per cent.; on Fig. 6, 150 per cent.; on Fig. 7, 50 per cent.; on Fig. 8, 66 per cent.; and on Fig. 9, 125 per cent. These figures may seem strange, take Fig. 6, which had the largest increase. In this instance, the increase was not larger, because the press did not run faster, because we got every stroke. The operator in the old way, if he had caught every other stroke, would have increased 100 per cent., but it showed that he was not able to do that, and hence the increase was 150 per cent.

We consider these experiments as our first aid work. Our real task will begin when automobile feeds are worked out. We have about 500 presses running; one department alone has about 3,000 different dies. This department lost 24 fingers last year. It has run for the months of April, May and June without a scratch, which goes to show what can be done when safety devices are given serious thought.

We have overcome the objections of the superintendents and foremen, because we have increased their production, and we have made the operators contented, as they can earn more money, and not work as hard as they did before. For that reason, we have the co-operation of all, and have instances in which



FIGS. 7 AND 8—TWO EXAMPLES OF RE-DRAWING WORK.

the operator refused to work without first having a slide placed on the machine, not only for safety's sake, but because he reasons he can earn more money by having the slide installed.

HANDY SUGGESTIONS

The Railway Association of Canada have issued their bulletin No. 12, which contains many valuable suggestions to would-be shippers. They start off as follows:

"A machine broke down from being run at too low a speed! For lack of moisture in the factory air, a cotton fabric failed to take smoothly its rubber surfacing—the air made the nappe stand out. In other words, your goods, or any man's goods or services require at least some consideration from the user if they are to do justice to themselves. All your pains go to waste if your customer or client neglects to use your product as it is intended to be used.

"And so with railway service to you. While the constant vigilance of the managements must keep up the performance of actual railway staffs, nothing but voluntary co-operation can maintain the 'shipping efficiency' of that other part of the transportation machine—the consignor and the consignee.

"Consequently, while attending as closely as possible to their own interior efficiency, the railways of Canada must appeal to the users of railway service with regard to the exterior efficiency of the transport system. May we suggest, therefore, that you instruct your secretary to prepare for you a report somewhat along the following lines:

First—As to Containers

"What is our shipping room staff using to pack our goods? Is it really a cheap container? Or is its seeming cheapness offset by the loss of time, or temper, and possibly of customers by its frequent failure to protect our shipments? Or by the worry and fuss and loss of time in having to duplicate orders that should have gone through unbroken in the first place?

"Is our container pilfer-proof? Is it, for example, a carton sealed with strip-paper? Easily slit and resealed? Or is it protected with wire seals less easily violated?

"Are our men using a crate where they could use plain sacking—as in the case of a certain cushion manufacturer, who cut the weight of a shipment in two by using burlaps? Or should we crate our goods on six sides where we now protect only four?

"Are we using cardboard where we should use crating, or a solid box?

Second—Marking

"How does our shipping room staff address our shipments? With good clean whole stencils? Or with daubs of a worn-out paint brush? Do the invoices show the name and address of our customer clearly and accurately—including the name of the country and province? Or is there a 'temperamental' scribbler making them out? Do the markers copy them from the invoice just as clearly? Or with one eye on the invoice and the other on Bill Brown's imitation of Babe Ruth on the ballfield?

"Do they use tags that are easily torn off? Or is the marking placed where it can't come off and will be seen easily?

"Has your head shipper a copy of the rules and regulations of the Canadian Freight Association?

Third—Bills of Lading

"Who makes them out? Does he or she write 'a fair hand'? Even so, why are they not made out on the typewriter—most people can use a machine well enough for that purpose?

Fourth—Time of Shipment

"Does your shipping room work overtime? If so, is it necessary? Is there any reason why the work should be 'bunched' at the end of the day? Or could some of it be got rid of, for example, in the morning, when the freight sheds are not so rushed?

"We venture to suggest inquiry along these lines, and improvement wherever possible along the lines indicated. Your co-operation in using railway service in the best possible way will be of great assistance to the carriers, and, therefore, to all Canadian industry."

FOR BETTER MAINTENANCE OF AIR COMPRESSORS

By Mark Purcell*

From a survey of the general situation on railroads in connection with train operation and when direct inquiry is made, the usual impression is that compressors are giving good service, although at the same time service records may show a large amount of wheel sliding and breaking in two of trains that, from first analysis, would not appear to have any relation to, or to any extent to be due to, the manner in which the compressors were operating, and yet careful, or even casual, investigation develops in many cases that the compressor is largely responsible for the trouble.

If a compressor runs slow, or for any reason raises the pressure slowly, there may not be enough accumulated after a brake application is made, for slowing down or stopping, to make a proper release, and the engineer, being necessarily anxious to avoid delay, attempts to release and proceeds with the result that only some of the brakes are released and wheels are slid or drawbars pulled out; and, with passenger trains, passengers are annoyed and sometimes injured by rough handling of the train, and still the compressor has not actually stopped and refused to work.

From such conditions as those outlined in the foregoing, and those cases coming up occasionally where the compressor fails completely, we investigate further as to cause and remedy, and find that most of the low efficiency and some of the failures are due to lack of repairs, or to the quality of the repairs made being below, though often only slightly, the standard required. In some cases it is an error in a single particular, but more often in a combination, such as a number of leaks, any one of which may be too slight to cause trouble, yet when combined becoming serious. The above applies more particularly to compressors having steam and air cylinders compounded, on account of the balancing effect that may be caused by leakage.

It is not uncommon to find a compound compressor that is chronically inefficient, and be advised that one part after another has been repaired or replaced, until all or nearly all of the working parts have been gone over, and yet the operation is not improved. Some such cases are a matter of record, where a careful inspection showed everything in fair condition, except the high pressure air piston rings were 3-16 to 5-16-inch open, or rings in both high and low pressure air pistons 3-16 to 1-4-inch open when in the smallest part of cylinder, of rings in some of the pistons of the main valve 1-8 to 3-16-inch open

(Continued on page 272)

*General air brake inspector, Northern Pacific Railroad. Paper read at the annual meeting of the Air Brake Association, Chicago.

FIG. 9 SHOWING HOW TRIMMING OPERATION WAS ACCOMPLISHED.

Thickness of Plates, and Riveting of Stacks

The Common Guyed Steel Stack is the One Under Discussion—This Subject is a Bit of a Mystery to the Average Person; and Should be of Particular Interest.

By JOHN S. WATTS

THIS article deals only with the common guyed steel stack, and not at all with the self-supporting stack, as the former has not been usually designed at all, but built by rule of thumb, with a consequent wide variation of practice in the thickness of plate used. I have seen all kinds of riveting from 2" pitch up to 12" pitch. The lack of any data published on the life of these stacks has led me to gather up the information collected over a number of years, to try and arrive at some more dependable method of specifying the scantlings required than has been in vogue in the past.

My reason for not including the design of self-supporting stacks is that this problem is pretty well understood, and is really a very different affair, and is therefore not touched upon in what follows.

The first point to be decided upon is the thickness of plate to be used, and while it is well known that a new stack of any thickness almost will stand the wind pressure, until quite badly corroded, no attempt has been made, so far as I know, to determine the thickness required to carry the wind pressure, and to resist corrosion over a pre-determined number of years.

In a guyed stack, the stresses are analagous to those in a beam uniformly loaded, and supported at each end, the load being the wind pressure, and the stack being supported by the foundation at the bottom end, and the guy ropes at the upper end.

D. K. Clark, in his book "Rules, Tables and Data," gives a formula for thin hollow tubes, as beams supported at both ends and loaded in the center, which agrees very closely with the results of experiments made by Sir William Fairbanks on tubes having dimensions similar to those of the stacks we have under consideration.

This formula is

$$W = \frac{3.14 \times D^2 \times T \times S}{l}$$

Where W = Load in pounds
D = diameter of tube, outside, in inches
T = thickness in inches.
S = Stress in pounds per square inch
l = length between supports in inches; in our case this is the length from the foundation to the guy band.

That portion of the stack, above the guy band, being a cantilever, uniformly loaded, will be equal to the other portion of the stack in strength, if made one fourth of the length of the stack between the foundation and the guy band. For very high stacks two or more sets of guy bands may be used, and, l is then tween the foundation and the guy band.

In the case of a stack, the load to be carried is that due to the wind pressure, and is uniformly distributed, and therefore the load that can be supported will be double that given in the above formula, which considers a concentrated load. We therefore change the formula to read

$$W = \frac{6.28 \times D^2 \times T \times S}{l}$$

It will make it more convenient to use the length, L (which is in inches), in feet, so making L = the length in feet between supports, we have

$$W = \frac{6.28 \times D^2 \times T \times S}{12 \times L}$$

The wind pressure is generally taken as 56 pounds per square foot as a maximum, and in a round stack, the effective area against which this pressure will act as half the diameter, multiplied by the height, both in feet. The load W will then be

$$W = \frac{D}{12} \times L \times 28$$

Substituting for W, in the beam formulae, we get

$$W = \frac{6.28 \times D^2 \times T \times S}{12 \times L}$$

$$\therefore \frac{D}{12} \times L \times 28 = \frac{6.28 \times D^2 \times T \times S}{12 \times L}$$

$$\therefore T = \frac{\frac{D}{12} \times L \times 28 \times L \times 12}{6.28 \times D^2 \times S}$$

$$= \frac{L^2 \times 28}{6.28 \times D \times S}$$

Taking the safe stress to be 16,000 pounds per square inch, and substituting in the above formulae, we have

$$T = \frac{L^2 \times 28}{6.28 \times D \times 16{,}000}$$

$$= \frac{L^2}{3589 \times D}$$

To the thickness given by this formulae must be added a sufficient amount to cover the loss by corrosion, which may be expected to take place during the number of years which it is desired the stack should last.

Under average conditions, burning soft coal with natural draft in a fairly pure air, and the stack having received one shop coat of graphite paint and, another coat of paint just previous to erection, the plates will corrode away at a rate of about .01 in. in thickness per year. In very close proximity to the sea this rate will be increased to about .013 in. per year.

If the stack could be repainted once a year, the life of the stack would be about doubled, but the expense of erecting staging to do this painting, which must be done both inside and out to be of any benefit, is prohibitive.

It will, generally speaking, be found cheaper to make the plates of a thickness that will give a life of ten to twelve years as at the end of that period it is very probable that a larger stack will be required to take care of an increase in the boiler plant.

The actual thickness of plate to be employed, then, will be = T + (.01 in. × the number of years of life required).

Experience has shown that the plates do not corrode under the rivet heads, nor do the rivets themselves waste away, it is therefore not necessary to have the riveting any stronger than a solid plate would be of a thickness = T.

The actual thickness of plate used, being designated as P, the required efficiency of the riveted circumferential joint, to equal the strength of the calculated thickness of plate T, will be

$$\text{Eff} = \frac{T}{P}$$

The diameter of the rivet used must be such that the bearing surface of the plate, on the rivet, will be sufficient in area to develop the full shearing strength of the rivet. Taking the safe bearing stress as 24,000 pounds per square inch, and the safe shearing stress as 12,000 pounds per square inch, the diameter of the rivet being d, the safe load on one in single shear will be $d^2 \times .7854 \times 24{,}000$; and the safe load on one rivet in single shear will be $d^2 \times .7854 \times 12{,}000$.

$$\therefore d^2 \times .7854 \times 12{,}000 = d \times P \times 24{,}000$$

$$\therefore d = \frac{P \times 24{,}000}{.7854 \times 12{,}000}$$

$$= P \times 2.55$$

The required efficiency of the joint being that of the rivets in single shear, will be

$$\text{Eff} = \frac{d^2 \times .7854 \times 12{,}000}{\text{Pitch} \times P \times 16{,}000}$$

$$\therefore \text{Pitch of rivets} = \frac{d^2 \times .7854 \times 12{,}000}{P \times \text{Eff} \times 16.000}$$

$$= \frac{d^2 \times .7854 \times .75}{P \times \text{Eff}}$$

(Continued on page 265)

Reducing the Cost of Locomotive Repairs*

The Subject of Cost is a Vital One in Any Business, But Especially so in a Railroad Shop—The Subject of Repairs, While an Unpleasant One, Must Be Met.

By S. W. MULLINIX

MATERIAL represents approximately 40 per cent. of the cost of repairing and maintaining locomotives, a large percentage of which is purchased either rough or finished, and owing to the high cost of labour and the absence of modern and special production machines in many railroad shops, there are many articles which can be purchased in a finished condition more cheaply than they can be manufactured by the railroads. There are also many articles and tools sent from the purchasing to the mechanical department to be tested out to see how they compare with home-made articles and tools, as well as to compare with similar articles from other manufacturers. These tests should be given careful consideration, as they very often decide a standard for the entire system, and sometimes what is considered a successful article or tool in one shop is complained of by another. For that reason, when an article is being tested it should be gone into thoroughly, having competent employes pass on it.

Were one to stop and figure, one would be appalled at the cost in dollars and cents of the unnecessary labour which is wasted on material such as hard castings, requiring twice as long to finish, or the many hours of labour that are wasted on some pieces of material that turn out to be full of blowholes or cracked. They may have been passed on by the test department, but no matter how efficient the inspectors are, they will not find all of the defects, especially in our rough material. Even though defective material is replaced by the manufacturers, they do not pay for transporting back and forth to the store department, and from there the handling to the shop and back, nor do they refund the amount spent for labour in the shop.

The mechanical department should work very closely with the store department on unsatisfactory material, calling attention promptly to any article that is not standing up or giving the service that should be expected, so that they can get in touch with the manufacturers for correction.

Locomotive Cost

During the war period the locomotive cost has also been greatly affected, due to shortage of material, making it necessary to substitute all classes of material. The mechanical department is to blame, to some extent, for this condition, due to the changing of patterns and specifications, which at times may be a paying proposition, but it tends to discourage the store people from carrying any large amount of stock. The mechanical department is also responsible for the great number of parts which the store is compelled to carry in order to supply the various styles and types of equipment, such as air brakes, injectors, safety valves, and lubricator parts. It would be far cheaper to scrap the obsolete equipment, replacing with standard material, which will give better results and reduce the number of repair parts to be carried in stock. We must check over our material and equipment, simplifying stocks wherever possible, and we must not merely go over them once and then sit back and imagine that the job has been completed. It never will be as long as we operate railroads.

Another very expensive practice is the robbing of material from one engine for another. We not only pay for removing and replacing the part removed, but the chances are that it will cost more to apply the piece removed than it would cost to apply a new one. Each of these items traced down will disclose that if someone, whoever he may be, had been on the job it would not have been necessary. A large percentage of the material which we use does not give the service that should be expected, on account of extraneous conditions. For instance, a piston rod may be packed half-a-dozen times, never getting it tight on account of imperfect rod, or guides not being properly lined. Had the trouble been found out in the first place and corrected, it would have saved five sets of packing and the cost of applying. This applies to many items used on locomotives.

Material, where carried in stock by the store, should not be ordered before it is to be applied, especially small finished parts, as they will be thrown about and either broken or lost, necessitating ordering other pieces, which will double the cost. Shop people should be more familiar with the cost of different items of material which they use, as it is surprising to many good railroad men to know just what many small items really do cost, and probably they would think twice before throwing old parts away and putting on new ones.

Another item of material where the quality has a great deal to do with the cost is in connection with the painting of locomotives, for no matter how carefully or how scientifically it is applied, poor paint will not give good results, and will have to be removed much oftener than good paint. We are not merely painting our locomotives, especially our freight engines, with a view to beautifying them, but to preserve the material. An old coat of good paint is much better than a new coat of poor paint.

We have the opportunity to be far more efficient in the handling of material than with labour, as the human element does not enter into it to any great extent, and if we watch more carefully the things which we scrap there would not be so much material to reclaim, for the more lax we are in scrapping material the better showing the reclamation department can make.

Manufacturing Locomotive Parts

The use of forging machines in the blacksmith shop has worked wonders in the way of producing forgings which require very little or no finish, such as small side-rods, eccentric rods, motion work, spring hangers, and yokes, large hexagon nuts, and like material. Many large shops to-day are equipped with modern forging machines, which with the proper dies are a great help in reducing costs, as many of the parts now made require very little finish, where formerly they were finished all over. Blacksmiths have a great chance these days to do their work so as to eliminate finish. For example, in main and side-rods centre sections may be forged to size, requiring no finish except where the rods are channelled. Guide blocks can also be forged so as to require no finish except where they fit on the cylinder heads and the face for the guides and yoke. Guides should be forged so as to eliminate as much finish as possible. Parts such as piston rods and valve stems should be cut to the proper length. Wedge bolts should be forged and ends squared, so that all that is necessary to complete them is to thread them in a bolt cutter. These were formerly made from bar stock on turret machines. Eccentric blade forks, ends, and jaws for other motion work should be made allowing finish only where they fit on to the links—outside contours may be ground off. Eccentric blades for outside valve gears should be forged, allowing finish only on the sides, on the back end and for the link fit on the front end. Large hexagon and castle nuts should be forged and holes punched allowing very little finish. There are many other items where finishing can be redueed or eliminated, and, naturally,

*Proceedings of the Western Railway Club.

the less the number of operations necessary to produce a finished part, the less the cost will be. Dies for this work are very expensive and should be well taken care of, as they will pay for themselves many times over.

Castings

Patterns should be changed so as to reduce or eliminate finish where possible, and changed from brass to cast iron or steel or from cast iron to steel where parts are apt to break. If it is absolutely necessary to use brass, use it; if not, use either cast iron or steel, but no matter what is used no more finish should be called for than is absolutely necessary. We are using many castings in the rough to-day which a few years ago we thought necessary to finish all over, such as side-rod collars, other collars for motion work wedge-blocks, and collars for main rods, front and back ends, also for strap middle connections, and many other small castings. Finish may be reduced on parts such as cast-iron piston heads, allowing finish only on the outside for cylinder size, and the inside for the rod fit. Front cylinders and valve heads may be cast with finish for the joint only. Core slots in driving-box wedges for wedge bolts to size, and maintain one standard for all wedges. All grate, side, and centre bars and supports, ashpan and grate shaker-rigging castings should be cast ready to apply on engines with all holes cored and all castings the proper size and shape. The use of good metal patterns is a help in securing good castings of the proper size and shape, as they will not warp or twist out of shape, and once they are made right they will always be that way. Eliminate as much as possible finish on whistles, cab fixtures, blow-off cocks, boiler checks, cylinder cocks and valves, bells and yokes, relief valves, parts for piston and valve-stem, packing, oil cups, swab holders, grease cups and plugs. Many of these items are used in large quantities, and every little saving that can be made will help to reduce the cost.

Where it is necessary to finish castings or forgings, enough allowance for finish should be made, as it is much cheaper to remove ⅛-inch than to just scrape off the sand or scale.

Reclaiming Material

Wonderful progress has been made in the last few years in the way of reclaiming material. Although the results will not be so noticeable in the next few years, they will be as good at least, as a more careful study is being made of the things which might be reclaimed, as well as of the new places where reclaimed material can be used. At Silvis we are making many special machines, such as rattlers for cleaning nuts and other small material, cutting shears and machines for straightening iron, special cutters for cutting gaskets and washers from old leather and rubber. The electric and acetylene welders have also worked wonders in the way of reclaiming. Most of this material is reclaimed after reaching the scrap dock, and is handled in most cases by a special reclamation department.

There is another side to the reclamation question, one which is not so often heard of. This is the reclaiming of material such as broken parts on locomotives without removing them, or by removing, reclaiming, and replacing on the same engine they were removed from. In most cases this is done with either the electric or acetylene welders. There is very often a close margin between the cost of reclaiming some certain piece and purchasing and applying a new one. In these cases we should apply the new piece, as too often in figuring the amount which we save we colour the figures to make them look as attractive as possible, or to otherwise try to make a good showing, without taking into consideration the life or wearing qualities of the piece we reclaim against that of a new one.

We must guard against letting our enthusiasm get the better of our good judgment in the things which we reclaim. Unquestionably, there are parts being reclaimed to-day at a loss, both in material and in labour. Other cases will actually show a great saving. Where parts, such as piston rods, valve stems, and other like material have been reclaimed by building up for fits, they should be properly annealed before being turned to fit. Where rods or stems are worn near to the scrapping limit, or to the age limit, if we have one, it is not advisable to attempt to reclaim them. The practice of welding small broken cast-iron parts which, in the first place, do not require much finish, is not worth the chances one takes in getting a good weld. In many cases new parts will be just as cheap and much better.

Looking back through the years one can plainly note the progress made day by day and year by year—made possible both by more modern machines and tools and by improving the methods of doing work. Still progress has not kept pace with the modern locomotives, which are not only much larger, but are equipped with modern appliances, such as mechanical stokers, super-heaters, feed-water heaters, brick arches, and power reverse, all of which add to the cost of maintenance. The average cost of repairing engines has increased year by year, but by united effort it should be possible, by more efficient methods and practices, to stop its upward trend, which is necessary before we can hope to reduce it.

Thickness of plates and riveting of Steel Stacks.

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To illustrate the mode of procedure we will take a concrete example, say a stack 40 in. diameter by 100 feet high, to last an estimated time of twelve years.

As explained above, the length of the stack from the foundation to the guy band should be four times the length of the stack above the guy band, the length L will therefore be four-fifths of 100 feet, that is, 80 feet. Substituting in the formulae we have $T = \frac{L^2}{3589 \times D}$.

$$\therefore T = \frac{80^2}{3589 \times 40}$$
$$= .044 \text{ in.}$$

For corrosion during twelve years, we must add .01 in. $\times$ 12 = .12 in., making a total of .044 in. + .12 in. = .164 in.

The nearest gauge to this is No. 8 B. W. G., which is .165 in.

The efficiency of the joint, which will be required to equal the strength of a plate .044 in. thick, will be

$$\frac{.044}{.164} = .268$$

The diameter of the rivet will be

$$d = P \times 2.55$$
$$= .165 \times 2.55$$
$$= .4207 \text{ in.}$$

which will call for a $\frac{7}{16}$ in. diam. rivet hole.

The pitch will be

$$\text{Pitch} = \frac{d^2 \times .7854 \times .75}{P \times \text{Eff}}$$
$$= \frac{.4375^2 \times .7854 \times .75}{.165 \times .268}$$
$$= 2.54 \text{ in., say } 2\tfrac{1}{2} \text{ in. pitch.}$$

While this riveting is only necessary at the points of maximum bending moments, it is probably as cheap to make the riveting uniform throughout as it would be to having wider pitches at the points of lower strain.

The rivets in the vertical seams have no other function to perform except that of holding the joint together without openings that would leak air into the stack, and a pitch of sixteen times the thickness of the plate will answer the purpose well.

In a paper read before the American Chemical Society at St. Louis, Jerome Alexander recently announced the discovery of a new fuel fluid, greater in heat value than either coal or present fuel oils. He asserted that the fluid would prove valuable to navigation, permitting a wider cruising radius, and could be used for smoke screens. The new fuel utilizes coal waste and cheap tars.

Evolution of the Electric Brass Furnace

Electric Crucible Furnaces and Overhead Resister Furnaces Are Discussed in This Interesting Paper which Was Presented Before the American Electrochemical.

By H. M. ST. JOHN

An electric furnace classification is based, as a rule, on the difference of method utilised for the application of heat to the material under treatment. In this case the species are three:

The induction or direct resistance furnace, in which heat is generated in the metal itself by virtue of its own resistance to the passage of an electric current.

The arc furnace, in which heat is generated between an electrode and the metal, or between independent electrodes, and transferred to the metal by conduction or radiation, direct or indirect.

The indirect resistance furnace, in which heat is transferred from an incandescent resistor to the metal by conduction or radiation, somewhat as in the arc furnace.

All of the electric furnaces so far proposed for melting brass naturally fall in one of these classes, or a combination of some two of them.

In the beginning the would-be inventor of an electric brass-melting furnace was obsessed by the idea that such a furnace should bear a close resemblance to the combustion furnaces then in use for that purpose. In the electric crucible furnace as in the fuel-fired crucible furnace, the heat must, in general, be generated at some point outside the crucible and transmitted to the metal through its walls. A favorite suggestion was to surround the crucible with an electric resistor of granular nature, which was heated to incandescence by the passage through it of a suitable electric current.

Most of these fundamental difficulties were obviated by using a resistor which surrounded the crucible but did not come in contact with it. In this way the heat generated in the resistor was first transmitted to the crucible by radiation, and, finally, by conduction through the walls of the crucible to the metal.

To the writer's knowledge, the only furnace of this type which was ever operated with any degree of technical success was equipped with wall resistors of thin carbon slabs, provided with means of variably adjusting the contact pressure between the slabs. The generation of heat in this furnace depended, not on the resistance of the carbon itself, but in the contact resistance between the slabs which could be varied at will in such a way as to provide an excellent means of controlling the current and voltage, and thus the rate of power input. Despite its good qualities, it was soon apparent that this furnace could never be commercially successful. Its maintenance cost, both for carbon electrical parts and refractories, was a serious handicap, but more serious still was the fact that its thermal efficiency was inherently and irremediably low.

The latest proposal to melt brass in an electric crucible is one which has recently been very thoroughly described and discussed, in which the metal within the crucible is heated by a high-tension, high-frequency induction or eddy current. The walls of the crucible itself are electrically conducting and serve to heat its contents during the period while the metal is still solid and in pieces not in good electrical contact with each other. Most of the disadvantages already described as characteristic of the crucible furnace have been overcome in this design. This new type has, however, so far been built in sizes more suitable for the laboratory than the foundry.

The low thermal efficiency of crucible furnaces heated from without naturally suggested the possibility of utilizing the walls of the crucible itself as a resistor. This principle was tried out quite thoroughly rather early in the development of electric furnaces for melting brass. In one type the crucible was built of a special mixture with suitable electrical conductivity, but no attempt was made to insulate the walls of the crucible from the metal which it contained. In another design this feature was taken care of by means of special insulating lining separating the conducting walls from the metal. It proved almost impossible, however, to maintain this insulating layer, and short circuits invariably resulted.

Overhead Resistor Furnaces

Not all, even of the early experimenters, limited their attention to the crucible furnace. The advanages of a larger furnace capacity and the elimination of crucibles were sufficiently obvious, and had already resulted in a considerable use of various types of direct-flame oil and gas furnaces. The earliest attempts to melt brass electrically in a furnace of this sort made use of an incandescent resistor supported above the bath and radiating heat directly to the metal. This construction, applied to an open-hearth furnace of small capacity, gave rapid melting and a fairly high thermal efficiency. The principal difficulties were two; the development of a resistor which would stand up continuously under the required conditions without an excessive maintenance cost, and the invention of some reliable method for supporting the resistor in the desired position over the bath. Neither of these basic problems has ever been adequately solved.

The difficulties which interfere with the use of an overhead resistor are partially avoided if the resistor is located above the bath, but at either side or surrounding the central portion of the melting chamber. One well-known type of furnace now in commercial use employs this principle, utilizing for the purpose a granular resistor contained in a nearly circular refractory trough. This trough is exposed to very severe usage, since the resistor temperature must be much above that of the molten metal. The roof also is at a temperature considerably in excess of that of the metal, and must be highly refractory. Another type of furnace which is in somewhat limited commercial use employs a combination of granular resistor and smothered arcs at either end of the melting chamber. In this type also most of the heat must first be radiated to the roof and then to the metal.

A high thermal efficiency was early recognized by investigators in this field as an absolutely essential qualification for the permanently successful electric brass-melting furnace. It semed obvious that if some practical method could be devised for generating heat in the metal itself, conditions most favourable for a high efficiency would be produced. The celebrated pinch-effect phenomenon is too well known and has been too often discussed to require definition here. The pinch-effect can be utilised to increase substantially the electrical resistance of molten brass through which a heavy electric current is flowing. This was done with considerable success in designing the first practical direct-resistance furnace for brass. It has recently been proposed to change the construction of this furnace in such a way as to eliminate the massive metallic electrodes.

The elimination of electrodes from the design of the direct-resistance furnace was evidently of the highest importance. This was done in a somewhat later type of furnace by constructing it as a vertical-ring induction furnace with the resistor channels jointed at the bottom to form a complete circuit for the passage of electric current. The limitations of the vertical-ring induction furnace are due, first of all, to the fact that it is an induction furnace, and, as such, cannot be constructed in large sizes without introducing electrical disadvantages such as low power factor

Furnaces of the Arc Type

The widespread success of the arc fur-

naces in the melting of steel was not overlooked by those more particularly interested in the brass industry. Many attempts were made to apply both direct and indirect arc furnaces directly to the melting of brass, without changing the design which had been found most suitable for steel melting. These attempts were pretty uniformly unsuccessful, because copper and its alloys—particularly the high-zinc alloys—suffered under the direct application of such a high temperature heat source as the electric arc.

A great deal of study was devoted to the discovery of some method which would make possible the utilisation of th good features of the electric arc for brass melting. The direct type of arc furnace was evidently out of the question. In the indirect arc furnace, overheating was less localised. It seemed probable that if the metal could be stirred with sufficient vigour, the entire bath could be maintained at a uniform temperature, and tendency toward local overheating could be entirely neutralised. It was found by experiment that rocking the furnace mechanically, at the rate of approximately two oscillations per minute, resulted in a degree of agitation ample to maintain complete uniformity of temperature throughout the molten bath, and that the obvious advantages of the arc furnace could be utilised in this way without the slightest injury to the metal, even in the case of alloys containing 40% or more of zinc.

The so-called rocking electric furnace resulted from this development and is in wide commercial use at the present time for melting all classes of copper alloys, as well as copper itself. As in the induction furnace, the vigorous stirring of the metal results in a uniformity of temperature and of composition throughout the alloy, a feature which is of particular importance in the melting of high-lead alloys.

The pronounced success of the rocking type of arc furnace has prompted many suggestions for modified designs, similar to it in principle but differing from it in details of construction. For example, it has been proposed to rotate the furnace body instead of merely oscillating it.

The evolution of the electric brass furnace has now proceeded to such a point that fundamental improvements in design are henceforth likely to be rather slow to materialise. There will, of course, be constant progress in the development of refinements in mechanical and electrical design, calculated to make the furnaces more reliable, more durable, and more nearly foolproof than they are at present.

This brings us to a brief consideration of what the brass-foundryman can expect and ought to realise from the use of electric furnaces.

The first and probably the most important point is the saving of metal—commonly wasted during the melting process—which electric melting makes possible. If the charge to be melted consists of new metal or clean scrap, the net metallic loss during melting and pouring from the furnace should not exceed 1 per cent. for yellow brass and 0.5 per cent. with red brass. With clean yellow brass, containing 40 per cent. of zinc, losses as low as 0.75 to 0.85 per cent. have been experienced as an average for a considerable tonnage of metal melted. In melting a scrap charge containing a high percentage of non-metallic, such as oily borings, chips, grindings, etc., the net loss should not exceed 2 per cent.

It is also true that the furnace which melts without agitation is not particularly well suited for melting a charge which contains a high percentage of finely divided, dirty scrap, while these can be handled without difficulty in either induction or rocking arc furnaces. Brass melted in the electric furnace is practically free from metallic-oxide drosses and has no opportunity to pick up sulphur or other contamination from combustion gases.

The consumption of electricity energy under average conditions of 8 to 10-hour operation is as low as 240 kw.-hours per net ton for yellow brass, and 275 kw.-hours per ton for red brass, in the induction or arc furnaces. In 24-hour operation figures as low as 200 kw.-hours per ton or less have been obtained. Less efficient furnace types use from 400 to 500 kw.-hours per ton, depending upon conditions.

Flexibility, which in this case may be defined as the suitability of a furnace for radical changes in operating conditions or for an abrupt change in the composition of the alloy to be melted, is a marked characteristic of the resistance and rocking arc furnaces, which is notably lacking in the induction furnace.

The net melting cost, considering all factors which should properly be considered under this head, is naturally lower in those furnace types which melt the metal most rapidly and efficiently, since their use of electric energy is more economical and their higher rate of production reduces the fixed charges per ton of metal melted. In many cases the cost of electric melting is not more than half the cost of melting the same alloy in combustion furnaces. Even in the less efficient furnace type, electric melting is usually less costly than the older methods.

Electric brass melting can no longer properly be called "the coming thing." It has arived in a most convincing fashion, as is evidenced by its rapid adoption by the larger and more progressive rolling mills, foundries, and manufacturing establishments which use brass in large quantities.

ADJUSTABLE TAPER GAGE

The Knauel Tool Works of Rock Island, Ill., have brought out an adjustable gage that may be quickly set to any desired taper and locked in position. These gages are only made in the open size but will cover a wide range of taper work.

GRAPHITE IN CANADA

A report on graphite, just published by the Mines Branch of the Department of Mines, contains a wealth of information on the subject of this interesting and important mineral. The report is written by Mr. H. S. Spence, mining engineer of the department, and treats of the properties, occurrence, distribution, mining, and uses of graphite in a most comprehensive manner. Interesting information is given on the present status of the graphite industry in Canada, and on the outlook for the industry as it is likely to be affected by foreign competition.

The report points out that Canada possesses deposits of flake graphite superior in richness and quality of flake to any on the American continent. What is probably the largest and richest deposit of flake graphite known in the world occurs in Ontario, and is worked by the Black Donald Graphite Company of Calabogie. Difficulties of concentrating and refining the graphite, however, have long hampered operators and have mitigated against the establishment of a flourishing industry. Quite recently these difficulties have been overcome by the employment of the oil-flotation system of ore concentration, which yields far better results than were obtainable by the old methods, both in the richness in carbon of the concentrates made and in the amount of graphite recoverable from the ore treated. Several Canadian mills have now been equipped with the above flotation process and are producing refined graphite equal, if not superior, to the best graphite on the market.

Crucibles used in the melting of steel and alloys consume a large proportion of the graphite produced, and other important uses are in lubricants, paints, foundry facing, pencils, stove polishes, dry batteries, dynamo and motor commutator brushes, electrodes, and boiler scale preventives. In all, about 50 different uses of graphite are listed in the report, which, in addition, gives much interesting information on the methods of manufacture of a number of the more important graphite products. The report consists of about 200 pages, and is profusely illustrated with photographs, drawings, and maps. Copies may be obtained by application to the Director, Mines Branch, Department of Mines, Ottawa.

Montreal.—Another addition to the fleet of the Canadian Government merchant marine will be made about the middle of this month when the complete "Canadian Runner" will be turned over to the company by the Canadian Vickers, Ltd. Launched on May 8, 1920, from the yards of the Port Arthur Shipbuilding Company, the vessel is of 4,350 deadweight tons, and had to be cut into two sections to come through the Lachine Canal. The bow section is already at Vickers and the stern is expected to arrive to-morrow. She should be ready to sail, probably for the United Kingdom, about the end of the third week in September.

Industry's One Law "Be Square With Your Men".*

Lasting Success Only Attained by Understanding and Utilizing Human Element in Accordance with Principles of Justice—Scientific Achievements Heralded, While Greatest Forces Have Not Been Cultivated.

By ERNEST E. BELL

INTEGRITY of purpose coupled with ability for accomplishment, or the lack of these, I doubt not, influences the fixing of credit with everyone of you more often than does the financial statement. In taking a broad survey of industry generally and casting a balance of assets and liabilities for industrial progress, we find one of the most important, if not the most important factor, to be the human element. That industrial institution which under present conditions fails to realize this fact and grasp the fundamental principles upon which the human element can be utilized for industrial progress, regardless of its financial statement, is neglecting to cultivate one of the most important factors for future profit.

An appreciation of this fact, with intelligent inquiry into the attitude of management toward labor, and the attitude of labor toward that particular management, is becoming of more and more importance to the banker and those entrusted with the fixing of credits. It is to be hoped, however, that those responsible for extending financial support to industry will not satisfy themselves with inquiry into these relationships, but will inform themselves as to the fundamentals underlying right industrial relationships, so that they may intelligently awaken and guide effort in this direction.

It all resolves itself, in the final analysis, into a question of human relationships, and the question of human relationship is as old as the Garden of Eden. As between man and woman, it started when Eve asked Adam to partake of the apple. As between men, it was raised, and has been a question since Cain inquired, "Am I my brother's keeper?" As a factor in industry it has existed since the herdsmen of Lot had strife with the herdsmen of Abraham on the plains south of Bethel and since Pharaoh's taskmasters required the children of Israel to make bricks without straw.

As for you and me, our earlier teachings of love, sympathy and kindness were gained at our mother's knee, while our impressions as to right conduct and punishment for wrongdoing were received over our father's knee. Such thinking as we may have done since has been influenced very largely by these early impressions, and whether the teachings of our mother or the experiences with our father in the woodshed have predominated, depends somewhat upon the kindness or justice with which these were administered.

Human relationships find expression through family ties, through friendships, through contacts which result from the performance of our daily tasks. Systems of government have been established in an effort to control and co-ordinate human action and protect human rights. Men differ in their opinions as to personal rights and as to forms of government. But the most rapid advances of civilization and industry are recorded under those forms of government which, within proper limits and with justice to all, have permitted of individual initiative and action. The principal effort of every human being is to find contentment and happiness, and here again men differ in their conception of what is required to produce contentment and happiness. But the majority of men have concluded that true contentment and happiness are not to be found in the acquisition of material wealth at the expense of others nor in the wielding of political or industrial power for purely selfish ends.

It has been said that all men are born free and equal. That all men do come into this world with equal right, and should have equal opportunity for the pursuit of liberty and happiness, is unquestionably a right premise. But whatever their right we certainly cannot agree that man's opportunity is equal, and even if it were all men are not born with equal ability to succeed, nor with equal capacity for appreciation of the many and various purposes for which individuals may rightly strive. St. Paul tells us that some are born to prophesy, some to preach, some to teach. And the greatest Teacher of all ages tells us that there shall always be rich and poor, masters and servants, those who exercise authority and those who submit to authority. But this same Teacher gives justice, kindness and love as the controlling factors in all human relationship. He condemns with equal emphasis oppression by those in authority and disobedience on the part of those who should serve.

Improvement in forms of government undoubtedly is possible and betterment in industrial relationship should come with it, but the lessons which we draw from the wisdom and experience of the past lead to the inevitable conclusion that there must be an authority with power to direct action; that individual capacity plussed by individual effort will make for individual advancement and that all individuals are not equal in natural capacity nor is their willingness to make sacrifice and to wisely apply their effort. Some men, therefore, will outstrip their fellows and thus will acquire advantages and benefits, to which they are rightly entitled, but which they must use with the true spirit of consideration for the rights of others and not for the unjust exploitation of those less fortunate.

Regardless of forms of government men are contented and happy only when they have opportunity for individual expression in effort, when they are free to apply themselves, with proper reward to the limit of their natural capacity. It is this that makes industry, and industry creates those things which minister to the physical necessities of humanity. Unless work is rewarded by a fair return for effort, and to be a fair return it must be sufficient to provide for the normal necessities of the individual and those dependent upon him, no form of government is sufficient to guarantee the happiness and contentment of the human race.

Industry, therefore, as it provides opportunity for individual effort and accomplishment, becomes of paramount importance in human relationship and to human happiness. Industry started when God found Adam clothed in a fig leaf, led him to the nearest exit from the Garden of Eden and told him to go out and earn his bread by the sweat of his face.

But man can never escape his responsibility for individual effort—work—and to the extent that we try to escape that individual responsibility will we find discontent, want and distress of every character. For the past four or five years most of the civilized world has devoted its energies to destruction instead of industrial construction—the result largely of mutual reaction from oppression. In the utilization of material forces men have learned to study and recognize natural laws. But in human relationships we seem to have overlooked the natural laws of cause and effect, of action and reaction. Where oppression is the cause the effect must eventually be the reaction which we now witness in Rusia, which tears at the very foundations of civilization by the roots, turns order into chaos and makes men reckless in their strife for the recogni-

*Address delivered before the Pittsburgh Association of Credit Men. Ernest E. Bell is vice-president of the Hydraulic Steel Co., Cleveland.

tion of those things which they demand as natural endowment.

Less Thought Given Human Relations

Man seems to have acted with less intelligence in conducting human relationships than in the subjugation of material elements. He seems to have given less thought and less study to the natural laws which control humanity. Just as water can be utilized for power through recognition of the natural law of gravity, so can the power of the human race be developed and utilized only when we recognize the natural endowments of mankind and operate in accordance with them. In our relationships with family and friends we recognize a natural law of love, and through acts of kindness show appreciation of this natural attribute and produce a reaction of like character. When we step out of the family into industry we seem to assume immediately that this natural attribute of the human race fails to exist and apparently set ourselves to operate upon the theory that all men are selfish, exclusively selfish, and through operating upon this basis, produce only selfishness as a reaction.

Seek Cause for Dissatisfaction

Scientists, psychologists and economists have taken up the study of this problem in an effort to find the cause for dissatisfaction in the industrial relationship between individuals and classes. An article recently appeared in one of the national weeklies which gave some very interesting data in regard to the reaction of certain laborers to music. It said that some who gave no evidences of refinement, without education, who were seemingly capable of only the most ordinary tasks, showed marked appreciation for music of a high order, and left noon hour concerts with tears of emotion in their eyes, as they thanked those who had provided this pleasure and diversion for them.

Another experience is that of a steel company which is making intelligent effort to interpret right relationships between employer and employe, to gain the confidence of their men by, perhaps, unusual methods. This company has secured one of the best artists in the country to produce paintings of men and factory scenes, some of which are reproduced in their plant publication. This artist tells of a common laborer, a roustabout in the steel mill, who looked over his shoulder one noon hour as he tried to portray on canvas the molten metal flowing from an open-hearth furnace. The man said to the artist, "You paint God." In surprise the artist inquired what he meant, and the laborer went on to express in broken English his idea that God is in the hot metal, God is in the iron, God is in nature. And this artist has had a lot of experiences, which show that under any spark-burned flannel shirt beats a heart which is full of sentiment.

Sociologists have stories to tell of the reaction which comes from kindly deeds, performed not as acts of charity but of common justice, and in such manner as to recognize the self-respect of the individual, from which they conclude that regardless of employment, environment or the station of life in which the individual may be found, the same human impulses actuate all mankind. Science through continuing this effort eventually may make the unique and remarkable discovery that the human race is human; that there is in the hearts of men those things which God originally planted there, sympathy, kindness, love, and that these will react to sympathy, kindness and love. But when the psychologists, the sociologists and the scientists get through, if their science leads to right conclusions, they will go back to the teachings of the Carpenter of Nazareth and proclaim in unison that the only right basis for human relationship is to "do unto others as you would have others do unto you." And when men learn to treat with each other on that basis there will be no difficulty in the reconciliation of differences in industrial life.

But, you say, this is sentimentalism, and there is no room for sentiment in business; that the function of business is to acquire gain, and that its very character, therefore, makes necessary the elimination of those human attributes, in the full expression of which we find pleasure and satisfaction in the intimate relationships of family and friendship. Let us look at this problem, considering business from the most selfish and narrow standpoint, as being the art of acquiring gain in worldly goods. To this end we employ our every energy and seek out every element which can be utilized for the accomplishment of this purpose. The most important of these is the human element. From a purely selfish standpoint, therefore, it behooves us to study the natural laws through which the full potential power of human endeavor for industrial progress will be released.

Natural Laws Aid Progress

Man's abiilty to use material forces is dependent upon his ability to understand and recognize natural laws. We recognize the natural law of gravitation in damming up streams for the creation of power. Men of unusual ability, of particular training and knowledge, have spent decades in an effort to learn the natural laws through which the power of electricity can be utilized. But have we used the same intelligence in our study of the human element as we make effort to utilize its power for industrial progress? Conditions today in industry give positive answer. Industry in many parts of the world is paralyzed, and in our own country is suffering to an extent from which it will take years to recover, for the very simple reason that we have not understood the handling of men; have not applied ourselves with the same degree of intelligence to a study of human attributes and the proper treatment of human beings as has been used in the study of material forces for their utilization. Our very selfishness has reulted in a reaction of selfishness, and industry and individuals are now paying the price, not only in discontent and unrest, but in dollars.

If men react and become more constructively useful through our giving consideration to the human attributes of love and kindness, then from the most selfish standpoint of individual gain we can find no excuse for refraining from giving full expression to these sentiments in our industrial human relationships. Did the lords of Russia who practiced oppression during decades and centuries past act with far-sighted wisdom from a purely unselfish standpoint? No, and against them must the indictment be drawn for the present destruction, which is nothing more nor less than reaction from centuries of injustice and oppression. And we may well consider against whom our children and our children's children will draw the indictment, should our failure to properly conduct ourselves in human relationships in industry result in destructive reaction in years to come. Possibly this is sentimentalism, in that it treats with attributes of sentiment, but in the last analysis it is only commercial self-interest, because it makes for the utilization of the potential power of the human element in industrial progress and for protection against that destruction and loss which reaction from opposition to natural laws must and inevitably will bring about.

This does not necessarily mean that business is to become a love feast or a Sunday School picnic. "Business is business" and doubtless always will be. But it may be good business for us to pause long enough to think seriously of these matters from a purely business standpoint; to make an inventory of business generally; to face without prejudice the debit and credit columns of those factors which advance or retard constructive progress; to let our vision extend beyond our own profit and loss statement for this year in protection of right profits in years to come.

It may not be expedient to give expression to love and kindness in the same manner in business as we express these feelings in the family circle or with intimate friends. Men do not expect kindness to find expression in business through the giving of something for which an adequate market return is not required. In fact, they resent such an attitude as has been shown where so called welfare work has been attempted with kindness as the only compelling motive. But where kindness has resolved itself into sincere interest in the other fellow's well-being and is expressed in terms of justice and not charity, better relations have been and are being

established. And this is true because there is in every human being an instinct which demands the recognition of self-respect and this self-respecting individual says: "I don't need your kindness in the form of charity. Give me justice in the right spirit and I ask no more." And whether men realize the fact or not, few indeed, fail to appreciate and react to conduct which finds its impulse in recognition of the principles of the golden rule and in an effort to observe those principles.

This also is human instinct which demands the privilege of self-expression and it is this instinct which causes men to resent and resist ready-made plans which are handed down by well-meaning but misguided ownership; plans toward the forming of which labor has given no thought and in the carrying out of which it has no function. We are perfectly willing to have an architect draw the plans for our new home, but every member of the house likes to be consulted before the plans are finally approved. If each one of us, therefore, will consider the other fellow as having the same human attributes as we and accord him the same treatment to which we would naturally respond were our positions and conditions reversed, reactions from such conduct would soon adjust all differences. Men only want to be treated human, not humane.

The leader of a labor union came into my office some weeks since and asked in connection with some statements which had been made over the signature of our company, just what we meant by management having an equal responsibility to capital and to labor. In reply I asked him, "Just what do you mean by capital?" His statements indicated that he looked upon capital as that vague, intangible, unapproachable, unpreachable, inhuman power, which is labor's enemy, and the sole purpose of which is to exploit labor. With evidence of this mental attitude on his part, I inquired if a fair definition of capital would not be the conservation of energy, and used this illustration: "All men have been enjoined to work, to exert the energy, physical or mental, with which nature has endowed them. Let us turn two men loose in the wildnerness. One applies his energy to clearing off a patch of ground, to building a cabin, to getting a garden started, so that he may have food for the winter, to make provision generally against future needs. When winter comes he has a warm cabin, plenty of firewood and plenty of food. He has built up a reserve to make him comfortable. The other, instead, spends his time in loafing, hunting and fishing a little when he is in the mood. This is all very well for the summer, but when winter comes, will he not find himself some cold morning knocking at the cabin door of the man who worked and conserved, asking for a handout and a place to warm his feet? The first man has simply created capital in the form of those things which protect him against want. The second man has failed to do so.

The Lesson of Tony and Mike

"And to bring the illustration a little nearer to present day conditions: Tony and Mike started to work in a steel mill some years ago. They both started on the same day and at the same rate of pay as laborers in the yard. Tony was an energetic worker and applied himself to his task. When the day's work was done he used to go home to his family, conserving his energy for the next day's work. He always managed to save something out of his pay, and by taking care of his physical welfare, he made himself an increasingly valuable man. Within a few months he asked the foreman of the yard how he could fit himself for a better job. The management provided opportunity for Tony to get a better education by studying nights. In the course of time he became a unit boss. His increased pay enabled him to lay by a larger amount in the savings fund, and when the company gave an opportunity for employes to buy stock Tony had a cash down payment ready and got hold of a block of stock., In the course of time Tony became a foreman. He had bebecome a capitalist through his investment in the company's stock, and when he was taken sick and died, it was with the thought that his wife and family were cared for through this stock which had been acquired by his thrift and conservation. Mike shirked his work from the first day. He just about held his job. His evenings, as well as his pay, were spent in the saloons. Physically, he became less capable every year. He still works as a roustabout in the yards, but he is not nearly as good a man to-day as he was 10 years ago. And he hasn't saved a cent."

At this point I asked, "To whom does the management of the company owe the greater responsibility? To the capital created through Tony's energy, represented in the stock which he left for the protection of his family, or to Mike who failed to conserve his physical energies or the result in pay which they produced?" You can guess his answer.

So, when actual human relationships as to cause and effect are pointed out, and it is realized that capital, whether in large or small amounts, is simply the accumulation of conserved energy, which comes from somebody's application, hard work and ability to save, labor would, indeed, be unreasonable did it not recognize the responsibility which management has to those who have acquired capital in this manner. But labor is resentful at being oppressed in order that great accumulations of capital may be accomplished, and rightly so.

And thus the greatest differences which exercise humanity to-day, those existing between capital and labor, may be reasoned out and reconciled if we but approach this problem in the right spirit. If we will subject it to the same analysis of cause and effect, of action and reaction, as we apply in the utilization of material forces, both capital and labor inevitably will come to see that difference in station and accomplishment are not differences which necessarily lead to controversial strife. The unreasonableness in men is very largely reaction from the unreasonable manner in which they have been treated, whether capitalist or laborer. Industry is suffering on account of our having forgotten or failed to recognize the humanity of the human race, on account of our having acted upon impressions which were gained in the woodshed entirely, and having overlooked those other more important attributes which were the basis of our mother's teachings.

And what are we going to do about it? The Almighty, for the preservation and development of civilization, has in His wisdom implanted certain instincts in the human soul. They constitute the most potent force in the whole scheme of creation, and until these human impulses have been released, so that the human element in industry may extend itself naturally, labor is no more able to relieve its own unrest than the fever patient is to reduce his own temperature without the cause having been removed.

We can no more change the instincts with which the human race has from the beginning and will until the end of time come into the world than we can cause water to flow uphill. Man has learned to utilize material forces through studying natural laws and adjusting his operations to certain fundamental principles which nature has prescribed. Why then, is it not good common sense, good business, for us to study the natural forces which control humanity and so adjust our thinking and our doing that industry may benefit in full measure from the power for progress which is to be found in the human element? We don't fight natural forces, but adjust ourselves to natural laws in the utilization of material elements. And until industry shall have learned that all human beings are fundamentally the same that all characteristics which prompt human action and stimulate human endeavor, are fundamentally the same differing only in degree, and shall appreciate this fact and recognize it in human relationships, industrial unrest will never be quieted and labor will never be satisfied regardless of the hours of toil, the rate of pay or the cost of living which are offered.

There is no single influence in industry to-day which more quickly changes the balance sheet or more vitally disturbs credits than misunderstandings and strife between those who apply their dollars and those who apply their skill and brawn to industrial progress. In ventories of raw materials accumulate and lie dormant instead of being fabricated into finished product and converted into the wherewithal with which to pay bills. And this may be true, not because of differences at that particular plant, but for causes which have their origin

in other plants, possibly in other industries, and not unlikely in other cities. Our process of industrial development has brought about an interweaving and an interdependence of interests which has wiped out industrial and geographical boundaries.

You pay a high price for flour in Pittsburgh, while wheat rots in the elevators of the great Northwest. Your warehouses are filled with finished product, ready for shipment, and your banks find it difficult to supply the capital with which to keep industry going. These specific instances are due very largely to differences which have arisen between individuals in the transportation industry. If transportation had not been interrupted, the wheat from the Northwest ere this would have reached the consuming market; dollars which have been sent from the East to carry this grain in elevators would be in circulation and your stores of finished product would have been converted into cash.

It is confidence that lubricates the wheels of industry; it is confidence upon which credit is based, but until confidence shall have found expression in right relationships between so-called and miscalled "capital" and "labor," it will be impossible to establish that uninterrupted flow of commodities upon which all credits depend and through which obligations are liquidated.

NOT SATISFIED WITH OUTLOOK

Increase in Miners' Wages Has Resulted in Decrease in the Output

Roy M. Wolvin, president of the Dominion Steel Company, returned to Montreal from a trip to the Maritime Provinces, where he inspected the company's plants and conferred with the officers in charge of its steel and coal activities.

"The steel works at Sydney are at present very prosperously employed and working to full capacity," Mr. Wolvin stated. "We have plenty of orders ahead, and, taken altogether, the outlook is good. Production at the coal mines, however, is disappointing, due in large measure to the fact that the miners are taking many summer holidays, while there is a feeling of restlessness abroad, while waiting for the report of the Royal Commission now investigating conditions in Nova Scotia."

Mr. Wolvin expressed the view that, owing to the conditions existing in the country at the present time, and with the cost of living on the decline, together with the prospect that there would be considerable unemployment during the winter, the commission could not with consistency recommend an increase in wages. The investigation of that body, he stated, would undoubtedly show that the increased wages granted during the past three years had generally resulted in a decrease in the output of coal at the mines.

WAR CONTRACTS IN THE COURT NOW

Dominion Steel Was Ordered to Roll Rails and Stop Its Work On Munitions

Ottawa.—That the condition of Canadian railways was such in the early months of 1918 as to justify the Dominion Government taking steps that practically stopped the making of steel for shells by the Dominion Iron and Steel Company in order that rails necessary for renewals might be rolled was shown in the hearing of the case of the Dominion Iron and Steel Company versus The King, which opened in the Exchequer Court.

The point at issue was the price the company thought should be paid for 116,000 tons of rails rolled and delivered subsequent to April, 1918, by the steel company, the rails being furnished in consequence of an order in council passed by the Government under the authority of the War Measures Act enjoining the company to supply at least 100,000 tons in order that the railways might be put in a position to operate up to full capacity during the period of the war.

The cause of the difference of opinion as to the value of the rails, it developed during the hearing, was that when the Government order was issued the Dominion Iron and Steel Company had in hand large orders from the Imperial Munitions Board for shells, and the manufacture of these had to be practically discontinued, with the result that 99,000 tons were not delivered. On behalf of the company it was stated that for this steel the company would have received about $80 per ton, but cost of production would have exceeded the cost of making rails by from $3 to $5 per ton.

CAN'T GET RAILS TO PUT DOWN TRACK

So Building of Many Branch Lines Has Been Held Up For the Present

Ottawa. — Difficulty in securing supplies of steel rails and also shortage of labor are assigned as causes of little progress this year in projected construction of branch railways. The Canadian National had planned to take up slightly-worn main line rails and use them for branch extensions, replacing them with heavy 85-pound rails; but the latter cannot be secured save with great difficulty and delay, and, as a result, branch line work, especially in the West, has been retarded.

There is likewise a shortage of railway labor due to the fact that Canadians do not take to that kind of work, while thousands of foreigners who used to do it went home during or after the war, and have stayed there. Others have gone to the cities. As the urban labor markets are becoming slack, it is hoped that in these quarters the necessary men may soon be secured for railway extension and maintenance.

BALDWIN'S READY IN SHORT TIME

Ready to Go Ahead With Production of Material at Toronto Plant

"Baldwins, Limited, hope to have eight mills in operation within two months, all at Ashbridge's Bay," Sir George Wright, vice-president of the company, said as he was leaving Toronto for England. Sir George has been in Toronto for several weeks organizing the plant.

"We have sufficient electric horse-power from Niagara to run the eight mills," said Sir George, "and we have been assured by Sir Adam Beck that within the next year we will be able to obtain sufficient power to run any extensions that we may care to make.

"We intend to put down sufficient mills to supply the whole of Canada with black plates, tin plates, galvanized sheet metal and black sheet.

"I have been very much impressed with the help that Mr. Cound, our general manager, has received from the people of Canada. The working people of Canada seem to take a great interest in the plant.

"Like everywhere else, it is true here that the only way in which a plant may be successful is by the help and support of the people who work with us."

Baldwins, Limited, have purchased several reducing furnaces at Collingwood, which they are moving to Toronto.

RAILWAY RATE INCREASES AT A GLANCE

	Eastern Canada	Western Canada
Freight Rates—		
September 13 to December 31	40%	35%
January 1	35%	30%
Coal increased 10 to 20 cents ton. Fuel wood, 10%. No increase on milk, sand gravel, crushed stone.		
Passenger Rates—		
September 13 to December 31	20%	20%
January 1 to July 1	10%	10%
July 1	Return to present rates	
Increases not to exceed 4 cents per mile. No increase on commutation fares.		
Special Services—		
Sleeping and parlor car rates	50% increase	
Excess baggage	20% increase	
Switching, demurrage, stopovers, weighing, etc., must be made basis of special application.		

Did You See Mechanical Drawings at the Ex.?

J. H. Moore.

IT may be possible that many visitors to the Exhibition at Toronto this year have missed the excellent display of mechanical drawings, owing to their peculiar and unsuitable location.

The majority of these drawings are the work of railroad shop apprentices, and the students are to be highly commended upon their work. A wide variety of subjects are covered, and the writer noticed that these included the following:

Drawings of valve motion, section of locomotive boiler, steam pump, model beam engine, air compressor, steam engine, locomotive cylinder details, locomotive inspirator, section of pneumatic drill, electrically driven pump, pneumatic hard grease press, steam hammer, pneumatic motor, and quick action triple valve.

Other subjects were hydraulic wheel press, hydraulic piston remover, control panel for electric welding and cutting, suburban type locomotive, duplex pump, flanging press, electro turbo generator, and a set of lever shears.

All drawings showed signs of promise, while some in particular were almost without fault. The chief features to the writer's mind were the neatness of arrangement, and careful workmanship throughout.

Quite a number of contestants won prizes for their efforts, and as it was impossible to secure the names of all those exhibiting, we will speak only of the prize winners. These prizes were divided into certain sections, so that when you read of various first prizes being awarded you will understand we speak of prizes for the different sections.

First Prizes

The lucky artists to land first prizes are as follows: W. Grandison, G. T. R. shops, Stratford, Ont., his showing being a splendid drawing of a duplex pump; E. T. Driver, of Toronto, won first prize by his drawing of a continuous current generator, while Arthur Sansfacon, of the C. P. R. Angus shops at Montreal, landed a first prize for his splendid drawing of some columns of the Corinthian order. Frank Brown, of Toronto, got first prize for his showing of the Gloucester Cathedral cloisters. The two latter drawings were, of course, architectural.

Second Prizes

The gentlemen who came close seconds and who captured the coveted blue tickets, were as follows: A. T. Dutand, G. T. R. shops, Montreal, got his prize for a view of a suburban type locomotive. Another G. T. R., Montreal, man to land a second prize, was L. A. Tugeral, a pair of lever shears being his exhibit.

The judges evidently felt some special prizes should be awarded, and C. Kyle, C. P. R. shops, Montreal, and E. Harris, G. T. R. shops, Montreal, were the fortunate ones. The former secured his prize for a showing of locomotive 2,300, while the latter displayed a neat flanging press. It might be well to add that C. Kyle also won another second prize in the architectural class by an exhibit of some columns of the Corinthian order. J. B. Helme, of Toronto, landed a second prize for a neat drawing showing the east entrance of the main building of the University of Toronto.

From the foregoing one can see that quite a number of prizes were given and well they deserved them. In some cases the drawings were colored with different shades of ink, making a rather pretty effect. In practically all drawings appearance was aimed at from the border lines in.

Help Them Along

It is very encouraging to see such a display of earnest effort by the apprentices in the railroad shops in particular. The executives who have the destinies of these young chaps in their hands are to be congratulated on the splendid showing of their boys, and if all apprentices in the machine tool line could do equally as well, it would tend to raise still further the present standing of the machine tool business.

We were rather disappointed on not seeing some efforts by the students of our various technical schools but perhaps by next year we will have that pleasure. We feel sure there is plenty of hidden talent in our many technical and evening classes, and would suggest that the teachers of such classes encourage their students to prepare work for next year. It is also to be hoped that by the time the next exhibit is due, the place of location will have been changed to one of more suitable locality, such as the machinery hall.

MAINTENANCE OF AIR COMPRESSORS

Continued from page 262

and a poor fit in the grooves, and when these are properly repaired the compressors work all right.

What Examination Proved

In one case an 8 1-2-inch cross compound compressor developed pounding, would not supply sufficient air, and the engine had to be taken off an important train. Examination showed that the rings in both the high and low pressure pistons were 3-16 to 5-16-inch open at the ends and lacked about .012-inch of filling the ring grooves. New rings that would fit the cylinders, but were .012-inch smaller than the grooves, were applied to both the air pistons, and the compressors gave good service for four months, and probably longer, but records do not show.

Still another. An 8½-inch cross compound compressor pounded some, and ran so slow with 190 pounds steam pressure that it would not keep up 90 pounds standard brake pipe pressure on a regular passenger train of ten cars, against normal leakage. Examination showed:

(a) Main steam and air cylinders slightly worn. (b) Steam cylinder head parts in good condition. (c) Main steam and air pistons about 1-32-inch smaller in diameter than their cylinders. (d) Packing rings in steam and air cylinders came together at ends in smallest part of cylinders and were a little less than 3-32-inch open in largest part of cylinders. (e) Rings lacked .005 to .008-inch of filling grooves in high pressure steam cylinder. (f) Rings in low pressure steam cylinder lacked .012 to .015-inch of filling grooves. (g) Rings in high pressure air cylinder lacked .015 to .018-inch of filling grooves. (h) Rings in low pressure air cylinder lacked .012 to .015-inch of filling grooves. (i) Upper final discharge valve had a 3-16-inch lift, one upper intermediate valve had 7-32-inch lift and other air valves had only slightly more than standard lift.

New pistons that would fit the cylinders closely at the smallest part, and in which the rings fitted the grooves with just enough clearance so they would expand by their own tension when compressed into the grooves, were applied and no other repairs made, and the compressor given a severe running test in which its capacity and speed developed were fully up to standard.

Recommended standards to cover repairing and adjustment of the different parts of compressors have been extensively published and discussed ever since the cross compound compressor came into use, but general observation would indicate that these are not taken seriously and appear to be seldom considered in connection with compressor repairs and maintenance. On account of this, the general standard of service of these compressors is considerably below what may reasonably be expected and what may be obtained by uniformly raising the standard of quality of work done in maintaining them, which may be done at slightly increased cost, and by simply following standards such as those outlined in recommended practice by the Air Brake Association.

The Northwest Air Brake Club believes that it is time for a general awakening to the need of progress and improvement along these lines, and that the logical and most effective means of bringing about such improvement is through the influence of the Air Brake Association and the air brake clubs throughout the country. The number of engine failures chargeable to the air compressor alone indicate the need for improved compressor maintenance, and the other troubles that can readily be traced directly to a lowered compressor efficiency emphasize it to a high degree.

WHAT OUR READERS THINK AND DO

SHORT CUTS

By Fred Horner

The following hints, or short cuts, will no doubt be of interest to the readers. Some may know of them, then to others the schemes will be new. The first idea is shown at A. This really gives two suggestions for set-screw guards, to those who do not care much about hollow set-screws. In the first instance the idea is to thread the neck of the dog, and screw upon it a stout steel tube. The other notion also incorporates a renewal, when the thread in the dog has worn badly. Bore the neck out and thread afresh to a larger size. Then screw in a renewal bush which is extended into a protective tube. A socket wrench is used to operate the screws.

The next scheme is shown at B. This depicts a miniature bolt driver.

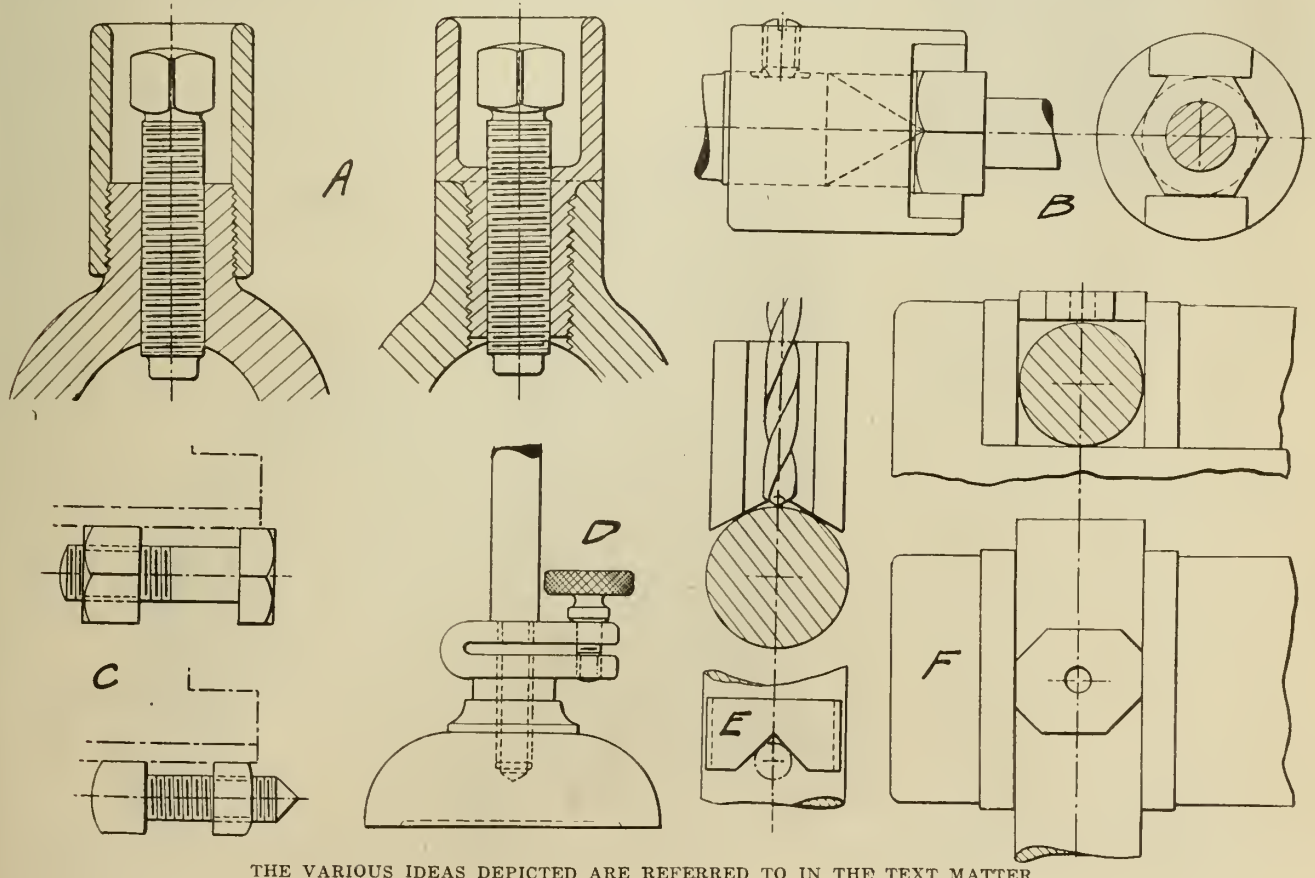
When small bolts or other flatted pieces have to be driven between centres, a useful driver may be made in the manner shown. A piece of stock is bored out to slide snugly over the centre, and is locked thereon by a grub-screw bearing upon a flat. The nose of the fitting is slotted out suitably to embrace the head, the sharp corners left from the slotting being preferably removed as shown.

The third suggestion is shown at C. In this case nuts are used to aid in the chucking of screws. In any case where small bolts or screws have to be chucked for thinning, trimming, chamfering or pointing operations, it is convenient to run a nut on the thread as illustrated, so that the jaws will have a bearing to centre, and grip the work properly. This avoids all damage to the thread, and risk of the piece tilting and pulling over to one side.

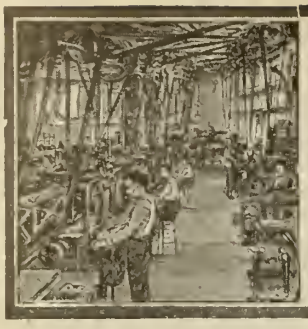
The next example is shown at D. For those who wish to make a simple fine adjustment for their surface-gauge, the sketch C is shown. The method is to interpose a U-piece of steel between the base and the pillar, and so get a slight up and down movement for the final fine setting by springing this loop together or letting it open, the control being through the screw. The lower half of the loop is fixed by screwing it over a stud screwed into the base.

At E is a hint of an entirely different nature. This illustrates a simple device for bringing cylindrical pieces axially under the drill, so that the resulting hole will pass right through the centre. It consists of a small block of metal milled with a vertical vee-groove, to lie against various diameters of drills, and a transverse groove at the bottom to rest on the curve of the work, this permitting the latter to slide into correct relation to the drill.

The last hint is shown at F. It depicts a device for cross drilling in the vise. Readers are doubtless familiar with the tip of gripping a bit of plate on top of a shaft or spindle in the machine vise, the plate having a central hole to guide the drill axially across the shaft centre. A modification, which extends the usefulness of the idea, is to cut flats, on the plate as seen in the illustration, giving for example three different spans, to suit the vise opening on corresponding diameters of shafts.



THE VARIOUS IDEAS DEPICTED ARE REFERRED TO IN THE TEXT MATTER.

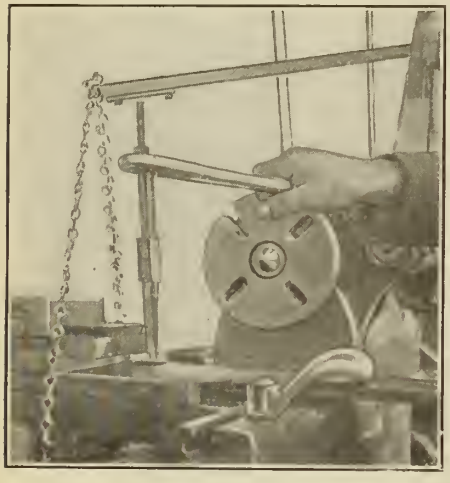


DEVELOPMENTS IN SHOP EQUIPMENT

ACKLAND SCREW DRIVER

The screw driver as depicted is the product of the Ackland Specialty Co., Springfield, Mass. It is said that this driver will remove any rusted or stuck screw which could not be budged by an ordinary driver.

The principle involved is an old established law of mechanics. A few pounds of pressure at the end of the upper bar and on the rachet handle results in a much greater pressure at the slot of the screw. This feature of course eliminates the danger of the driver slipping and ruining the screw slot.



HOW THE SCREWDRIVER IS USED.

Automatic and machine manufacturers are said to be especially interested. The blades are made from special heat-treated and tempered steel. The post is attached to the blade by a case hardened socket and sliding on the post is a rachet which permits using the driver in narrow and restricted places. The cross bar is secured to the post by a ball joint permitting movement in all directions.

The chain is attached on the end of the cross bar and looped around some projecting lug of the machine. A glance at the photo illustrates clearly the method of using.

PROFILE MILLING MACHINE

The Automatic Machine Company, Bridgeport, Conn., have placed on the market what is known as their automatic multiple-spindle profile milling machine. It is said to be specially adaptable for automobile engine work, or in other manufacturing where it is necessary to finish a large number of irregularly-shaped pieces.

A glance at the illustration will be worth while before going into further details. The spindle head can be made to accommodate any number of spindles, and their positions also can be arranged to suit the work. When a change is desired the spindle carrier is easily removed and a different one substituted, using the same spindles. These spindles are equipped with bronze thrust and taper bearings below, and straight bearings above, the central point where they are driven by spiral gears.

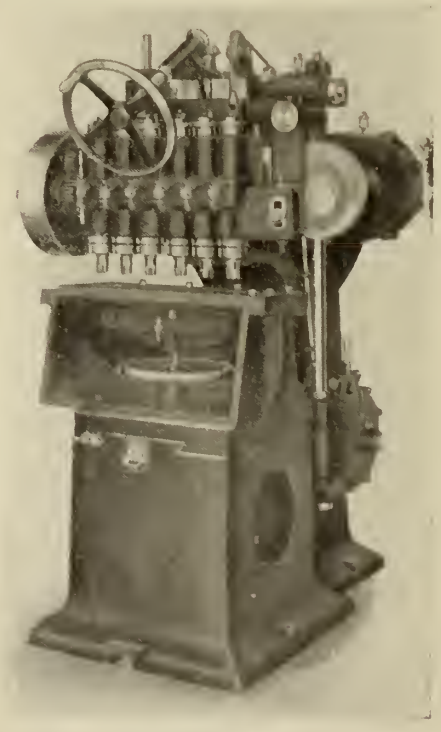
In operation, one cam moves the head or spindle carrier longitudinally and another moves the table or platen transversely. These are so designed and synchronized as to make the cutters follow the desired outline. After the cycle has been completed the feed trips out, while the cutters continue to revolve to clear themselves. The operator's duties are in this way confined to merely chucking and unchucking the work.

There is an adjustment for wear in cutter diameters in profiling any single design, and there is an additional adjustment on the traverse motion of the table to aid in setting the jig correctly and rapidly. The table is also provided with adjustable taper gibs.

An independent vertical adjustment for position of cutter on each spindle is provided, and the spindle bearings can all be adjusted for wear. The complete spindle head is counterweighted and is raised or lowered by the handwheel shown in the illustration.

The material and workmanship is claimed to be of the very best, and ball bearings are used to take the thrust on the spindle driving shaft, and the vertical worm shaft. Sight feed oilers are placed on the head and principal bearings, and accurate timing of the cams and gears is ensured by thorough running tests before shipment. Following are the principal specifications:

Number of spindles—as required. Table, 24 in. by 24 in. Height, from top of table to bottom of spindle, when up, 22 in. Longitudinal-transverse motion —to suit work. Dimensions over all, 4 ft. 6 in. wide, 5 ft. deep, 6 ft. 9 in. high.

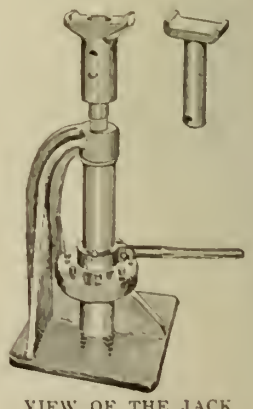


MILLER AS EQUIPPED WITH SIX HEADS

REPAIR JACK

The R. S. Whitney Manufacturing Co., Lewiston, Me., have placed on the market a safety repair jack which is illustrated herewith. This type of jack is designed to meet the demands of all classes of car, truck, and tractor repair work, and combines simplicity with strength.

All parts are properly proportioned, and a lever raises and lowers the screw, and is attached by means of a collar to the rotating nut. This, of course, increases the adaptability and flexibility of the jack. The rotating nut is placed at the extreme lower end of the screw in order to provide the greatest possible



VIEW OF THE JACK.

clearance. An extension supporting arm is also included, this portion being shown in the sketch. You can thus accomplish varied work with the one jack. The height closed is 19 inches, and it has a raising radius of 11 inches plus that of 7¼ inches, obtainable by using the extension arm, therefore the scope of usefulness and utility is practically unlimited.

FLUE AND PIPE BENDER

The Baird Pneumatic Tool Co., Kansas City, have placed on the market an arch flue and pipe bender as shown in the accompanying illustration. This machine is especially adapted for bending into difficult shapes locomotive or marine arch flues, also air pipe connections as used under the regular freight or passenger cars.

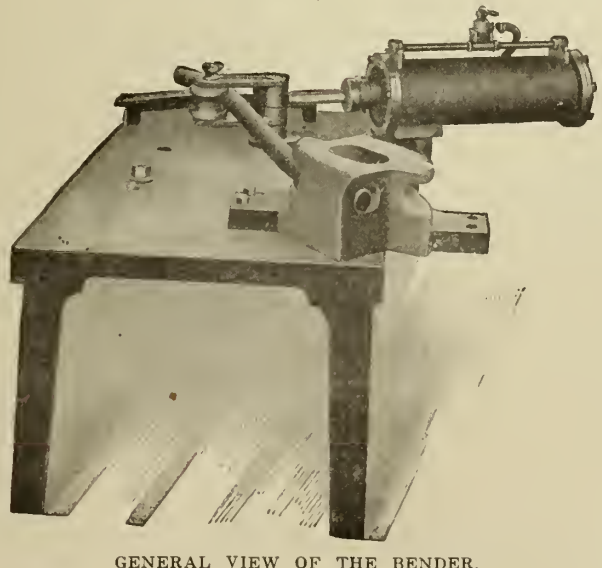
It is rigidly constructed to meet the hard usage of boiler shops, and will bend arch flues or pipe to any desired angle. It is not necessary to sand or heat the flues or pipes with this machine.

It is fitted with special blocks and forming rollers the exact contour of the outside diameter of 3 in. and 2½ in. boiler tubes. It is said that the round bend obtained by using this machine permits a flue-cleaning motor to pass through in the cleaning process. This is very often necessary in cleaning arch flues.

As can be noted from the illustration the complete machine includes cast iron table with planed, finished top. To this table is fastened the air cylinder supporting the piston directly connecting with the forming rollers and yoke, which in turn produce the radius bends in the pipe through the forming blocks and quadrant located at opposite ends of the table. This quadrant is fitted with a plug which can be placed in spaced stops to secure any radius within the capacity of the machine.

A patented four-way valve is fastened to the cylinder and within easy reach of the operator. Should more than the bend required be secured, by reversing the air valve the operator can take out the amount necessary. This notice should particularly interest railroad shops, marine plants, boiler shops, and shipyards. Following are the machine's principal specifications.

Diameter of air cylinder, 3 in.; stroke of piston, 26 in.; maximum travel of forming roller, 26 in.; air pressure required, 100 pounds per square inch; dimensions of forming table, 3 ft. by 5 ft.; bending blocks — one with capacities, pipe, ¾ in., 1¼ in., 1½ in., 2 in., 2½ in. and 3 in.



GENERAL VIEW OF THE BENDER.

NEW THINGS IN MACHINE TOOLS

UTILITY SCREW PRESS

A screw press that has been designed for a wide range of work has been placed on the market by Carl Pletz and Sons, of Cincinnati, Ohio. The machine is adapted for the straightening of shafts, bending bars or shapes, pressing in bushings, etc. The lower end of the steel screw is fitted with a special pad that remains stationary when in contact with the work, the thrust being taken on a bronze washer running in oil. When using a four foot bar it is claimed that a pressure of about 20 tons is applied to the screw. Two sizes are made, with distances under the screw pad of 14 and 20 inches. The approximate weight is 500 and 600 pounds respectively.

MILLING ATTACHMENT

A milling attachment that has been adapted for use on shaping machines, has been placed on the market by the Tri-State Milling Machine Company of Memphis, Tenn. The spindle is worm driven and is supported by a rigid overhanging arm, and the housing is intended to be secured to the ram slide, the ram being moved back out of the way. The table of the attachment is fastened to the table of the shaper with special provision for latter adjustment.

MULTIPLE-SPINDLE MILLING MACHINE

A multiple-spindle vertical milling machine has been added to the lines of the Betts Machine Company, of Rochester, New York. The machine is of rigid construction and is designed for heavy production work. The machine is made with three or more spindles as desired. The spindles are made from steel forgings driven through long splines and spur gears; spindles being adjusted vertically by hand. The machine may be belt or motor driven. Work holding fixtures are located on the continuous revolving table, the pieces being changed while the work is passing from one working position to the next. The table has a flat bearing on the bed and is driven through a large internal gear, all bearings being of bronze and all gears running in oil. It is claimed that one of these machines has a production capacity three times as great as a single spindle machine.

AUTOMATIC-STROKE BELT SANDER

A belt sander that automatically moves the sand belt across the surface being sanded has been brought out by the Mattison Machine Works, of Rockford, Ill. The machine is of rigid construction, the heavy casting carrying the power drive mechanism being mounted on two ample supports at either end. The shoe for applying the sand belt slides on a bar extending across the front of the machine, and is operated with a rapid reciprocating motion by a steel belt running over two flanged pulleys. Geared quadrants, which may be adjusted to suit any length of work, operate the pinions that drive the pulleys. All shoe connections are made of aluminum, and are counterbalanced. The work table is mounted on ball bearings.

FACE GRINDING MACHINE

The Diamond Machine Company of Providence, R.I., are now manufacturing an extra heavy duty face-grinding machine, that is intended for grinding operations on the heavier equipment that formerly has been accomplished on planing machines. The grinding wheel is made of the sectional type, a number of abrasive blocks secured in a chuck. Special attention has been given to the handling of the coolant, so that clean, cool liquid is returned to the circulating system. Duplicate control is provided so that the machine may be operated from either side. The machine is motor driven through a Morse silent chain.

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Paying the Real Increase

AN Ottawa despatch credits Hon. F. B. Carvell, head of the railway commission, with a statement to the effect that the increase in freight rates could not possibly amount to more than 15 cents per ton of coal coming to Ottawa. This figure came out because it was reported that certain coal dealers were to raise the price of coal 50 cents per ton on the head of the new freight schedule.

Right here is where the big complaint is constantly raised. Wholesalers and retailers alike complain that by the time increased freight charges are passed on to the customer they amount to three or four times the amount granted to the carrying interests.

The statement of Hon. Mr. Carvell that 15 cents is the increased cost of a ton of coal in Ottawa suggests that it might be well for the railway commissioners to have worked out a table showing the exact increases on a given list of staples in the principal points in Canada.

By so doing they would be giving the public the protection to which they are certainly entitled, and the absence of which is liable to leave openings for increased prices that have no foundation in fact or reason.

It is true that many papers are publishing figures showing how the rates affect certain lines, but these are not accepted as official, and they lack, for that reason, the weight an official ruling would have. For instance, were it handed out by Ottawa, in an official way, that the increased carrying charges on a ton of steel from Pittsburgh to Toronto, or Montreal, having regard to the added increase in the cost of moving the raw materials in the first place, amounted to one or two dollars, or whatever the figures actually were, the trade would accept that ruling and adjust schedules accordingly.

The trade generally, as far as lines covered by this paper are concerned, believe that if the freight service is improved forty per cent., along with the forty per cent. increase in rates, it will have been a fairly good investment. They know that industries are having a hard time in many cases because they cannot get the service they require from the roads, and they know that many firms have been put to a lot of expense in having to provide their own carrying service. On the other hand, if they put up the increase of forty per cent. and do not receive a better service it will simply be that much money passed over to the roads.

Mechanical Drawing Is Not Fancy Work

MECHANICAL drawing at Toronto Exhibition seems to appeal to the directors as worthy of a place in a building devoted to needle-work, etc.

The fancy work is placed first, and the room that is left at the top of the cases is devoted to a display of mechanical drawing. Then, a few pieces being left over they are hung upstairs to the accompaniment of more lace and photographs.

Mechanical drawing is a part, and a very important part, of the machinery field, and cannot be alienated from it.

It is not fancy work—neither is it a pastime. It is serious, constructive and essential work and the people who would be most interested in it, and who would profit most by it, are the men who visit Machinery Hall.

It might be possible also to introduce something in the way of designing, rather than in copy work, bringing perhaps from twenty young minds an idea or two that might be of the real worth-while type.

The Double Steel Market

RIGHTLY or wrongly, there is a growing feeling in the steel trade that there will be a levelling process soon that will do away with the two-headed market that has existed for some time. By a two-headed market we mean the selling price of the corporation as opposed to the selling price of the independents.

It may be that the corporation figures will come up a little, while it can be only a matter of time before some of the prices now secured by the independents will have to sag, although there are some of them brave enough even yet to talk about the prices increasing.

Right now Canadian warehouses are buying sheets in United States, for which they are paying nine cents a pound in New York funds. The average price for these covering some years is shown in the following table, prepared from the current market quotations at Pittsburgh:

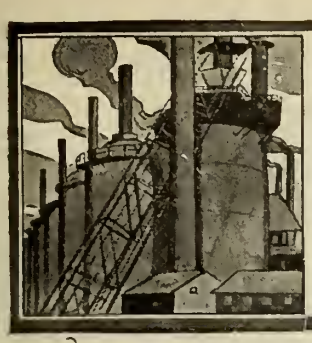
1905	2.28	1913	2.20
1906	2.47	1914	1.89
1907	2.60	1915	1.93
1908	2.48	1916	3.06
1909	2.26	1917	6.29
1910	2.29	1918	4.98
1911	2.03	1919	4.43
1912	2.00		

An explanatory note in the Pittsburgh market records states that the prices in 1919 are subject to certain premiums for quick delivery.

Those who must have material are buying and paying for it, but the present price schedule does not encourage buying for stock, thus giving the volume of orders that the mills must sooner or later have to operate at capacity and at low cost.

The pith of such plants as the sunflower, rush or elder is advocated by the "Scientific American" as a good material for cleaning the lenses of scientific instruments.

An extension of the Temiskaming and Northern Ontario Railway from the present terminus at Cochrane to James Bay is shortly to be undertaken by the Ontario Government.



MARKET DEVELOPMENTS

A Readjustment of Steel Prices Likely

Report Gains That Corporation May Come Up While Independents Ease Off—Freight Rates Should Result in Better Service—Railroads Are in Market for Some Equipment.

WHERE and how the new railway rates will fall is one of the topics that the market discusses at length this week. In some cases it will make no difference in prices quoted, although the difference will come when the buyer pays for the haul from the present location of the material to his own premises. Much material in the steel trade has already felt the total cost of haulage increases because the U. S. freight rates cover the case. Considerable of the concern is that the purchaser shall pay only the increase granted to the roads.

Although there is nothing official to warrant the belief, the trade seems to feel that there is bound to be a move that will do away with the dual steel market that exists now, viz., the selling schedule of the corporation and of the independents, between which there is a difference so great that it cannot be reconciled. Most of the deliveries that are finding their way into this territory now are coming from the independent mills, and as a result the prevailing prices are very high.

Machinery houses report in several cases that they have had a number of very interesting inquiries during the past few days, and that deliveries on orders that have been booked some time ago are coming through in a very satisfactory way.

The Government railroads are buying small tools now, particularly carbon and high speed drills. As a general thing though the trading that is being done is in smaller lots.

Several houses report that they find it necessary to pay more attention to their collections than usual, reporting some of these as being rather slow.

In hardly any section of the steel, iron or allied trades can it be said that there is any buying being done for stock now, prices and deliveries being very much opposed to any such policy.

MONTREAL TRADE NOT WORRIED OVER THE INCREASE IN FREIGHT

Special to CANADIAN MACHINERY.

MONTREAL, September 16. — Business and industrial conditions are developing a gradual improvement as the mid-summer holiday season comes to a close. Some factories that have been curtailing operations, due to a shortage of fuel, are more actively engaged, and in many lines the prospects for a busy fall season are quite marked. Following the announcement of the increase in freight rates the Railway Board have received many requests for deferred action, but while recognizing the right to appeal, the Board authorizes the increase to become effective at once. In the statement issued, the following clause is inserted: "If it should appear to be a case where the appeal should be granted and the decision modified or reversed, there could, if deemed proper, be provision for rebates of rates charged beyond those ultimately fixed."

Better Delivery Offsets Freight Increase

It is expected that the 40 per cent. increase in freight rates will ultimately mean that steel commodities will be advanced in price sufficiently to meet this additional charge. Where the steel is taken from warehouse stock the price that has been effective is still quoted, but where material is shipped from the mill the added freight charges approximating 17 to 20 cents per hundred pounds, are included in the invoice. This condition will apply generally when local supplies are exhausted. The car situation in this district is quite normal but congestion in the vicinity of American mill point prevents the regular shipment of steel, and dealers and consumers in distant sections are frequently inconvenienced by the non-delivery of much needed material. The demand for steel lines has shown no marked improvement, but the movement is steady and of an encouraging character. The situation may be summed up in the statement of a dealer here when he said: "Users of steel are not buying any more than they need but are willing to pay for what they want." This would appear to indicate that buying is not restricted for urgent requirements, but that only immediate necessities are given consideration. The supply of sheets is still below the maximum trade requirements, but owing to the failing demand from the automobile industry the quantity of available sizes is showing improvement, and it is not improbable that the market conditions may offset the increased cost of transportation, and as a result the quotations on some lines may not show the added costs of haulage.

Present Activity Slight

"The increased freight charges will have little material effect upon our business, as present operations are on a restricted scale owing to the continued dullness of the market. Movement is almost confined to local activities and little railroad transportation figures in its shipment, but where material is required to be placed on the railroads for distant haulage the customer naturally or automatically pays the extra charge." This statement shows the quiet state of the old material situation, and in some respects the dealers are disinterested in the present market. There is, however, a feeling that the railroads will make every effort to establish normal conditions before the winter actually sets in, and if this can be effected there is a large possibility that improved operation would follow in many lines of industry and open the way for a better demand for a greater range of scrap materials. Last week's quotation may be considered as nominal with an upward tendency.

WANT TO GET A BETTER SERVICE

Believe Rates on Railway Will be Worth While if it Results in Quicker Shipments

TORONTO.—The market is adjusting itself this week to the new freight charges. It was only a couple of weeks ago that the new rates from U.S. points were taken care of, and in doing this a revision of rates on account of Canadian changes has been made unnecessary, as much of the shipments come from points in United States.

While there is in some concerns an alarm at the principle of continually increasing costs, there is no alarm over the new rates as a general thing. Here are a couple of opinions, one of them from a leading warehouse, and another from the manager of one of the largest selling forces for machine tools and other lines.

"As far as the business of the steel yards is concerned, we believe the rates are all right. Much of the material we get is from Pittsburgh, and the rates we have announced, amounting to an increase of $2 per ton in most lines, cover all the increases that are necessary. One of the worst things that the manufacturers with whom we have business in Canada have to contend with is the fact that railway service has been very indifferent for many months past. There are plants that have had to resort to all sorts of schemes in order to give service to themselves that they should get from the railways. If the increase in rates will enable the roads to get their equipment whipped into better shape, then we believe it will be a good investment to pay the increased carrying charges."

The manager of the other business spoke along similar lines. "I can show you a good many lines where our increases have been over 40 per cent., which is the amount now allowed the roads. The whole thing hangs on the performance the roads are prepared to give for the increase granted them. If there is no improvement over what we have been experiencing, then we will look upon it as just that much needlessly added to the cost of carrying on business, which we have to pass on to the men who buy from us, but if we get a 40 per cent. improvement in the service from the roads, then good and well, we will have something for our money, and it will be a good investment."

Must Watch Closely

Others point out that it is necessary for dealers and manufacturers to watch very closely all the increased charges that have been put into effect, and see that they are not trying to absorb too many of them, and by so doing wearing down their margin of profit, past which it is not safe for them to go.

In this same connection, the market reports that more attention is being paid to collections as a general thing than for some time past. Some dealers report that they are having more trouble now in keeping their books well cleared up, and firms that before always paid promptly, are now taking advantage of every circumstance to extend their payments over as long a period as possible.

POINTS IN WEEK'S MARKETING NOTES

August production rate of iron and steel was the largest since December, 1918, barring last February and March.

—

Pittsburgh claims a decided improvement in freight movement, saying that in many lines the business is nearly normal.

—

There are few new buyers in the steel market and business is dull as far as new bookings are concerned.

—

August shipments of steel are stated to be about 90 per cent. of the output.

—

The Government railroads are in the market for carbon and high speed carbon drills.

—

The steel trade feels that if higher freight rates can bring about a more efficient service it will be money well spent.

—

There is not the insistent demand for plate there was a few months ago, and dealers claim there is enough in the yards to care for all the business that is offering.

—

A shortage of cement is holding up work on the Welland canal. The contractors claim the large shipments going to United States are responsible for this.

—

Shipments of machine tools are very satisfactory now. Some firms think September will be one of the largest delivery months of the year.

—

Warehouse prices on bar iron and steel, plate, sheets, etc., were put up $2 per ton.

—

All soft steel bar makers are practically sold up for the remainder of the year.

—

Some rail tonnages of importance for 1921 delivery have been accepted by mills, but the price is left open till Jan. 1.

—

English makers of ferromanganese have cut their price to this country $20 per ton.

—

Lack of old rails is apparently all that is holding up large trading in hard bars, one interest reports having to turn down inquiries aggregating nearly 10,000 tons for this reason.

The Steel Market

The opinion is expressed, although there is nothing in fact to back it up, that the U. S. Steel Corporation prices will be raised and the prices of some of the premium mills will be lowered. "For a long time," stated one manager this morning, "there have been two separate and distinct markets, a high one and a low one, but unfortunately there has been only one seller, and that is the premium operator. We have had business booked with the Corporation for months, and we can't get an answer as to when it is coming through. But the continued existence of two steel markets is too absurd to last long."

There has been a fairly heavy shipment of tubes, and they are much needed. Most of them are 16 ft. 3¾ in., and many of the larger power plants are persistently in the market for these and the four inch tubes. A fairly large tonnage of two inch tubes is coming through, these being used more for smaller plants, for locomotives, etc.

There is nothing like the demand for plate that existed some months back, and of this line it can be said that there is not much trouble now in getting all that is required for ordinary purposes.

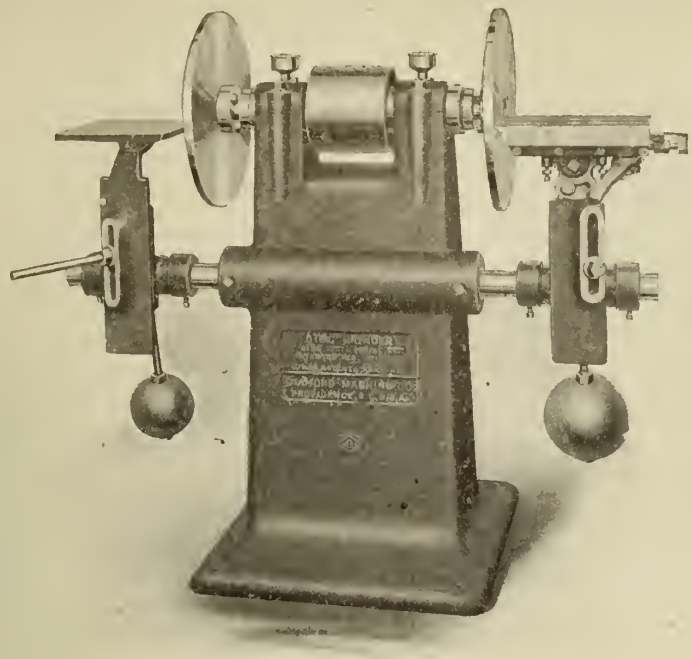
The sheet users are all in trouble together, and no one seems to be any worse off than his neighbor. Sheets are coming through in a week to ten days, from some of the independents, the price for black 28 gauge being 12.10 per lb.

The Machinery Market

A fairly good business is being done in machine tools, some places having disposed of a good assortment of these during the past few weeks. There is an improvement in the number of inquiries coming into the market, and dealers are hopeful that there will be a decided improvement later on.

The railroads—National—have specifications out for a fairly good list of carbon and high speed drills for some of the eastern shops, but otherwise the buying is being done by smaller interests. The automobile interests are not taking on anything like the stock they were a few months ago, and no large buyer has come in to take up the sag.

The scrap metal business is having a short week, because nearly all the yards are closed owing to the Hebrew holiday season following their new year celebrations. Trade during the past few days has shown no improvement over what has been experienced. Few buyers are in the markets for material, and the yards are buying very closely in what they do take on.



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SHIPMENTS IN AUGUST WERE 90 PER CENT. OF STEEL PRODUCTION

Special to CANADIAN MACHINERY.

PITTSBURGH, Sept. 16.—The iron and steel market continues stagnant in practically all branches. It is a case of the trade going ahead on its momentum, as producers are well filled with business and production is fully absorbed by deliveries against orders already in hand. Consumers desire to be obligated only to take such material as is required for business they have in hand, and as deliveries are better there is less demand for prompt lots to piece out with contracts.

Heavier Steel Production

The monthly report of the American Iron and Steel Association shows 3,000,432 gross tons of steel ingots produced by the 30 companies that make monthly reports, against 2,802,818 tons reported for July. Computing on the basis of the number of working days in the month and year, and allowing for the unreported production, ingots were produced during August at the rate of about 42,700,000 tons per annum, showing a 7.0 per cent. gain over the rate in July. This is a large gain from one month to the next, and is particularly striking in view of the fact that August, being a midsummer month, would be subject to the same adverse weather conditions as July. Barring last February and March, the August production rate is the highest since December, 1918.

Shipments Heavier

In August there was a double gain in shipments, since the production was larger and the mills shipped more than their production, instead of shipping less as they had done in July and in the three months preceding. During those four months they had to stock some of their output, on account of car shortage. About the end of July the turn came, shipments and production being approximately equal. Since then shipping conditions have constantly improved. As to the total volume of freight movement, the last week reported upon, that for the week ended August 14, shows the largest number (962,352) loaded for that week in any year, the number just passing that in the record year, 1918. An authority estimates that by this time the total freight movement is not only ahead of that in the same period in any year, but is ahead of the best record made in any week in any year. As to steel shipments, they were naturally very heavy when production was at the rate indicated and shipments were in excess of production.

Of the finished steel products accumulated during the car shortage easily the major part has now been moved. There remains considerable tonnage of semi-finished steel, the steel having been put in that form as a convenience, with the idea that it could gradually be fed to finishing mills as supplementary to the current production of steel. The finishing departments can, of course, stand only a slight overload, and thus with the best shipping and market conditions it would be quite a while before all the semi-finished steel could be worked off.

Momentum of the Trade

It has been made clear to everyone that the pig iron and steel markets have gotten into a condition of dullness from which they will only be resuscitated by a marked improvement in general business conditions. There is nothing in the markets themselves that would lead to there being a fresh buying movement. The influence must come from without, as buyers are now to be supplied with heavier deliveries than they were getting, on an average, in the past five months, so that the requirements of buyers must increase before they take much interest in making fresh commitments.

In the circumstances, the only question is how long the industry will be able to keep busy on its present commitments, or in other words how long the momentum will carry the trade. At a juncture like this there is always a difference of opinion. Some observers point to "full order books" and compute how long the orders will last the producers. Others assert that order books count for nothing, that orders can be canceled and buyers order shipments suspended or curtailed. Experience gathered over many years, from various situations like the present, indicate that neither party is exactly right, but that the former come nearer being right. There are always cancellations at a time like this, and there have been this time, but the cancellations amount altogether to but a very few per cent. of the total amount of business on books. Quite possibly a great deal of business would be canceled if the market broke, but the producers always look out for this. When the time comes that they see little new business to be secured either at existing prices or even at deep cuts, while a great deal of business is to be squeezed out of existing contracts, they simply "stand pat" on their prices. To cut prices, to engage in competition, would be simply for the mills to swap orders with each other at lower prices all around.

Accordingly there is the experience of mills in general adhering stiffly to their previous quotations, with the exception in some cases of such small mills as have been securing the outside prices on account of being able to make very early deliveries. When such mills reduce prices they are still above the general average of the independents. The Steel Corporation is in a class by itself, its prices being so much lower than the lowest of the independents.

Steel Corporation Tonnage

For the first time since May, 1919, the United States Steel Corporation has shown a decrease in its unfilled obligations, the last report showing 10,805,038 tons of unfilled business at the close of August, this indicating a decrease of 313,430 tons in August, comparing with an increase of 139,651 tons in July. Thus there was a change of about 450,000 tons from one month to the next. About half of this was due to an increase in shipments and about half to a decrease in bookings, or rather in the net bookings, as there may have been some cancellations in August, offsetting a small part of the bookings. Shipments in July may be estimated at 75 per cent. of capacity, and August shipments at 90 per cent. As the August decrease in unfilled obligations was about 23 per cent. of capacity the net bookings in August were about 67 per cent. of capacity. The unfilled obligations left are equal to about nine months of production at say 90 per cent. Should the corporation book month by month only one-half as much as it shipped, this being a very low estimate, the orders, if properly distributed to the different departments, would theoretically carry the corporation for 18 months instead of nine months.

Pig Iron

Production of pig iron increased in August as compared with July and the increase in merchant output was particularly sharp, being 6.7 per cent. The August rate of output was barely a shade under the rate last March, and otherwise was easily the heaviest rate shown by the merchant furnaces in a year and a half. This puts somewhat of a new aspect on the price advance that most pig iron producing districts brought about late in August. It is notable, now, that the Chicago district furnaces refrained from advancing their prices. They are still on the basis of $46 for No. 2 foundry iron, while the valley and Cleveland furnaces are at $50, and the eastern Pennsylvania and Buffalo furnaces are still higher. More important still is the refusal of the southern producers to put up their prices. They are still at the $42, Birmingham, figure attained at the end of last April. The furnaces could undoubtedly have advanced prices above $42 if they had desired, but they considered it wise not to do so. There is now a deadlock in the pig iron market, and one should experience no difficulty in deciding which party is going to yield first. Nothing may occur, however, for several months, as the present engagements will last both parties quite a while.

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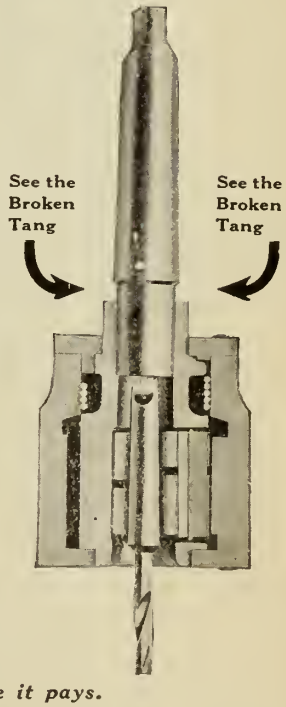

Do you salvage or discard your broken tang tools? Repairing or replacing them is unnecessary, for **Wahlstrom Automatic Drill Chucks** will hold tools whether they have tangs or not—the jaws grip on the sides of the shank—not by the tangs.

The percentage of reduction in your tool upkeep cost is governed entirely by the number of **Wahlstrom Chucks** operating in your plant. They pay for themselves.

There's no time lost in waste motion with the Wahlstrom Chuck. It is automatic and instantaneous in action. It enables the operator to make **tool changes in just two seconds**, without stopping the spindle of the machine.

In addition to regular drill press work they will increase production of lathes for burring, turning, filing, etc.

Made in two different styles. One style holds No. 1, 2 or 3 Morse Taper Shank Drills —with or without a tang. The other style is made in three sizes, which hold all sizes of straight shank tools from ¼ to 1-inch.

Give your men this keyless and colletless chuck. Results will prove it pays. Sent on trial.

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CANADIAN QUERY IN U.S. MARKET

Railway Specifications Are Being Looked Over—Business is Not Brisk

Special to CANADIAN MACHINERY.

NEW YORK, September 16—Several New York machinery dealers are quoting on the recent inquiries of the Grand Trunk Railway System (George W. Caye, purchasing agent, Montreal, Que), which call for both metalworking and woodworking tools for various Grand Trunk shops in Canada. Among the machines called for are the following: Two driving wheel lathes, 90 in. swing; two gap lathes, Bertram or equivalent; one 60 in. duplex horizontal driving box boring machine; one universal horizontal boring machine, equivalent to No. 32 Lucas; two single frame steam hammers, 800 pound; engine lathe, 26 in x 12 ft.; crank shaper, 20 x 22 in.; Fox turret lathe; radius link-grinding machine; Gisholt horizontal axle-box boring machine; McCabe pneumatic flanging machine; 35-ton hydraulic spring-testing machine; six Bridgeport grinders; 42 in. car wheel lathe; triple head bolt cutter; four sliding head Sibley drill presses; 26 in. woodworking tools as follows: one double arbor universal saw bench, one 36 in. band saw, one 16 in. hand jointer, five swing cut-off saws, one combined radial car boring machine, four self-feeding rip saws, four vertical hollow chisel car mortisers and borers.

The American Brake Shoe & Foundry Co., New York, is asking for bids on about ten machines. Other inquiries are few. Eastern railroads are not doing any buying of consequence, but there is a fair amount of buying in Chicago, principally by the Chicago & Northwestern and the Santa Fe roads.

Machine tool business has suffered a severe set-back in the past six weeks or two months, and the effects of this are seen in the slowing down of manufacturing operations at some machine-tool plants and the catching up on deliveries, some machines now being available out of stock. Prices, however, show no apparent weakness; in fact there have been some advances recently. The outlook for the future is somewhat uncertain; there are some in the trade who do not look for any pronounced revival in business before spring, while others think that a renewed demand will develop much sooner, possibly after the presidential election in November.

The full-rigged three-masted sailing vessel, Grand Duchess Maria Nikolawna, now in the harbor of Montreal, presents a striking contrast to the modern present-day steel freighter. This ship has a registered tonnage well below 2,000, but carries masts of such a height that it was necessary to step her main-topgallant mast in order that she pass beneath the Quebec bridge. The vessel was originally built in 1873 by R. Steele & Co., of Greenock, Scotland, and on her recent voyage out from Newcastle-on-Tyne made the trip in thirty days.

SIGNS OF PROGRESS

Imperial Oil is to build a $250,000 distributing plant at Brandon.

Dominion Bank is building a three-story premises at Brantford.

Masonic Hall at Bridgeburg is planned to cost $20,000.

Imperial Steel and Wire Co. are to start on new buildings at Collingwood.

Fisher Body Corp. is to build a factory at Ford City to cost $175,000.

Dominion Oxygen Co., Ltd., may build a factory at Halifax.

Steel Co. of Canada, will build a storage warehouse on Harvey Lane.

Taylor and Campbell are building an electrical factory on Adelaide Street, London.

Bank of Nova Scotia is building at Moncton, N.B. Dominion Bridge Co. have contract for the steel.

Willard Automobile Storage Battery Co., Cleveland, plan half million plant in Toronto.

Canada Bread Co., Toronto, build brick and steel stables and factory in Toronto, at Danforth and Ladysmith.

The Engineering Sales and Service Co., 55 St. Francis Xavier Street, Montreal, have obtained the Canadian agency for Haughton's Patent Metallic Packing Company of London, Eng., manufacturers of high grade anti-friction packings.

The C. P. H. Gas Engine Company of Canada, Ltd., with offices in the Dandurand Building, Montreal, expect to build a plant for the manufacture of a new type of internal combustion engine which is particularly adapted for all classes of service. J. Van der Ghote is secretary treasurer and general manager.

SHOP SECRETS ARE PROTECTED

Justice Guerin has handed down, in the Superior Court, an important decision on the question of the ethical and conventional obligations between employees and employer in condemning Siegfrid Sanders to pay $100 damages and the costs of an action brought against him by the firm with whom he was formerly employed in this city. The company maintained that Sanders, in the course of his work, acquired in confidence knowledge and information respecting the making and methods of a special machine, and that after he left their services he revealed this information to his new employers. His former employers allege that they sustained a severe monetary loss.

The company further alleged that Sanders had been employed by them to devote his time exclusively to their manufacturing department, and they also alleged that he agreed not to "directly or indirectly" make known to any persons, either during the period of his employment or thereafter, any of the special processes or knowledge of special machinery which he might learn from the company during his employment.

YARDS HERE TO FINISH THE BOATS

Ottawa Makes That Promise and Winter Work at the Yards Will be Assured

Herbert Wright, business agent of Toronto Local 128, International Brotherhood of Boiler Makers and Iron Shipbuilders, whose members are out of employment through the failure of the Dominion Shipbuilding Company, announced, following his return from Ottawa, that ships which the company was building for the Government would be proceeded with. Osler Wade, assignee of the company, had refused to continue the contracts, since he feared that they would be built at a loss.

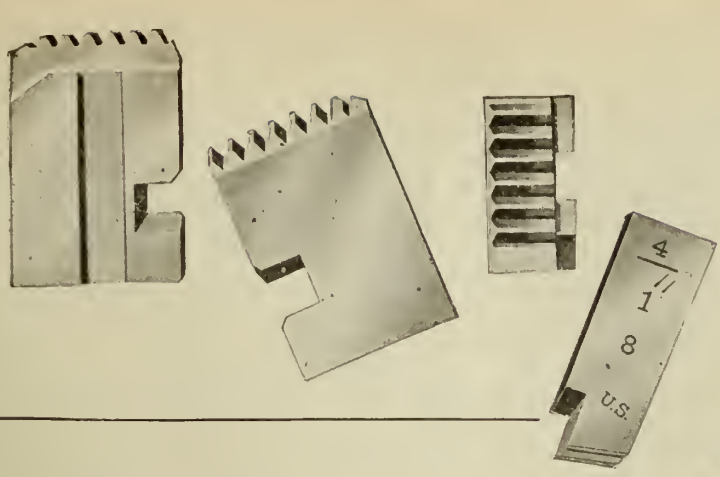
"I saw Senator Robertson, Minister of Labor, and he assured me that the Government would proceed with the ships this fall. I don't know exactly when the work will commence, but I believe that it will be when the present vessel is finished," said Mr. Wright. "There was nothing said during the interview regarding labor conditions, which were given as one cause which contributed to the failure of the company. He did not mention it, and I presume the same rate of wages will be paid."

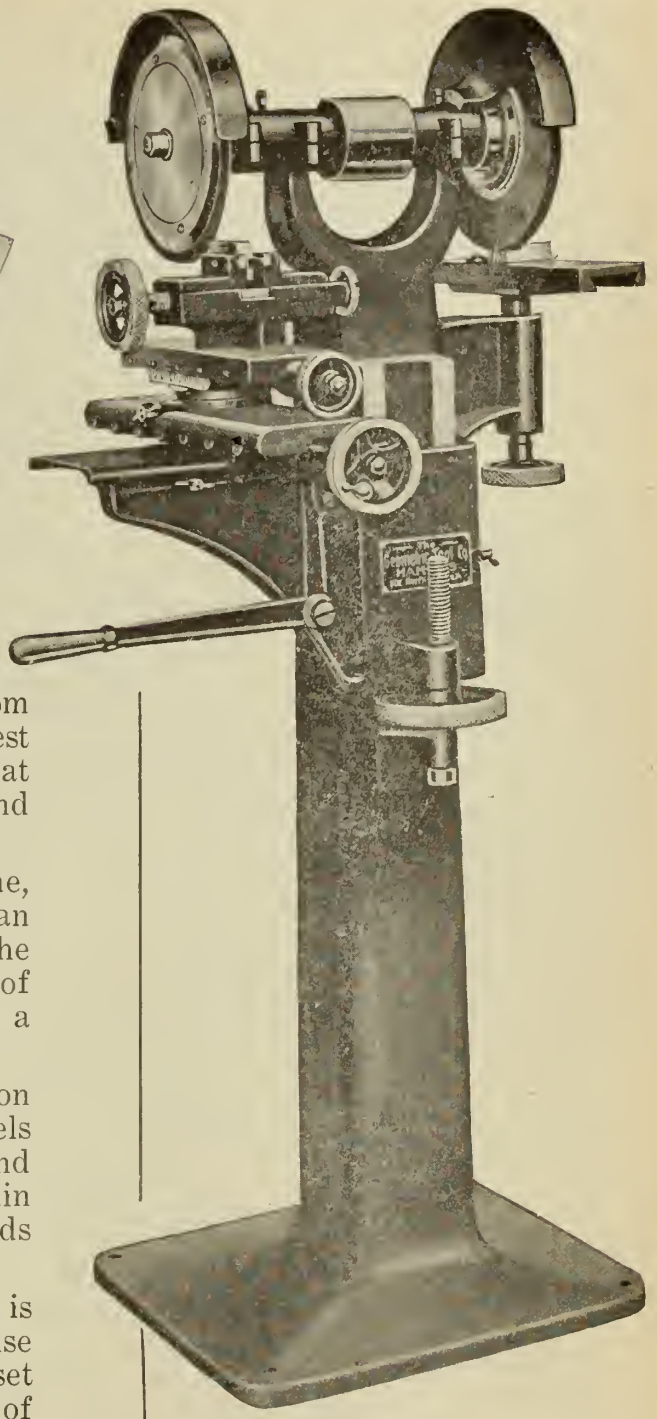
To Build Tankers.—According to Mr. G. A. Reading, representative of Robt. Reford Co., steamship agents, the keel of a ten-thousand-ton oil tanker will, in a few weeks, be laid on the ways recently vacated by the "Canadian Mariner," at Halifax. If all goes well the Halifax shipyards will contract for the construction of several oil tankers of large tonnage. Mr. Reading added: "The recent launching of the Canadian Mariner marked the fulfillment of the dreams of shipbuilding officials in Nova Scotia. Built entirely of steel by Canadian workmen, it is the largest ship ever launched in the province." As this was the first ship to be built by the Halifax shipyards the launching was naturally viewed with some trepidation by the promoters, and it was with relief that they saw the big vessel slide easily from her stocks.

J. B. McAndrew, of St. Catharines, Ont., has been appointed by the Civil Service Commission, Ottawa, to the position of Structural Engineer on the Welland Ship Canal.

W. F. V. Atkinson, consulting engineer and formerly chief forester of the Spanish River Pulp and Paper Mills, Ltd., Sault Ste Marie, Ont., has moved to Toronto, where he will continue in private practice.

H. Dixon, formerly chief engineer of the Canadian Northern Railway, has been appointed chief engineer of both the C.N.R. and the G.T.P., following the amalgamation of the two lines. Mr. Dixon's headquarters will be in Winnipeg.





Sharp Chasers Cut Clean Threads

Accurate, uniform threads result only from chasers which are maintained in the highest state of cutting efficiency. This means that chasers must be kept sharp, and ground uniformly.

Even if just touched up from time to time, the chasers respond splendidly, with clean threads. And with this machine — the Geometric Chaser Grinder—the matter of keeping threading tools up to scratch is a comparatively simple matter.

Various makes of chasers can be ground on this adaptable machine. The two wheels permit the easy grinding of both milled and tapped chasers. In addition, the plain wheel lends itself readily to various kinds of tool grinding.

Uniform grinding of a set of chasers is purely a mechanical matter through the use of adjustments which can be accurately set to govern the grinding of an entire set of chasers.

The Catalogue describing this machine is a mine of information on chaser grinding. Write for it.

THE GEOMETRIC TOOL COMPANY

NEWHAVEN **CONNECTICUT**

Canadian Agents:

Canadian Fairbanks-Morse Co., Ltd., Manitoba, Saskatchewan, Alberta
Williams & Wilson, Ltd., Montreal. The A. R. Williams Machinery Co., Toronto, Winnipeg, St. John, N.B., Halifax, N.S.

If interested tear out this page and place with letters to be answered.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$42 40
Lake Superior, charcoal, Chicago.	57 00
Standard low phos., Philadelphia.	50 00
Bessemer, Pittsburgh	43 00
Basic, Valley furnace	42 90
Toronto price:—	
Silicon, 2.25% to 2.75%	52 00
No. 2 Foundry, 1.75 to 2.25%	50 00

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	$ 5 60
Steel bars, base, Toronto	5 60
Iron bars, base, Montreal	5 60
Steel bars, base, Montreal	5 60
Reinforcing bars, base	5 60
Steel hoops	7 00
Norway iron	11 00
Tire steel	5 75
Spring steel	10 00
Band steel, No. 10 gauge and 3-16 in. base	6 10
Chequered floor plate, 3-16 in.	8 50
Chequered floor plate, ¼ in.	8 10
Bessemer rails, heavy, at mill	
Steel bars, Pittsburgh	3 00-4 00
Tank plates, Pittsburgh	4 00
Structural shapes, Pittsburgh	3 00
Steel hoops, Pittsburgh	3 50-3 75
F.O.B., Toronto Warehouse	
Small shapes	5 60
F.O.B. Chicago Warehouse	
Steel bars	3 62
Structural shapes	3 72
Plates	3 67 to 5 50
Small shapes under 3"	3 62

FREIGHT RATES

Per 100 Pounds.

Pittsburgh to Following Points

	C.L.	L.C.L.
Montreal	58½	73
St. John, N.B.	84½	106½
Halifax	86	108
Toronto	38	54
Guelph	38	54
London	38	54
Windsor	35	50½

METALS

	Gross. Montreal	Toronto
Lake copper	$25 00	$24 25
Electric copper	24 00	24 50
Castings, copper	23 50	24 00
Tin	56 00	58 00
Spelter	10 75	10 75
Lead	9 25	10 50
Antimony	9 00	12 00
Aluminum	36 00	37 00

Prices per 100 lbs.

PLATES

Plates, 3-16 in.	$ 7 25	$ 7 35
Plates, ¼ up	6 50	6 60

PIPE—WROUGHT

Price List No. 44—April, 1920.

STANDARD BUTTWELD S/C

	Steel		Gen. Wrot. Iron	
	Black	Galv.	Black	Galv.
⅛ in.	$6 50	$ 8 50	....	....
¼ in.	5 13	7 26	$ 5 43	$ 7 56
⅜ in.	5 13	7 26	5 43	7 56
½ in.	6 84	8 42	7 27	8 84
¾ in.	8 45	10 58	9 03	11 16
1 in.	12 50	15 64	13 35	16 49
1¼ in.	16 91	21 16	18 06	22 31
1½ in.	20 21	25 30	21 59	26 68
2 in.	27 20	34 04	29 05	35 89
2½ in.	43 00	53 82	....	....
3 in.	56 23	70 38	....	....
3½ in.	71 30	88 32	....	....
4 in.	84 48	104 64	....	....

STANDARD LAPWELD S/C

	Steel		Gen. Wrot. Iron	
	Black	G'v.	Black	Galv.
2 in.	$30 90	$37 74	$34 60	$41 44
2½ in.	45 34	56 16	51 19	62 01
3 in.	59 29	73 44	66 94	81 09
3½ in.	73 14	90 16	82 34	99 36
4 in.	86 66	106 82	97 56	117 72
4½ in.	0 98	1 23	1 24	1 49
5 in.	1 15	1 44	1 44	1 73
6½ in.	1 49	1 86	1 87	2 25
7 in.	1 94	2 43	2 42	2 90
8-L in.	2 04	2 55	2 54	3 05
8 in.	2 35	2 94	2 92	3 51
9 in.	2 81	3 52	3 50	4 21
10-L in.	2 61	3 26	3 25	3 90
10 in.	3 36	4 20	4 18	5 03

Prices—Ontario, Quebec and Maritime Provinces

WROUGHT NIPPLES

4" and under, 60%.

4½" and larger, 50%.

4" and under, running thread, 30%.

Standard couplings, 4-in. and under, 30%.

Do., 4½-in. and larger, 10%.

OLD MATERIAL

Dealers' Average Buying Prices.

	Per 100 Pounds. Montreal	Toronto
Copper, light	$15 00	$14 00
Copper, crucible	18 00	18 00
Copper, heavy	18 00	18 00
Copper wire	18 00	18 00
No. 1 machine composition	17 00	17 00
New brass cuttings	11 00	11 75
Red brass turnings	14 50	15 75
Yellow brass turninbs	9 00	9 50
Light brass	7 00	7 00
Medium brass	8 00	7 75
Scrap zinc	6 50	6 00
Heavy lead	7 50	7 75
Tea lead	4 50	5 00
Aluminum	19 00	20 00

	Per Ton	Gross
Heavy melting steel	20 00	18 00
Boiler plate	15 50	15 00
Axles (wrought iron)	30 00	20 00
Rails (scrap	23 00	18 00
Malleable scrap	26 00	25 00
No. 1 machine east iron.	32 00	33 00
Pipe, wrought	12 00	12 00
Car wheel	33 00	33 00
Steel axles	25 00	20 00
Mach. shop turnings	11 00	11 00
Stove plate	26 50	25 00
Cast boring	14 00	14 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, 7-16 and up	+10
Carriage bolts, ⅜-in. and less	Net
Coach and lag screws	—15
Stove bolts	55
Wrought washers	—25
Elevator bolts	+10
Machine bolts, 7-16 and over	+10
Machine bolts, ⅜-in. and less	+10
Blank bolts	Net
Bolt ends	Net
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	+25
Machine screws, fl. and rd. hd., brass	net
Machine screws, o. and fil. hd., brass	net
Nuts, square, blank	+25 add $2 00
Nuts, square, tapped	add 2 25
Nuts, hex., blank	add 2 50
Nuts, hex., tapped	add 3 00
Copper rivets and burrs, list less	15
Burrs only, list plus	25
Iron rivets and burrs	40 and 5
Boiler rivets, base ¾" and larger	$8 50
Structural rivets, as above	8 40
Wood screws, O. & R., bright	75
Wood screws, flat, bright	77½
Wood screws, flat, brass	55
Wood screws, O. & R., brass	55½
Wood screws, flat, bronze	50
Wood screws, O. & R., bronze	47½

MILLED PRODUCTS

(Prices on unbroken packages)

	Per Cent.
Set screws —20% 25 and	5
Sq. and hex. hd. cap screws	12½
Rd. and fil. hd. cap screws	plus 25
Flat but. hd. cap screws	plus 50
Fin. and semi-fin. nuts up to 1-in.	12½
Fin. and Semi-fin. nuts, over 1 in., up to 1½-in.	—5
Fin. and Semi-fin. nuts over 1½ in., up to 2-in.	+12½
Studs	+5
Taper pins	—12½
Coupling bolts	+40
Planer head bolts, without fillet, list	+45
Planer head bolts, with fillet, list plus 10 and	+55
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	+60
Collar screws	list plus 20, 30
Thumb screws	40
Thumb nuts	75
Patch bolts	add +85
Cold pressed nuts to 1½ in.	add $1 00
Cold pressed nuts over 1½ in.	add 2 00

BILLETS

	Per gross ton
Bessemer billets	$60 00
Open-hearth billets	60 00
O.H. sheet bars	76 00
Forging billets	56 00-75 00
Wire rods	52 00-70 00

Government prices.

F.O.B. Pittsburgh.

NAILS AND SPIKES

Wire nails, base	$6 10
Cut nails, base	7 00
Miscellaneous wire nails	50%

ROPE AND PACKINGS

Plumbers' oakum, per lb.	0 10¼
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 35½
British Manila rope	0 28
New Zealand hemp	0 28

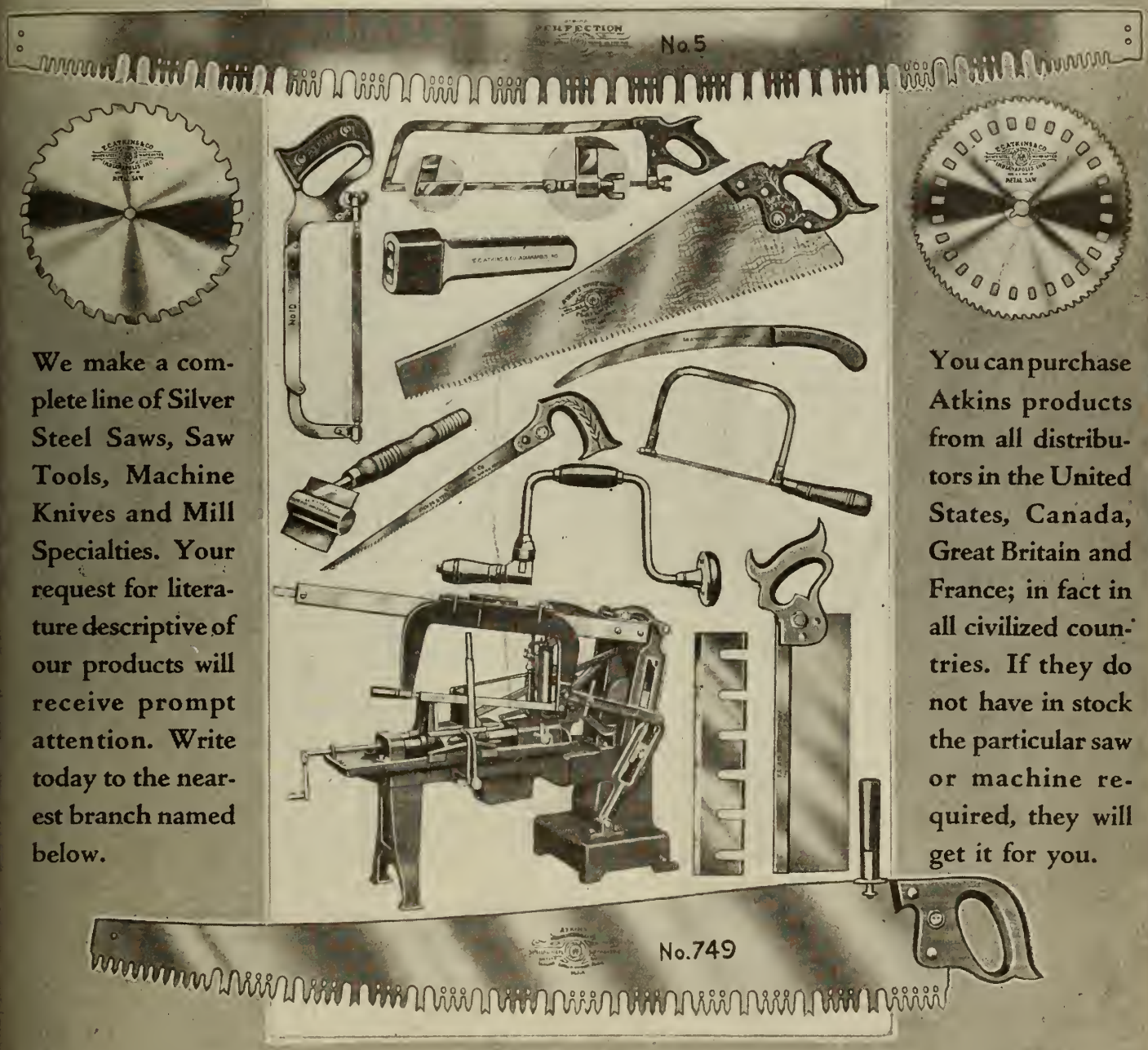
POLISHED DRILL ROD

Discount off list, Montreal and Toronto ..... net

ATKINS
SILVER STEEL
SAWS and TOOLS
A Perfect Saw for every Purpose

"Finest on Earth"

"Finest on Earth"



We make a complete line of Silver Steel Saws, Saw Tools, Machine Knives and Mill Specialties. Your request for literature descriptive of our products will receive prompt attention. Write today to the nearest branch named below.

You can purchase Atkins products from all distributors in the United States, Canada, Great Britain and France; in fact in all civilized countries. If they do not have in stock the particular saw or machine required, they will get it for you.

E. C. ATKINS & COMPANY, Inc.

Established 1857

Home Office and Factory: INDIANAPOLIS, INDIANA

Canadian Factory: HAMILTON, ONTARIO *Machine Knife Factory:* LANCASTER, N. Y.

Branches carrying complete stocks in all large distributing centers as follows:

ATLANTA	MEMPHIS	NEW ORLEANS	PORTLAND, ORE.	SEATTLE	SYDNEY, N. S. W.
CHICAGO	MINNEAPOLIS	NEW YORK CITY	SAN FRANCISCO	VANCOUVER, B. C.	PARIS, FRANCE

MISCELLANEOUS

Solder, strictly	$ 0 35
Solder, guaranteed	0 39
Soldering coppers, lb.	0 62½
White lead, pure, cwt.	20 35
Red dry lead, 100-lb. kegs, per cwt.	16 00
Gasoline, per gal., bulk	0 38
Pure turp., single bbls., gal.	3 15
Linseed oil, raw, single bbls.	2 37
Linseed oil, boiled, single bbls.	2 40
Wood alcohol, per gal.	4 00
Whiting, plain, per 100 lbs.	3 00

CARBON DRILLS AND REAMERS

S.S. drills, wire sizes	32½
Can. carbon cutters, plus	20
Standard drills, all sizes	32½
3-fluted drills, plus	10
Jobbers' and letter sizes	32½
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	50
Sleeves	50
Taper pin reamers	25 off
Drills and countersinks	net
Bridge reamers	50
Centre reamers	10
Chucking reamers	net
Hand reamers	10
High speed drills, list plus	10 to 30
Can. high speed cutters, net to plus	10
American	plus 40

COLD ROLLED STEEL

[At warehouse]

Rounds and squares	$7 base
Hexagons and flats	$7.75 base

IRON PIPE FITTINGS

	Black	Galv.
Class A	60	75
Class B	27	37
Class C	18	27

Cast iron fittings, 5%; malleable bushings, 22½%; cast bushings, 22½%; unions, 37½%; plugs, 20% off list.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$12 00	12 10
Sheets, Blue ann., No. 10	9 50	9 60
Canada plates, dull, 52 sheets	13 00	13 00
Can. plates, all bright	14 00	.....
Apollo brand, 10¾ oz. galvanized	....	....
Queen's Head, 28 B.W.G.	13 50	.....
Fleur-de-Lis, 28 B.W.G.	13 00	.....
Gorbal's Best, No. 28	....	....
Colborne Crown, No. 28.	....	....
Premier, No. 28, U.S.	11 50	12 60
Premier, 10¾-oz.	11 50	13 00
Zinc sheets	16 50	20 00

PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13.00; 5-16, $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.20; ¾ in., $9.30; ⅝ in., $9.50; 1 in., $9.10; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $13.00; 5-16 in., $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.50; ¾ in., $9.30.

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

BOILER TUBES.

Size	Seamless	Lapwelded
1 in.	$27 00	$.....
1¼ in.	29 50	.....
1½ in.	31 50	29 50
1¾ in.	31 50	30 00
2 in.	35 00	30 00
2¼ in.	35 00	29 00
2½ in.	42 00	37 00
3 in.	50 00	48 00
3¼ in.	.. ..	48 50
3½ in.	63 00	51 50
4 in.	85 00	65 50

Prices per 100 ft., Montreal and Toronto

OILS AND COMPOUNDS.

Castor oil, per lb.	
Royalite, per gal., bulk	27½
Palacine	30½
Machine oil, per gal.	54½
Black oil, per gal.	28
Cylinder oil, Capital	82½
Petroleum fuel oil, bbls., net	18

BELTING—No 1 OAK TANNED

Extra heavy, single and double	6½
Standard	6½
Cut leather lacing, No. 1	2 00
Leather in side	2 40 3 00

TAPES

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	$4 60
Polishing wheels, bull-neck	2 00
Emery in kegs, Turkish	09
Pumice, ground	06
Emery glue	30
Tripoli composition	09
Crocus composition	12
Emery composition	11
Rouge, silver	60
Rouge, powder, nickel	45

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	.08½
Grits, 80 and finer	.6

BRASS—Warehouse Price

Brass rods, base ½ in. to 1 in. rod	0 34
Brass sheets, 24 gauge and heavier, base	$0 42
Brass tubing, seamless	0 46
Copper tubing, seamless	0 48

WASTE

XXX Extra	.24
Peerless	22½
Grand	22½
Superior	22½
X L C R	21
Atlas	.20
X Empire	19½
Ideal	.19
X Press	17½

Colored

Lion	.17
Standard	.15
No. 1	.15
Popular	.13
Keen	.11

Wool Packing

Arrow	.35
Axle	.28
Anvil	.22
Anchor	.17

Washed Wipers

Select White	.20
Mixed colored	.10
Dark colored	.09

This list subject to trade discount for quantity.

RUBBER BELTING

Standard ... 10% Best grades... 15%

ANODES

Nickel	.55 to .60
Copper	.38 to .40
Tin	.70 to .70
Zinc	.16 to .17

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	$42 50	$43 00
Copper wire, list plus 10		
Plain sheets, 14 oz., 14x60 in.	49 00	48 00
Copper sheet, tinned, 14x60, 14 oz.	52 00	48 00
Copper sheet, planished, 16 oz. base	56 00	55 00
Braziers', in sheets, 6 x 4 base	48 00	46 00

LEAD SHEETS

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$11 50	$14 50
Sheets, 3½ lbs. sq. ft.	11 25	14 00
Sheets, 4 to 6 lbs. sq. ft.	11 00	13 50

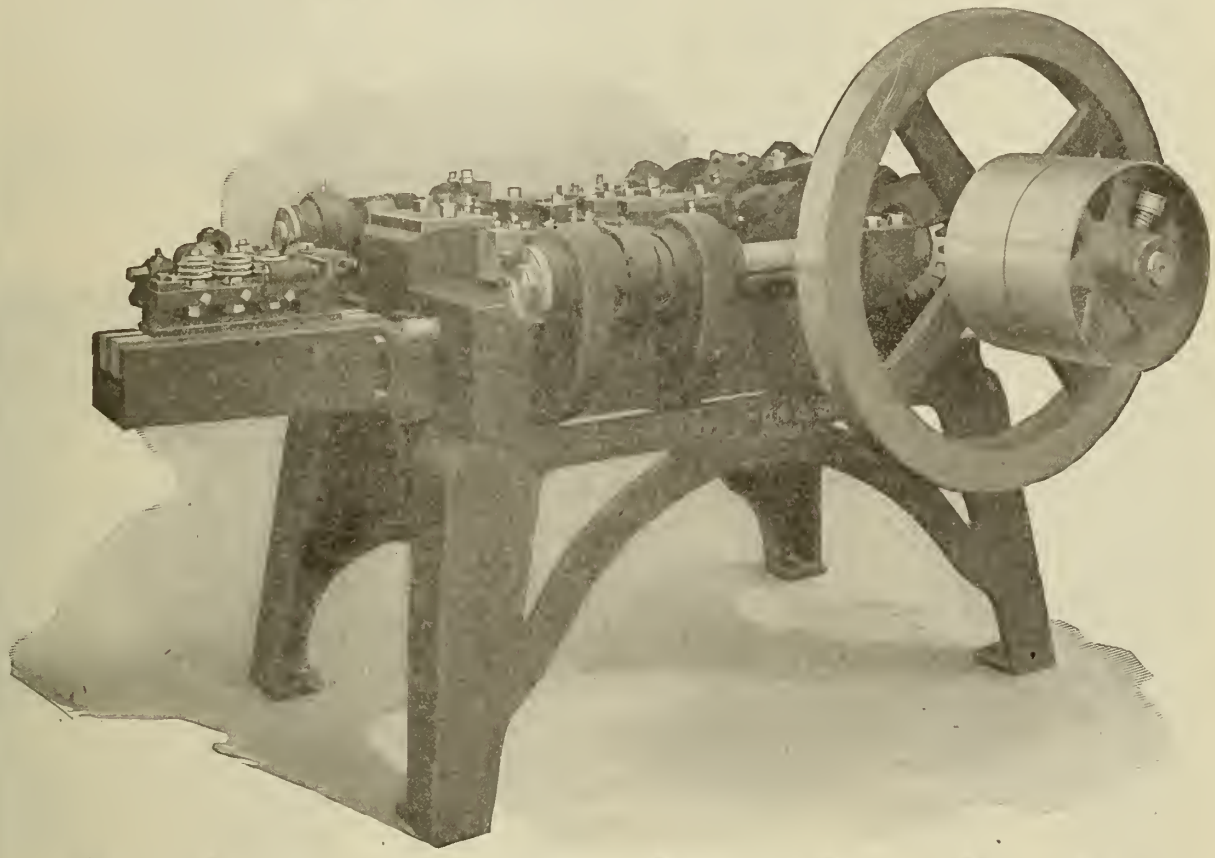
Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS

Acid, boracic	$ .23
Acid, hydrochloric	.04
Acid, nitric	.11
Acid, sulphuric	.04
Ammonia, aqua	.15
Ammonium, carbonate	.23
Ammonium, chloride	.22
Ammonium hydrosulphuret	.75
Ammonium sulphate	.30
Arsenic, white	.14
Copper, carbonate, annhy	.41
Copper, sulphate	.15
Cobalt, sulphate	.20
Iron perchloride	.62
Lead acetate	.30
Nickel ammonium sulphate	.20
Nickel carbonate	.32
Nickel sulphate	.22
Potassium sulphide (substitute)	.42
Silver chloride (per oz.)	1.30
Silver nitrate (per oz.)	1.25
Sodium bisulphate	.14
Sodium carbonate crystals	.06
Sodium cyanide, 127-130%	.38
Sodium hyposulphite per 100 lbs	8.00
Sodium phosphate	.15
Tin chloride	.80
Zinc chloride, C.P.	.30
Zinc sulphate	.10

Prices per lb. unless otherwise stated

There is Profit in Making Wire Nails



The Ryerson-Glader Wire Nail Machine

Many wire nail manufacturers have enlarged their facilities and brought their plants up-to-date by installing Ryerson-Glader wire nail equipment.

Other concerns, operating machine shops, boiler shops, etc., have added a wire nail department with splendid results.

If you are interested in wire nail manufacture, it will pay you to secure complete information on the Ryerson-Glader machines. They are built for speed and strength with accessibility of adjustments as the first consideration. The machines are manufactured in six sizes from No. 00 to No. 4, designed to turn out nails from No. 22 gauge by ¼" long to 60-d.

Write for complete information and prices, including Bulletin 22,011

JOSEPH T. RYERSON & SON

CHICAGO, ILL., U.S.A.

MACHINERY

Canadian Representatives:

GARLOCK-WALKER MACHINERY CO., 32-34 Front Street West, TORONTO

MONTREAL WINNIPEG

If interested tear out this page and place with letters to be answered.

Chambers of Commerce to Gather Here

Delegates from Many Parts of the Empire Will Discuss Various Matters—Commercial Relations Between the Various Dominions Will Be Dealt with—Shipping and Cable Rates Also Up.

THE ninth congress of "Chambers of Commerce of the British Empire" is to meet in Toronto at Convocation Hall from Sept. 17 to 23, 1920. The congress is one of the most important post-war commercial gatherings. The whole question of inter-Imperial trade, which includes the matter of reciprocity and tariff generally will be dealt with by the leading men of commerce of the Empire. Amongst the delegates are the Rt. Hon. Lord Desborough, K.C.V.O. (president).

Congress organizing committee (ex-officio):—

SIR JAMES W. WOODS

General chairman of the Canadian Committee of the Congress. Born in Woodstock in 1885, Director of the Imperial Bank and President of Gordon MacKay & Co., and Director of the National Trust Co. In 1915 he visited Great Britain, France, and Italy to forecast post-war commercial conditions.

Stanley Machin, J.P., chairman.

A. J. Hobson, LL.D., J.P., vice-chairman.

The Hon. J. G. Jenkins, treasurer.

Charles E. Musgrave, hon. secretary.

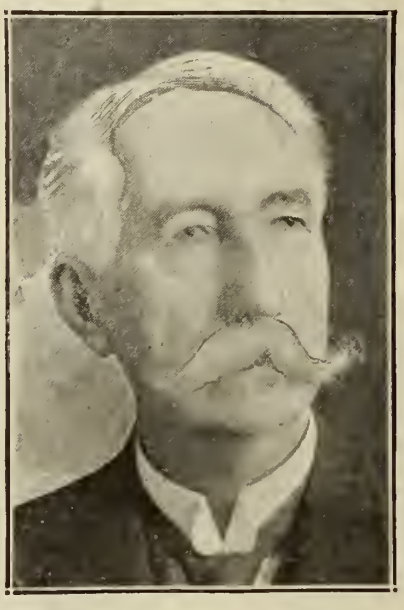
All British Chambers of Commerce, Boards of Trade and associations throughout the world will be represented and will discuss the resolutions within the limitations provided by the congress rules and general conditions.

Representation at the congress is distributed as under:

United Kingdom.—69 delegates, representing the Association of British Chambers of Commerce and all the leading industrial cities in the British Isles.

Canada.—49 delegates, selected by the various Boards of Trade representing 17 leading cities in the Dominion.

Australia.—6 delegates, representing the five chief cities of the Commonwealth.



HON. JOHN GREELEY JENKINS

Honorary Treasurer of the Congress, Agent General for South Australia in 1908, and is personally interested in production and development in Canada. He is a director for Great Britain on the Paris International Chamber of Congress.

India and Ceylon.—4 delegates.

New Zealand.—2 delegates.

South Africa.—2 delegates.

West Indies and Associated Chambers.—6 delegates.

Other British Possessions.—1 delegate.

CHARLES MARRIOTT

President of the Toronto Board of Trade. Born in Brantford Mr. Marriott is well known in business circles as General Manager of G. Goulding & Sons. He is a member of the C.M.A., the Royal Canadian Yacht Club and the Empire Club.

British Chambers in Foreign Countries.—4 delegates.

Honorary Delegates.—8.

Many points of vital importance to the future of Empire trade will be discussed, the chief of which is the commercial relations between the Mother Country and overseas dominions, with regard to the establishing of preferential trade within the British Empire.

Resolutions regarding general shipping conditions, empire telegraphic and cable communication, development of Empire resources and the facilities for shipping at Canadian ocean ports are filed for discussion.

THE RIGHT HON. LORD DESBOROUGH, K.C.V.O.

President of the Ninth Congress of the Chambers of Commerce of the British Empire. Empire builder and sportsman, Lord Desborough has played an important part in many varied fields.

The object of the congress is to give expression to Imperial commercial opinion on matters directly or indirectly affecting commercial and industrial affairs. These expressions will be of value and interest to all Canadian industries and will have an important bearing upon the future course of trade within the Empire.

The delegates will be officially welcomed at Massey Hall at 8.15 p.m. Sept. 17th by Hon. L. H. Clarke, Lt.-Governor of Ontario; Mayor Church and Sir James W. Woods, chairman of the Toronto Board of Trade General Congress Committee. Various receptions and entertainments are arranged extending until Sept. 24, when the congress propose to visit St. Catharines and Niagara Falls, following which they will tour a number of industrial, mining and agricultural centres in Ontario and Quebec, terminating at Quebec on October 11.

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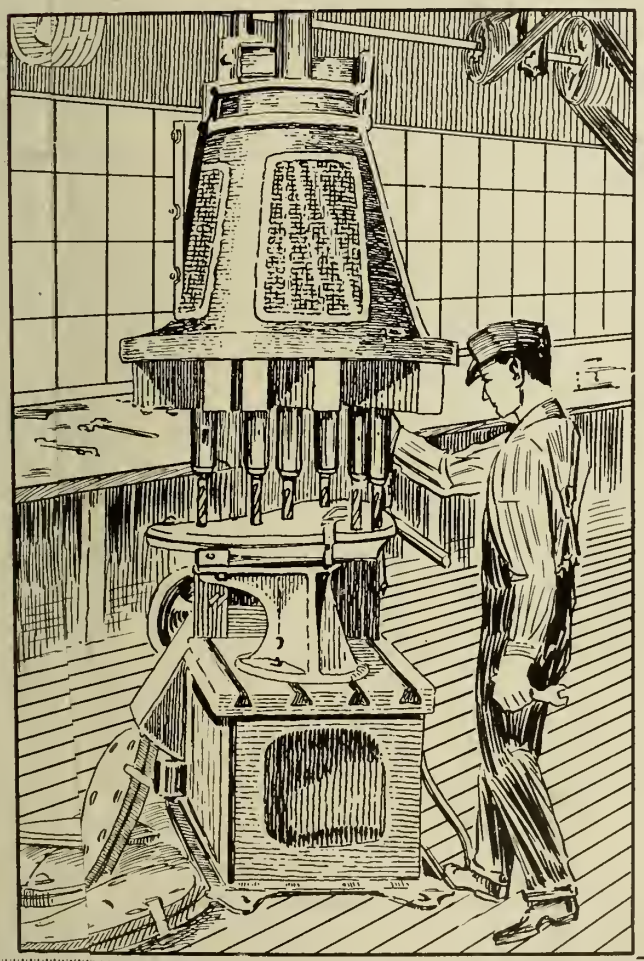

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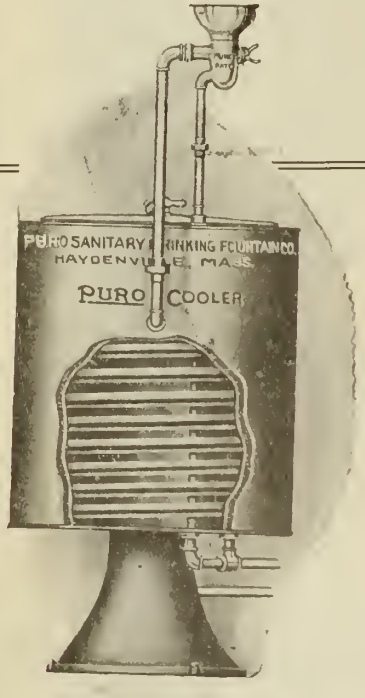

TRADE GOSSIP

Want Canadian Goods.—Importing interests in Luxembourg are desirous of securing raw materials from Canada. Inquiries have been sent out from the branch office of one such company that is situated in Antwerp. The materials that are particularly wanted include iron ores and steel, coal, asbestos, lumber, paper and wood pulp. One of the departments of the above organization wishes to import food stuffs. This query was addressed to the Department of Trade and Commerce at Ottawa, and the Luxembourg firm intimated that consignments could be billed via Antwerp, and that sole agencies for the Luxembourg area would be considered.

Scotia Steel.—Directors of the Nova Scotia Steel & Coal Company met at Montreal, following which the usual dividends of two per cent. on the preferred, and 1¼ per cent. on the common shares were declared. Both are payable October 15 to record of September 30. It was stated after the meeting that a quantity of routine details had been disposed of by the board, which also discussed a number of important matters connected with the future of the enterprise. Although no official statement was forthcoming after the meeting, it is understood that included in the matters taken up by the Scotia directors were final details in connection with the consolidation of the company with the British Empire Steel Corporation.

Close Welland Yard. — Another fortnight will see the yards of the British American Shipbuilding Company closed and the activities of one of Welland's foremost industries at an end. The finishing touches are now being put on the "Canadian Squatter," and in two weeks the sections will be towed to Montreal for completion. The plant will be sold and the buildings removed. At the present time only 150 hands are employed. At the first of the year the payroll carried 500 persons, and, at its peak, the yards had 500 employees. In all five vessels have been built, and for these over a million and a half dollars has been paid out locally in wages.

Sold Buffalo Plant. — Following the activity and strength in the securities of Canada Foundries & Forgings Co. on the stock exchange, after a period of neglect, comes the information that at a meeting of the directors in New York, arrangements were completed for the sale of the company's subsidiary at Buffalo, the Delaney Forge Co. It is understood that the sale will net the forgings company approximately $500,000. The Delaney Iron & Forgings Co. was purchased by the Canada Foundries & Forgings Co. in the fall of 1917. On March 4, 1920, the Delaney Co. raised its dividend from eight to ten per cent., which meant about 7.3 per cent. on the common stock of the parent company. Around the middle of July the parent company purchased the Mann Axe & Tool Co. of St. Stephen's, N.B.

Going to London.—A despatch from London says: "Ald. Bridge announces that the Chamber of Commerce has finally concluded arrangements whereby the Service Motor Truck Company of Wabash, Ind., will open a large branch factory in this city. The plant will be situated on a 50-acre site known as the Frank property, running along the L. & P. S. R., immediately west of Chelsea Green. Work on the construction of three buildings, each 100 by 300 feet, is to be begun at once. The plant will cost about $500,000, and it will employ 700 men to start with. The Rugles Motor Truck Company of Alma, Mich., has also decided to locate in London. Because of the fact that the two named concerns have agreed to come here, a very large malleable iron plant, which will supply them with castings, has expressed its intention of also locating in this city. Official announcement regarding this latter works is to be made in a day or two."

Presentation at Baldwins— A pleasing ceremony took place Saturday, when the employees of the new plant at Baldwins, Ltd., Ashbridge's Bay, made a presentation to Sir Charles and Lady Wright and others of the English directors.

On behalf of the employees, Mr. Coundon presented Lady White with a handsome leather hand bag and asked her to re-

INTERESTING FACTS TO BE FOUND IN THIS WEEK'S ADVERTISING SECTION

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How to maintain close accuracy.

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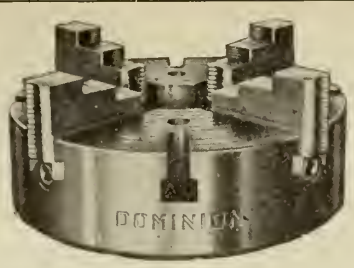
ceive a series of hand bags for the wives of her husband's colleagues in England. Sir Charles Wright, whose father, Sir John Roper Wright, is president, was presented with a gold pencil case and also received a series of gold pencil cases for his colleagues on the other side. Nathaniel Thomas, mill manager, made a presentation to Mr. Cound on behalf of the employees of a hand bag similar to one being sent on to his wife, who is at present in England.

PERSONAL

A Montreal report says: No confirmation was obtainable here of the report coming from Ottawa as to the impending resignation of Alex. Johnston, Deputy Minister of Marine and Fisheries, who, it is stated, is to become associated with the new British Empire Steel Corporation in an executive capacity. It is generally assumed that Mr. Johnston will join the corporation in the near future, although the exact nature of his new responsibilities is not yet available. As Deputy Minister of Marine and Fisheries, Mr. Johnston played a conspicuous part in the shipbuilding activities of the Government. He particularly interested himself during the past two years in the establishment and operation of the splendid ship plate mill of the Dominion Steel Company at Sydney, and it is regarded as probable that his association with the British Empire Steel Corporation will be in connection with this phase of the consolidation's activities.

Announcement is made that H. B. Smith, president of the Collingwood Shipbuilding Company, Limited, and a director of the Canada Steamship Lines, has been made president of Halifax Shipyards, Limited, succeeding Roy M. Wolvin, who has retired owing to the pressing duties of his position as president of the Dominion Steel Corporation. Halifax Shipyards is one of the chain of shipbuilding companies slated to enter the British Empire Steel Corporation merger, and it is said that Mr. Smith will be the shipbuilding director for the big corporation's chain of yards on the Canadian waterways.



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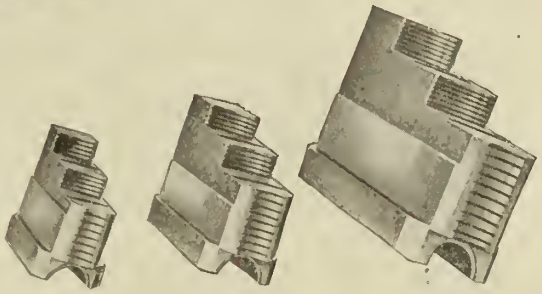

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AGENTS WANTED — REPRESENTATIVE IN Eastern Canada for well-known American firm manufacturing oxy-acetylene welding apparatus, etc. Box 705F, Canadian Machinery.

FOR HIGH-GRADE AMERICAN-MADE LATHE —14 to 26. In replying state territory you can cover and cover thoroughly. Box 682, Canadian Machinery. (c22m)

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150	1150	Ft. Wayne	600	ARB
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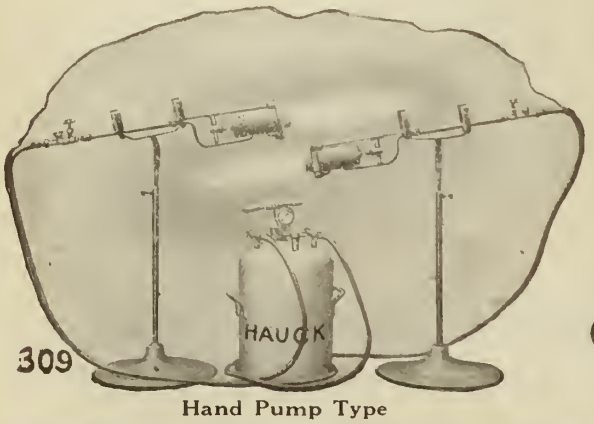

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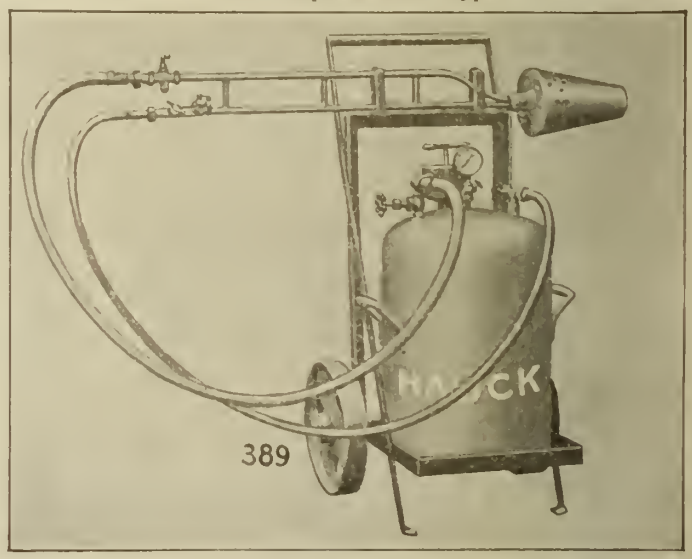

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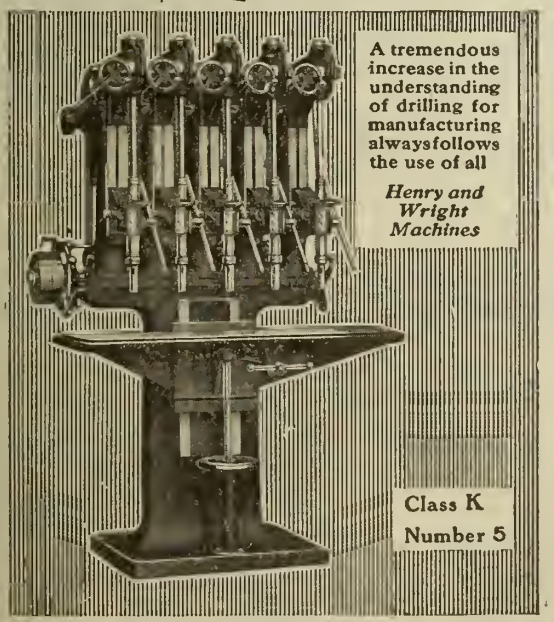
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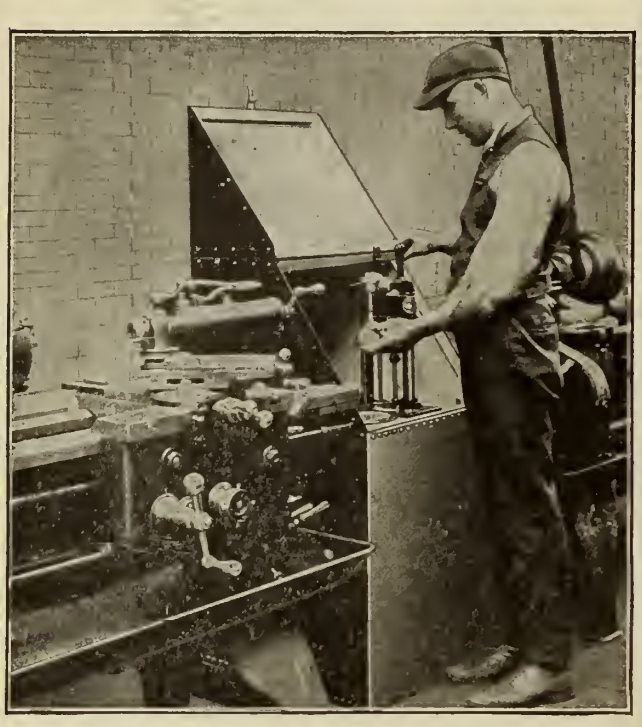

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2

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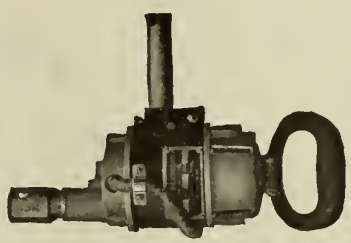

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All motors wound for 110 or 220 volts.

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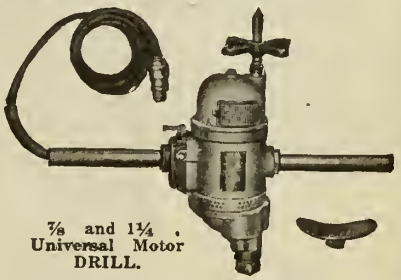

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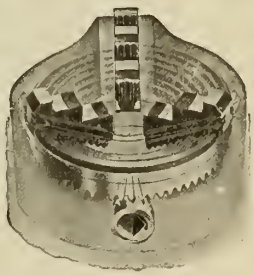

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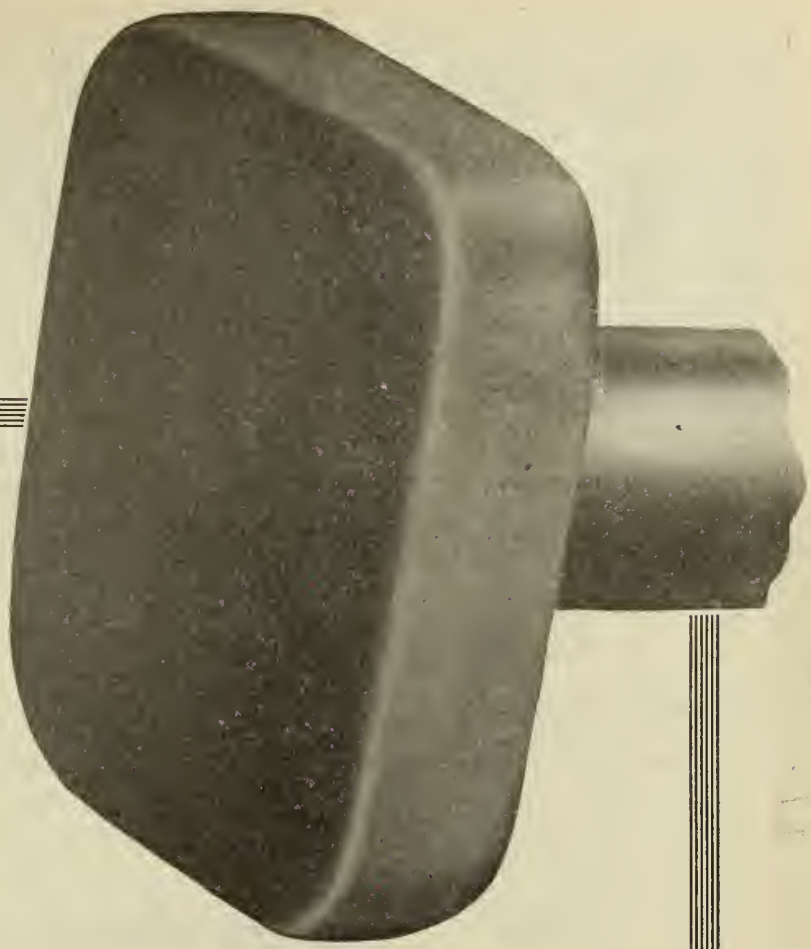

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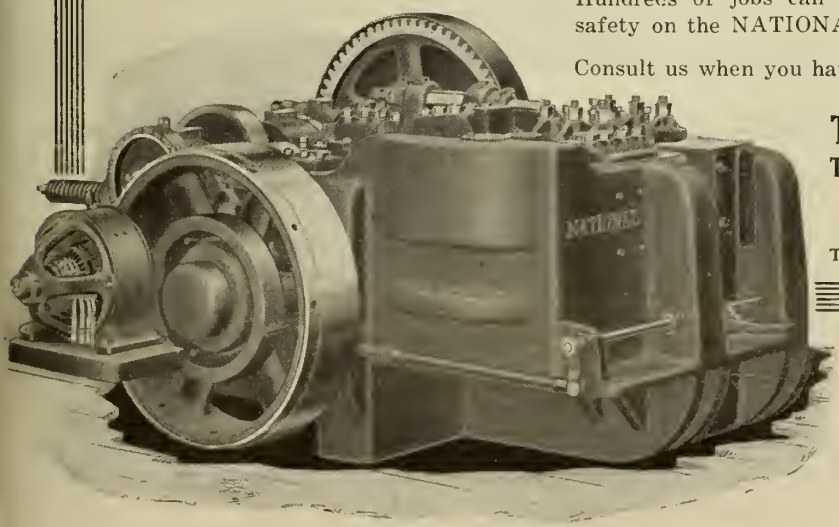

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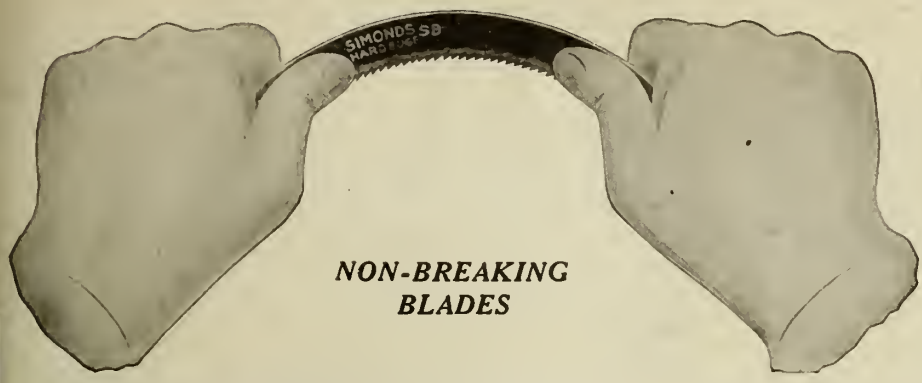

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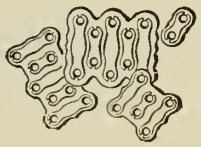

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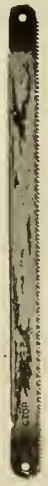

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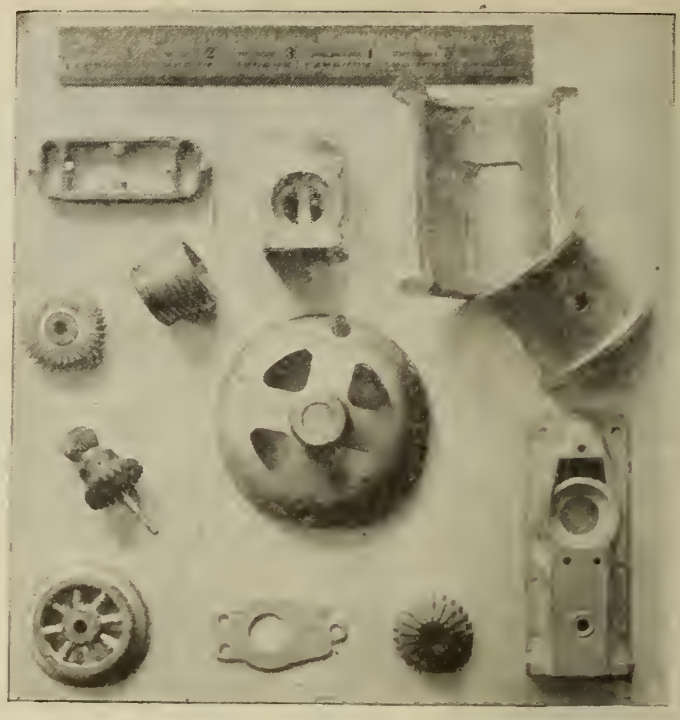

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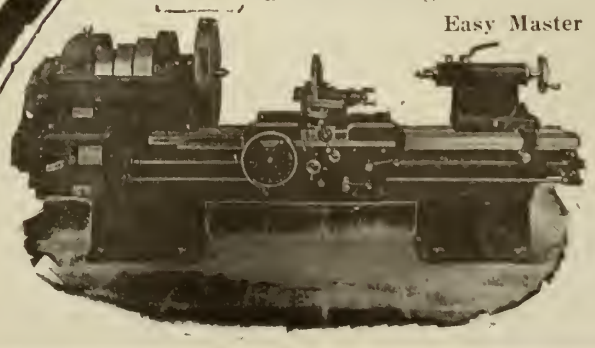

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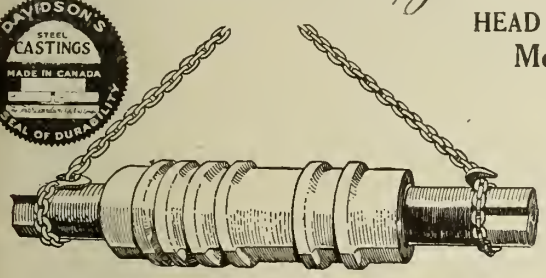

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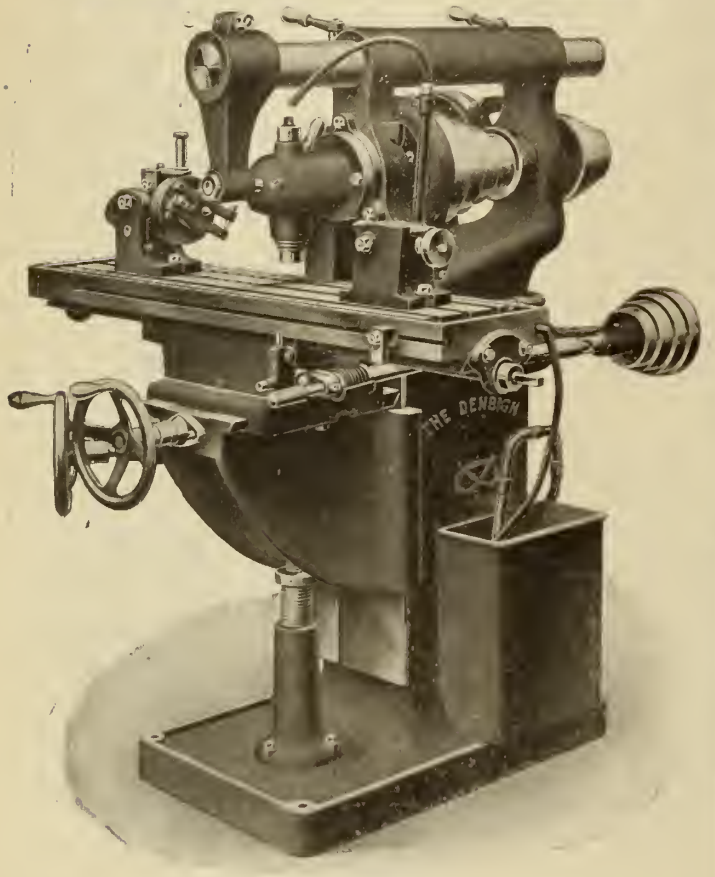

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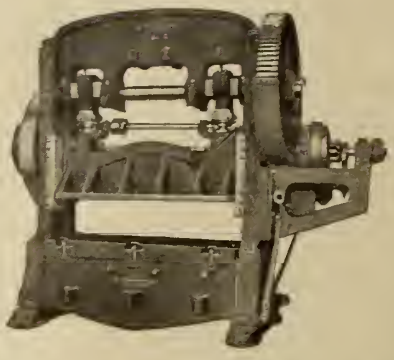

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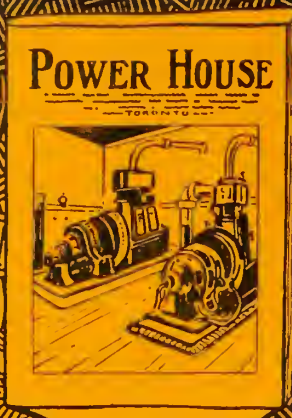

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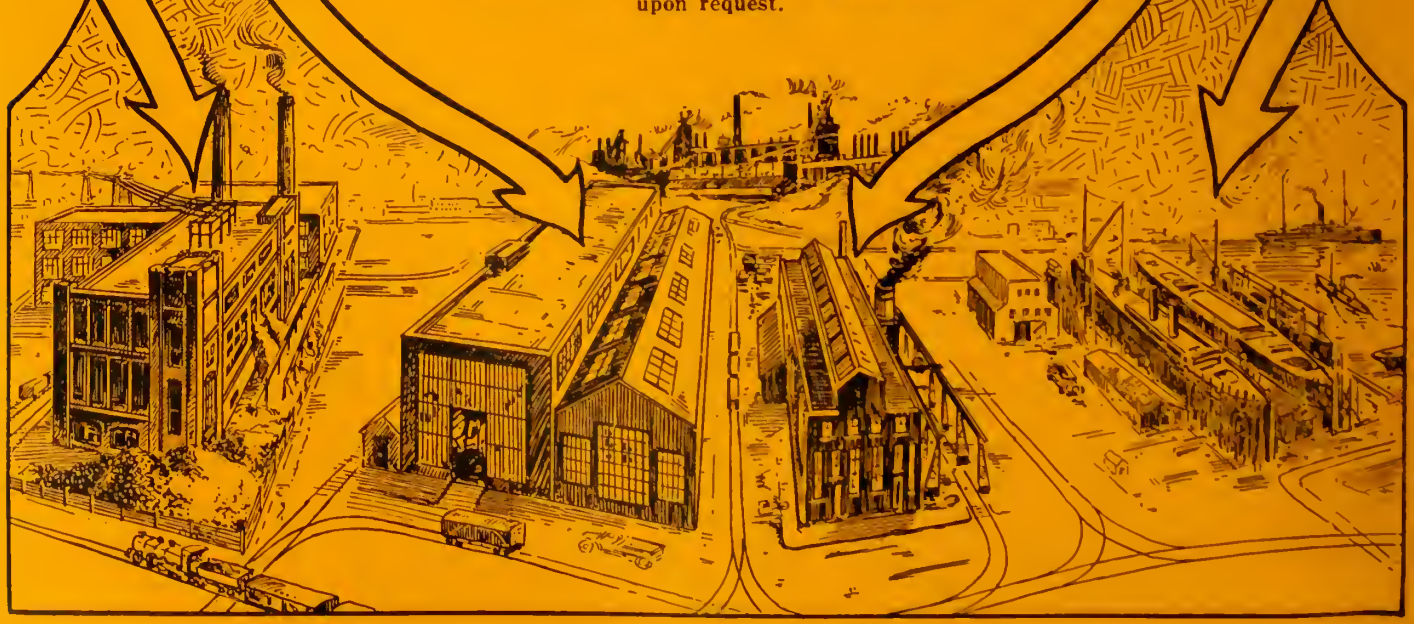

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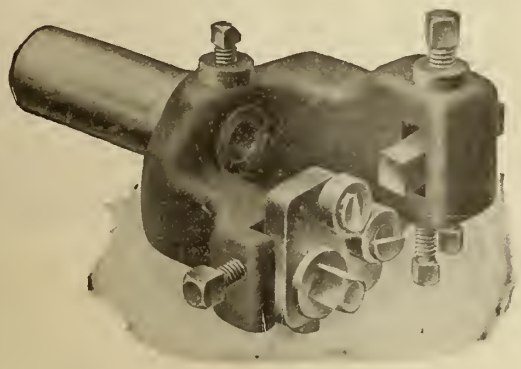

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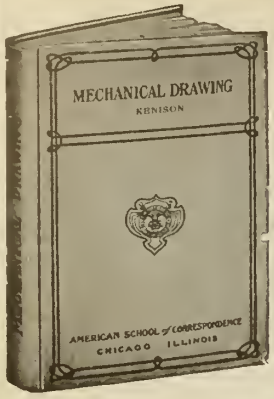

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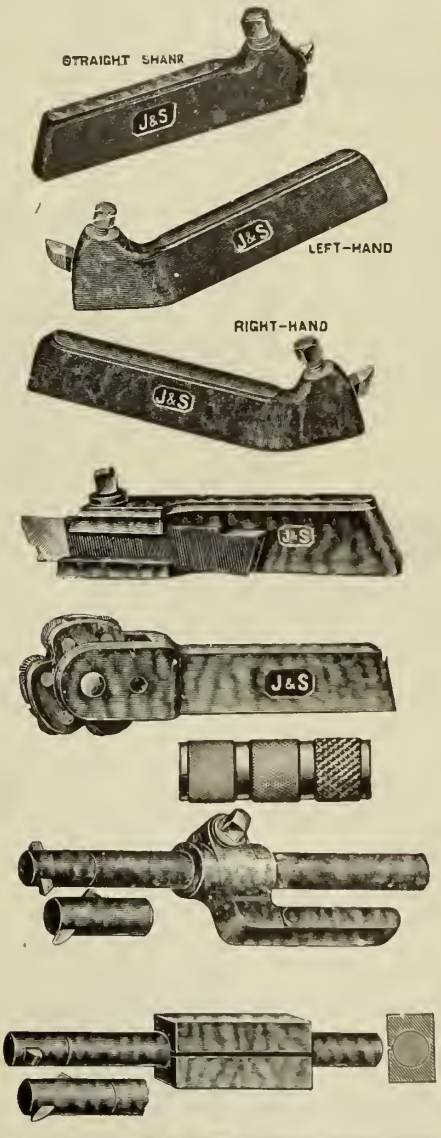

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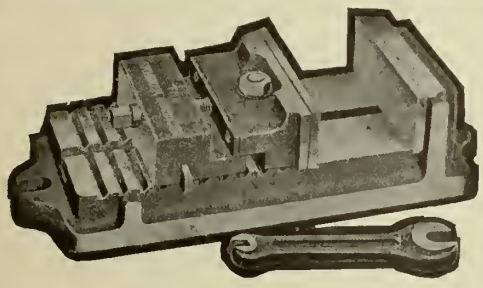

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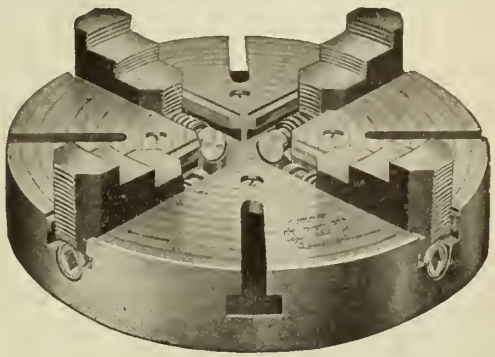

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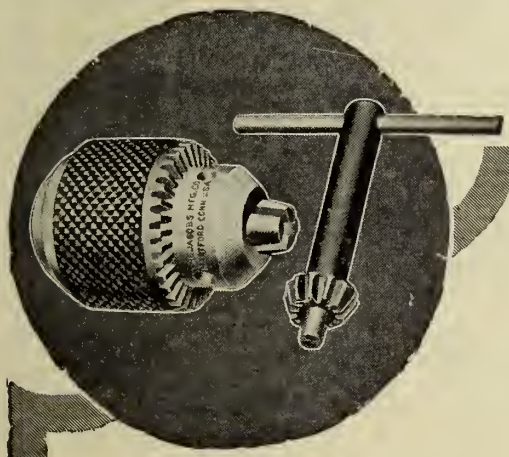

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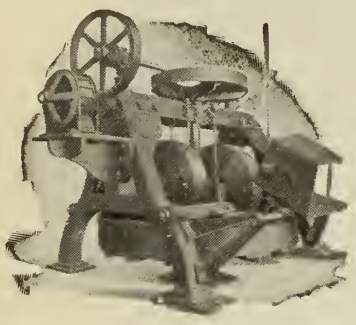

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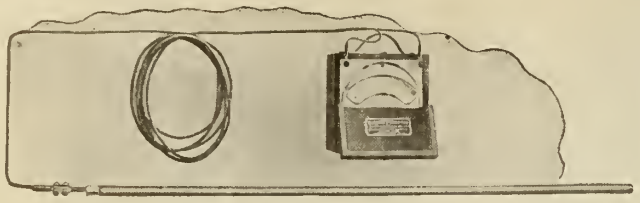

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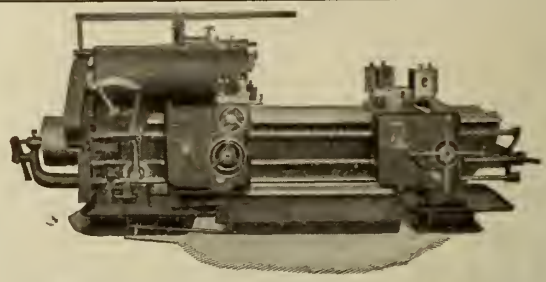

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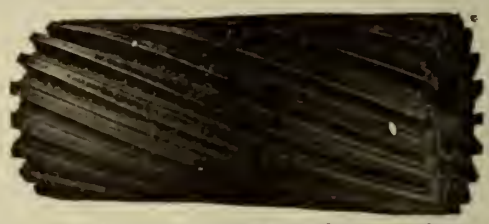

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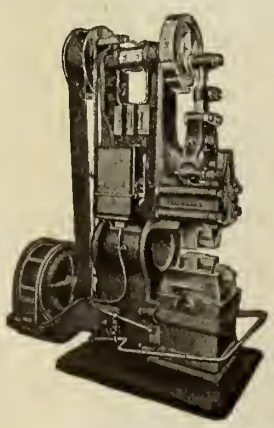

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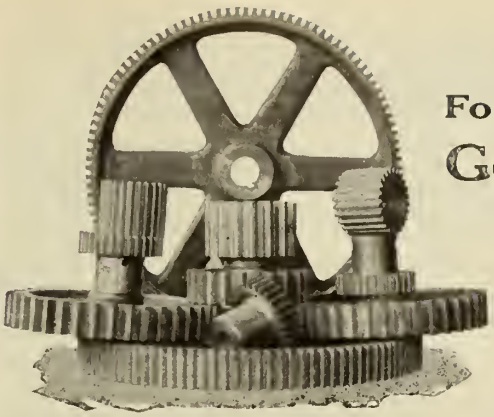

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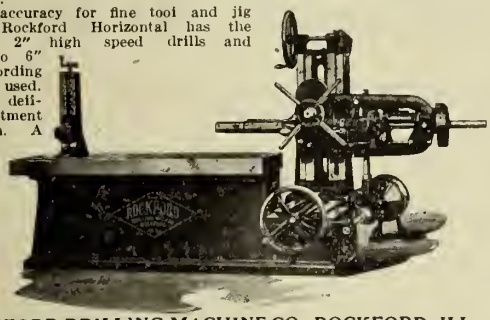

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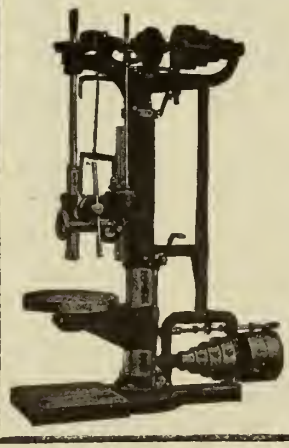

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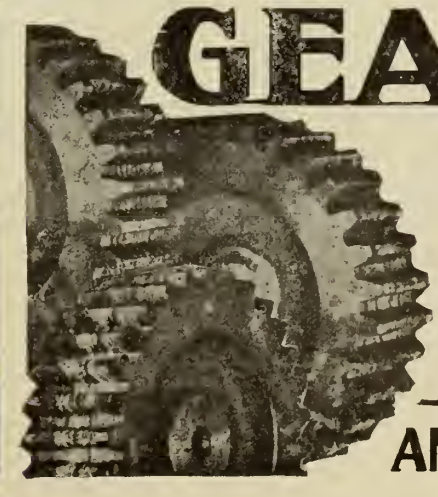

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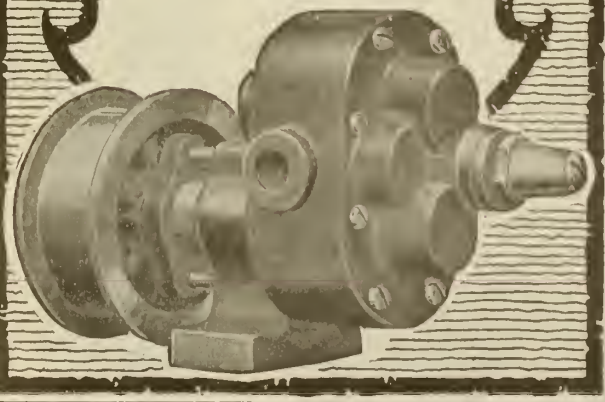

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BELTING, CHAIN
Canadian Fairbanks-Morse Co., Montreal
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Petrie, Ltd., H. W., Toronto.
Renold of Canada, Ltd., Montreal.
Whitney Mfg. Co., Hartford, Conn.
Williams Mchy Co., A. R., Toronto, Ont.

BELTING, CONVEYOR
Can. Consolidated Rubber Co., Montreal.
Can. Link-Belt Co., Toronto, Ont.
Canadian Fairbanks-Morse Co., Montreal
Federal Engineering Co., Ltd., Toronto.
Gutta Percha & Rubber, Ltd., Toronto.
Graton & Knight Mfg., Worcesteh, Mass.
International Mchy. Spls., Ltd., Montreal
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
McLaren Belting Co., J. C., Montreal.
Morse Chain Co., Ithaca, N.Y.
Petrie, Ltd., H. W., Toronto.
Quaker City Rubber Co., Philadelphia, Pa.
Rice, Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.
Sumner & Co., New York, N.Y.
Williams Mchy Co., A. R., Toronto, Ont.

BELTING, FRICTION AND SURFACE
Can. Con. Rubber Co., Ltd., Montreal.
Gutta Percha & Rubber, Ltd., Toronto.

BELTING, HAIR
Sumner & Co., New York, N.Y.

BELTING, LEATHER
Can. Graton & Knight Mfg. Co., Montreal
Gutta Percha & Rubber, Ltd., Toronto, Canada.

BELTING, RUBBER
International Mchy. Spls. Ltd., Montreal.
Quaker City Rubber Co., Philadelphia, Pa.

BELTING, STITCHED COTTON DUCK
Dominion Belting Co., Hamilton, Ont.
Gutta Percha & Rubber, Ltd., Toronto.

BELTING, WOVEN
Federal Engineering Co., Ltd., Toronto.
Sumner & Co., New York, N.Y.

BENDING MACHINERY
Bertrams, Ltd., Edinburgh, Scotland.
Bertram & Sons Co., John, Dundas.
Brown-Boggs Co., Ltd., Hamilton, Ont.
Can. Blower & Forge Co., Kitchener.
Dom. Steel Product Co., Ltd., Brantford.
Garlock-Walker Machinery Co., Toronto.
Petrie, Ltd., H. W., Toronto.

BLAST GATES
W. S. Rockwell Co., New York, N.Y.

BLASTING MACHINES, SAND
Garlock-Walker Machinery Co., Toronto.
Jardine, A. B., & Co., Hespeler, Ont.
National Mach. Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Toledo Machine & Tool Co., Toledo.
Williams Mchy Co., A. R., Toronto, Ont.

BILLETS
Atkins & Co., Wm., Sheffield, Eng.
Swedish Steel & Importing Co., Ltd., Montreal.
Algoma Steel Corp., Sault Ste. Marie.
Marshall, Son & Bunney, Toronto.
United Alloy Steel Corp., Canton, Ohio.

BILLETS, FORGING
Dominion Foundries & Steel Ltd., Hamilton, Ont.

BINS, STEEL
Dennis Wire & Iron Works, London, Ont.
Dominion Bridge Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Toronto Iron Works, Ltd., Toronto, Ont.
William Hamilton Co., Peterboro, Ont.

BLACKSMITH WORK
The Thos. Pink Co., Ltd., Pembroke.

BLOCKS, CHAIN
Oliver Engineering Co., Montreal.

BLOOMS AND SLABS
Algoma Steel Corp., Sault Ste. Marie.
United Alloy Steel Corp., Canton, Ohio.

BLOWERS
Can. Blower & Forge Co., Kitchener, Ont.
Garlock-Walker Machinery Co., Toronto.
MacGovern & Co., Moutreal, Que.
Petrie, Ltd., H. W., Toronto.
Sturtevant Co., B. F., Galt, Ont.

BLOWING ENGINES
General Combustion Co., Ltd., Montreal, Que.

BLOW PIPES AND REGULATORS
Carter Welding Co., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.

BLUE PRINTING MACHINERY
Commercial Camera Co., Providence, R.I.

BLUE PRINT PAPER
Hugbes, Owens Co., Ltd., Montreal, Que.

BOARTZ
Joyce, Koebel & Co., Inc., New York.

BOILER TUBES
Lyman Tube & Supply Co., Montreal, Que.

BOILER BREECHINGS
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
William Hamilton Co., Peterboro, Ont.

BOLT CUTTERS
Fellows Gear Shaper Co., Springfield, Vt.
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros., of Can., Galt, Ont.
Petrie, Ltd., H. W., Toronto.

BOILERS, RANGE
Can. John Wood Mfg. Co., Ltd., Toronto.

BOILERS
Dominion Bridge Co., Montreal, Que.
MacGovern & Co., Montreal, Que.

BOILERMAKERS' TOOLS
Holden & Co., Ltd., Montreal, Que.

BOLT CUTTERS AND NUT TAPERS
Aikenhead Hardware Co., Toronto, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Landis Machine Co., Waynesboro, Pa.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Rice Lewis & Son, Toronto, Ont.
Wells Bros. Co. of Canada, Galt, Ont.
Petrie, Ltd., H. W., Toronto.

BOLTS
Aikenhead Hardware Co., Toronto, Ont.
London Bolt & Hinge Wks., London, Ont.
Morrow Screw & Nut Co., John, Ingersoll
Rice, Lewis & Son, Toronto, Ont.
Steel Co., of Canada, Ltd., Hamilton.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

BOLTS, COUPLING
Galt Machine Screw Co., Ltd., Galt, Ont.

BOLTS, STAY
Morrow Screw & Nut Co., John, Ingersoll

BOLTS, SPRING SHAKLE
Can. Winkley Co., Ltd., Windsor, Ont.
Morrow Screw & Nut Co., John, Ingersoll

BOLTS, PATCH
Morrow Screw & Nut Co., John, Ingersoll

BOLT AND NUT MACHINERY
Bertram & Sons Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Gardner & Son, Robt., Montreal.
Landis Machine Co., Waynesboro, Pa.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ohio.
Williams Mchy Co., A. R., Toronto, Ont.

BOLT THREADING MACHINERY
Jardine & Co., Ltd., A. B., Hespeler.
Landis Machine Co., Waynesboro, Pa.
National Acme Co., Cleveland, Ohio.
Victor Tool Co., Waynesboro, Pa.

BONDING MACHINES
(Electric Railway)
The Lincoln Eleotric Co., Toronto, Ont.

BORING MACHINES, PNEUMATIC CYLINDER
Cleveland Pneumatic Tool Co., Toronto.
Canadian Fairbanks-Morse Co., Montreal
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Garlock-Walker Machinery Co., Toronto.

BORING MACHINES, UPRIGHT AND HORIZONTAL
Bertram & Sons Co., John, Dundas.
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Gisholt Machine Co., Madison, Wis.
Herbert, Ltd., Alfred, Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Hoefer Mfg. Co., Freeport, Ill.
Landis Tool Co., Waynesboro, Pa.
Oliver Machinery Co., Grand Rapids, Mich.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto.
Rockford Drilling Mchc. Co., Rockford, Ill.
Strelinger Chas. A. Co., Windsor, Ont.

BORING AND TURNING MILLS
Bertram & Sons Co., John, Dundas.
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Foss Mch. & S'ply Co., Geo. F., Montreal
Herbert, Ltd., Alfred, Toronto, Ont.
Oliver Mach. Co., Grand Rapids, Mich.
Niles-Bement-Pond Co., New York.
Strelinger Chas. A. Co., Windsor, Ont.

BOXES, CAST IRON
Brown & Sharpe Mfg. Co., Providence, R.I.

BOXES, STEEL SHOP AND TOTE
Cleveland Wire Spring Co., Cleveland.

BARKES
Brown, Boggs & Co., Hamilton, Can.
Electric Steel & Metals, Ltd., Welland.

BRASS—SHEETS, ROLLS, PLATES, AND RODS
Brown's Copper and Brass Rolling Mills, New Toronto.

BRASS ALLOYS
British Smelting & Refining Co., Ltd., Montreal, Que.

BRASS AND COPPER TUBING
Lyman Tube & Supply Co., Montreal, Que.

BRASS FOUNDERS
Canada Metal Co., Toronto.
Tallman Brass & Metal Co., Hamilton.

BRASS GOODS
Crane, Ltd., Montreal, Que.

BRASS PIPE AND TUBE
Crane, Ltd., Montreal, Que.

BRASS WORKING MACHINERY
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machinery Co., Toronto.
Warner & Swasey Co., Cleveland, O.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Prest-O-Lite Co., Inc., Toronto, Ont.
Wood Turret Machine Co., Brazil, Ind.
Williams Mchy Co., A. R., Toronto, Ont.
Brown's Copper and Brass Rolling Mills, New Toronto.

BRICKS, FIRE
Elk Fire Brick Co., Can., Ltd., Hamilton, Ont.

BRIDGES, RLY. AND HIGHWAY
Dominion Bridge Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.

BROACHING MACHINES
Strellnger, Chas. A. Co., Windsor, Ont.

BRONZE—SHEETS, ROLLS, PLATES AND RODS
Brown's Copper and Brass Rolling Mills, New Toronto.

BRONZE, NAVAL
Canada Metal Co., Toronto.

BRONZE COPPER
Tallman Brass and Metal Co., Hamilton.
Canada Metal Co., Toronto.

BRUSHES, CARBON
Lyman Tube & Supply Co., Montreal, Que.

BUFFING AND POLISHING MACHINERY
Ford-Smith Mach. Co., Hamilton.
Foss Mchy. & S'ply Co, Geo. F., Montreal
Garlock Walker Machinery Co., Toronto.
Petrie, Ltd., H. W., Toronto.

BUCKETS, DUMP
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

BUCKETS, ELEVATOR
Can. Link-Belt Co., Toronto, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

BUCKETS, CLAM SHELL, CRAB, DUMP
Brown Hoisting Machinery Co., Cleveland, Ohio.
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Ltd., Walkerville.

BULLDOZERS
Bertram & Sons Co., John, Dundas.
Canada Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford
Garlock-Walker Machinery Co., Toronto.
Lourie Mfg. Co., Springfield, Ill.
Petrie, Ltd., H. W., Toronto.
Strellnger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

BURNERS, OIL AND NATURAL GAS
Northern Crane Works, Ltd., Walkerville.
W. S. Rockwell Co., New York, N.Y.

BURRS, IRON AND COPPER
Parmenter & Bulloch Co., Gananoque.

BUSHING, BRONZE
Morrow Screw & Nut Co., John, Ingersoll

CALIPERS
Brown & Sharpe Mfg. Co., Providence, R.I.

CABLE, ELECTRIC
International Machinery & Supply Co., Ltd., Montreal, Que.

CABLES, TRANSMISSION AND TELEPHONES
Northern Electric Co., Ltd., Montreal.

CANNERS' MACHINERY
Bliss, E. W. Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Ont.

CANNERS' CONVEYORS
Can. Link-Belt Co., Toronto, Ont.

CARBIDE
Carter Welding Co., Ltd., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.
Union Carbide Co., of Canada, Limited, Weland, Ont.

CARBONIZING BOXES
Can. Driver-Harris Co., Ltd., Walkerville.
Katie Foundry, Galt, Ont.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.
Swedish Crucible Steel Co., Windsor.

CARRIERS, PNEUMATIC TUBE
Jones & Glasco, Montreal.

CARS, INDUSTRIAL
Can. Blower & Forge Co., Kitchener, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Elec. Steel & Metals, Welland, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

CAR MOVERS
Holden Co., Ltd., Montreal, Que.

CASES, FILING
Economy Drawing Table Co., Adrian, Mich.

CASTINGS, ALUMINUM, BRASS, BRONZE, COPPER AND GUN METAL
Algoma Steel Corp., Sault Ste. Marie.
Franklin Mfg. Co., Syracuse, N.Y.
Can. Metal Co., Toronto, Ont.

CASTINGS, DIE CAST
Can. Metal Co., Toronto, Ont.
Franklin Mfg. Co., Syracuse, N.Y.
Fisher Motor Co., Ltd., Orilla, Ont.
Tallman Brass & Metals Ltd., Hamilton, Ont.

CASTINGS, STEEL—ALL KINDS
Canada Electric Castings, Ltd., Orilla, Ont.
Dominion Foundries & Steel Ltd., Hamilton, Ont.
Electric Steel & Metals Co., Welland.
Mesta Machine Co., Pittsburgh, Pa.

CASTINGS, ELECTRIC AND ALLOY STEEL
Can. Elec. Castings Co., Ltd., Orilla, Ont.
Dominion Foundries & Steel Ltd., Hamilton, Ont.

CARRIERS COUPLING BOLTS
John Morrow Screw & Nut Co., Ingersoll.
Alexander Fleck Ltd., Ottawa.
Tallman Brass & Metal Co., Hamilton

CASTINGS, BENCH LEG
Brown & Sharpe Mfg. Co., Providence, R.I.

CASTINGS, BRASS AND IRON
Algoma Steel Corp., Sault Ste. Marie
International Machinery and Supply Co., Ltd., Montreal, Que.

CASTINGS, BUILDING
Katie Foundry, Galt, Ont.

CASTINGS, GRAY IRON
Bernard Industrial Co., A., Fortierville, Q
Brown & Sharpe Mfg. Co., Providence, R.I.
Brown, Boggs Co., Ltd., Hamilton.
Can. Elec. Castings Co., Ltd., Orilla, Ont.
Alexander Fleck, Ltd., Ottawa.
Gardner & Son, Robt., Montreal.
Hull Iron & Steel Foundries, Ltd., Hull
International Malleable Iron Co., Guelph
Kennedy & Sons, Ltd., Wm., Owen Sound.
Katie Foundry, Ltd., Galt, Ont.
Hamilton Co., Wm., Peterboro.
McFarlane Engineering Ltd., G. W., Paris, Ont.

CASTINGS, PLUMBERS'
Katie Foundry, Galt, Ont.

CASTINGS, NICHROME
Can. Driver-Harris Co., Ltd., Walkerville

CASTINGS, HARDWARE
Katie Foundry, Galt, Ont.

CASTINGS, STEEL CHROME AND MANGANESE STEEL
Thos. Davidson Mfg. Co., Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Hull Iron & Steel Foundries, Ltd., Hull.
Kennedy & Sons, Ltd., Owen Sound.

CASTINGS, MALLEABLE
International Malleable Iron Co., Guelph

CASTINGS, NICKEL STEEL
Hull Iron & Steel Foundries, Ltd., Hull.

CEMENT MACHINERY
Can. Fairbanks-Morse Co., Ltd., Montreal
Gardner, Robt., & Son, Montreal.

CEMENT HANDLING MACHINERY
Can. Link-Belt Co., Toronto, Ont.

CEMENT TOOLS
Atkins & Co., E. C., Hamilton, Ont.

CENTERING MACHINES
Victoria Foundry Co., Ottawa, Ont.

CENTRE REAMERS
Bertram & Sons Co., John, Dundas.
Butterfield & Co., Inc., Rock Island, Que.
Gardner, Robt. & Son, Montreal.
Morrow Screw & Nut Co., J., Ingersoll.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co., of Canada, Galt, Ont.

CHAIN, WELDED COIL
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

CHAIN BLOCKS
Aikenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Ford Chain Block & Mfg. Co., Phila., Pa.
Garlock-Walker Machinery Co., Toronto.
Lyman Tube & Supply Co., Montreal, Q.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Oliver Engineering Co., Montreal.
Rice Lewis & Son, Toronto, Ont.
Jones & Glassco, Montreal, Que.

CHAINS, AGRICULTURAL
Can. Link-Belt Co., Ltd., Toronto, Ont.
Morse Chain Co., Ithaca, New York.
Renold of Canada, Ltd., Montreal.

CHAINS, AUTOMOBILE ENGINE
Can. Link-Belt Co., Ltd., Toronto, Ont.
Morse Chain Co., Ithaca, N.Y.
Renold of Canada, Ltd., Montreal.

CHAINS, BICYCLE, DRIVE AND BLOCK
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold of Canada, Ltd., Montreal.

CHAINS, FOR ELEVATORS AND CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Lyman Tube & Supply Co., Montreal.
Morse Chain Co., Ithaca, N.Y.
Petrie, Ltd., H. W., Toronto.
Renold of Canada, Ltd., Montreal.
Williams Mchy. Co., A. R., Toronto, Ont.

CHAIN, MALLEABLE, DETACHABLE AND RIVETED
Can. Link-Belt Co., Toronto, Ont.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

CHAINS, POWER TRANSMISSION
Can. Link-Belt Co., Ltd., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N. Y.
Glasgow, N.S.
Renold of Canada, Ltd., Montreal.

CHAINS, SPROCKET WHEEL
Can. Link Belt Co., Ltd., Toronto, Ont
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.

CHAIN DRIVES
Can. Link-Belt Co. Ltd., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold of Canada, Ltd., Montreal.

CHASERS
National Acme Co., Cleveland, Ohio.
Taylor, J. A. M., 318 Stair Bldg., Toronto, Ont.

CHEMISTS
Toronto Testing Labatory, Ltd., Toronto.

CHUCKS, AERO, AUTOMATIC
Garvin Machine Co., New York.

CHUCKS, COLLET, AIR
Petrie, Ltd., H. W., Toronto.
Williams Mchy. Co., A. R., Toronto.

CHUCKS, DRILL, LATHE AND UNIVERSAL
Aikenhead Hardware Co., Toronto, Ont
Bertram & Sons Co., John, Dundas.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Fairbanks Morse Co., Ltd., Montreal
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Ltd., Brantford
Foss Mchy & S'ply Co., Montreal.
Gardner, Robt. & Son, Montreal.
Garlock Walker Machinery Co., Toronto.
Gisholt Machine Co., Madison, Wis.
Herbert, Ltd., Alfred, Toronto, Ont
Jacobs Mfg. Co. Hartford, Conn.
Ker & Goodwin Machine Co., Ltd.
Rice Lewis & Son, Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Petrie, Ltd., H. W., Toronto.
Strellnger, Chas. A. Co., Windsor, Ont
Williams Mchy Co., A. R., Toronto, Ont.

CHUCKS, DRILL, AUTOMATIC AND KEYLESS
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener.
McCrosky Tool Corp., Meadville, Pa., U. S. A.
Strellnger, Chas. A. Co., Windsor, Ont.

CHUCKS, FRICTION AND TAP
Victor Tool Co., Waynesboro, Pa.

CHUCKS, MAGNETIC
Heald Machine Co., Worcester, Mass.
Petrie, Ltd., H. W., Toronto.
Strellnger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co., Ltd., A. R., Montreal

CHUCKS, RING WHEEL
Ford-Smith Mach Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.

CHUCKING MACHINES
Brown & Sharpe Mfg. Co., Providence, R.I.
Garvin Machine Co., New York.
Gisholt Machine Co., Madison, Wis.
National Acme Co., Windsor, Vt.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto.
Strellnger, Chas. A. Co., Windsor, Ont.
Warner & Swasey Co., Cleveland, O.
Williams Mchy. Co., A. R., Toronto, Ont.

CIRCULATING SYSTEMS FOR LUBRICATING OIL
Bowser Co., Ltd., S. F., Toronto, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

CLAY FIRE
Elk Fire Brick Co., Can., Ltd., Hamilton, Ont.

CLEANERS, METER, WASTE, GENERAL
Oakley Chemical Co., New York, N.Y.

CLEANING COMPOUND
Oakley Chemical Co., New York, N.Y.

CLOCK SPRINGS
The Dunbar Brothers Co., Bristol, Conn

CLOCKS, WATCHMAN, PORTABLE
Gisholt Machine Co., Madison, Wis.

CLOSETS
Crane, Ltd., Montreal, Que

CLUTCHES, CHAIN
Wright Mfg. Co., Lisbon, Ohio.

CLUTCHES, FRICTION AND PULLEY
Bernard Industrial Co., A., Fortierville, Que.
Can. Link-Belt Co., Ltd., Toronto, Ont.
Carlyle Johnson Mach. Co., Manchester, Conn.
Positive Clutch & Pulley Wks., Aurora, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.

COAL CRUSHERS
Can. Link-Belt Co., Ltd., Toronto, Ont.

COAL HANDLING MACHINERY
Brown Hoisting Machinery Co., Cleveland, Ohio.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co. Ltd., Toronto, Ont.
Dominion Bridge Co., Montreal, Que.
MacGovern & Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Nova Scotia Steel & Coal Co., New

COLD ROLLED STRIP, ALL METAL COLLARS, SHAFTING
Can. Driver-Harris Co., Ltd., Walkerville.
Williams & Co., J. H., Brooklyn, N.Y.

COLLECTORS, PNEUMATIC
Can. Blower & Forge Co., Kitchener
Stuttevant Co., B. F., Galt, Ont.

COMPOSITION INGOT
Canada Metal Co., Toronto.

COMPOUNDS, CUTTING AND GRINDING, DRAWING STAMPING
Oakley Chemical Co., New York, N.Y.

COMPRESSORS, AIR
Atkins & Co., E. C., Hamilton, Ont.
Can. Ingersoll-Rand Co., Sherbrooke.
Cleveland Pneumatic Tool Co., Toronto
Curtis Pneumatic Machy. Co., St. Louis
Garlock-Walker Machinery Co., Toronto.
Holden Co., Ltd., Montreal, Que
MacGovern & Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto.
Superior Machinery Co., London, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

CONDENSERS
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
MacGovern & Co., Montreal, Que.

CONDUITS
Northern Electric Co., Ltd., Montreal, Que.

CONNECTING RODS
Canada Forgings & Engines, Ltd., Welland, Ont.

CONNECTING ROD CUTTERS INTERCHANGEABLE
Eclipse Counter bore Co., Ltd., Walkerville, Ont.

CONTRACT WORK
Brown Engineering Corp., T.
Ford Smith Machine Co., Hamilton, Ont.
Ross Engineering Co., Hamilton, Ont.
Katie Foundry Ltd., Galt, Ont.
Victoria Foundry Co., Ottawa.

CONTROLLERS, MAGNETIC BRAKES, ELECTRIC WINCHES, MONO RAIL HOISTS
Volta Mfg. Co., Welland, Ont.

CONTROLLERS AND STARTERS
Williams Mach'y. Co., A. R., Toronto.

BROWN & SHARPE

MILLING MACHINES

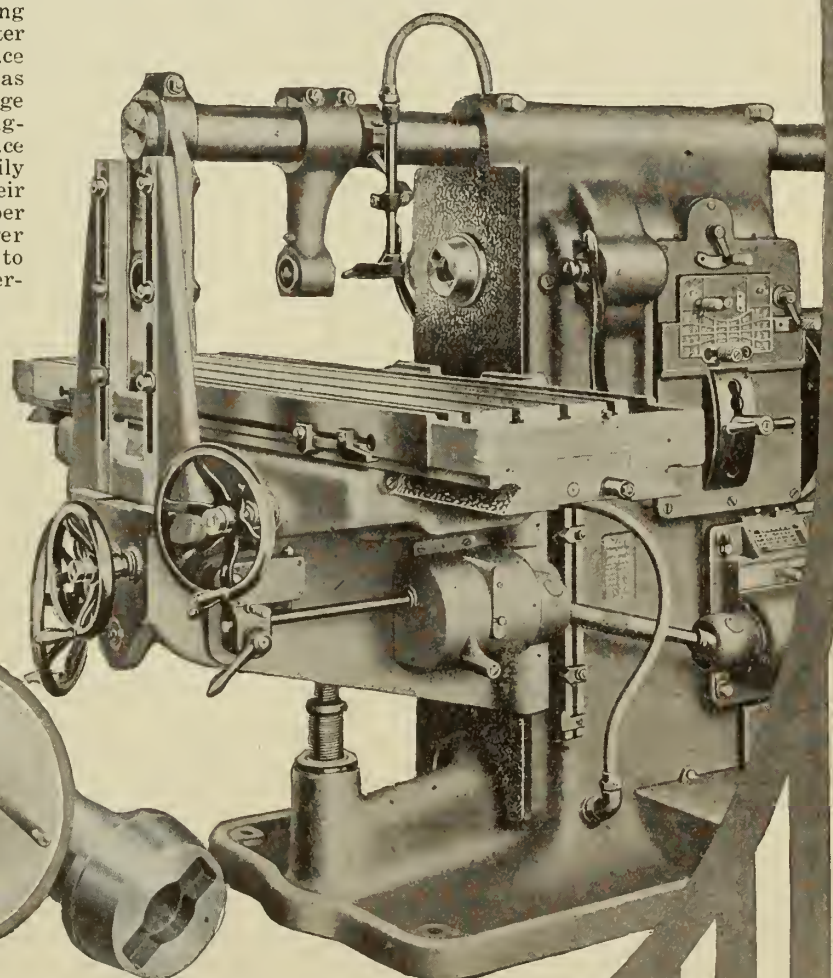
THE TAPER NOSE SPINDLE

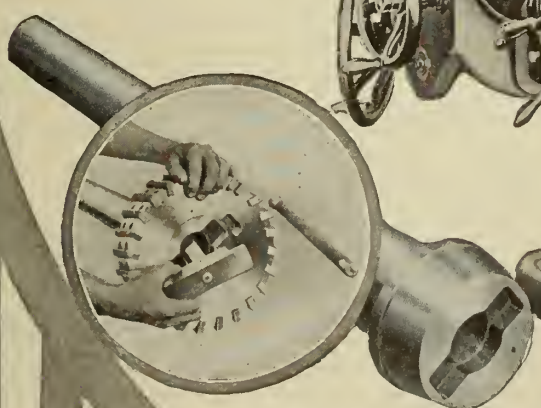
ASSURES A POSITIVE CUTTER DRIVE under all conditions. The front end of the spindle is tapered, hardened and ground and has a recess to receive cutter driver and clutch on arbors and collets.

Face milling cutters are quickly and easily removed and replaced. Note the fewness of parts, the absence of screws and loose parts.

To attach a face milling cutter simply place cutter onto the taper nose—place cutter driver in position as insert at bottom of page shows—and tighten drawing-in bolt. The removal of face milling cutters is as readily accomplished as is their placement. With the taper nose construction the danger of the cutter "freezing" to the spindle is entirely overcome.

The accurately ground tapers of the spindle and cutter, held together by the drawing-in bolt and cutter driver, make the cutter virtually an integral part of the machine and essentially as firm as though a part of the spindle itself.





Brown & Sharpe Mfg. Co.
PROVIDENCE, R.I., U.S.A.
Canadian Representative:
The Canadian Fairbanks-Morse C
Limited

If interested tear out this page and place with letters to be answered.

CONTROLLING INSTRUMENTS
Taylor Instrument Co., Rochester, N.Y.

CONVERTERS, ROTARY
MacGovern & Co., Montreal, Que.
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.

COOLERS, WITH DRINKING FOUNTAINS
Puro Sanitary Drinking Fountain Co. Haydenville, Mass.

COPING MACHINES
Bertram & Sons Co., John, Dundas, Ont.
Dom. Steel Products Co., Ltd., Brantford
Garlock-Walker Machinery Co., Toronto.
Niles-Bement-Pond Co., New York.
Can. Blower & Forge Co., Kitchener.

COPPER, BUS BAR, SHEET, PLATES, RODS
British Smelting & Refining Co., Ltd., Montreal, Que.
Brown's Copper and Brass Rolling Mills, New Toronto.

CORE OIL
Swan & Finch, Inc., 165 Broadway.

COUNTERBORES AND COUNTERSINKS
Aikenhead Hardware Co., Toronto, Ont.
Cleveland Twist Drill Co., Cleveland.
Eclipse Counterbore Co., Ltd., Walkerville.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
McCrosky Tool Corp., Meadville, Pa., U. S. A.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.

COUNTERSINKS, INTERCHANGEABLE
Eclipse Counterbore Co., Ltd., Walkerville, Ont.

COUNTERBORES, INVERTED, INTERCHANGEABLE
Eclipse Counterbore Co., Ltd., Walkerville, Ont.

COUNTERSHAFTS
Almond Mfg. Co., Ashburnham, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Baird Machine Co., Bridgeport, Conn.
Ford-Smith Machine Co., Hamilton, Ont.
Foster Machine Co., Elkhart, Ind.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co., Ltd., A. R., Montreal
Williams Mchy Co., A. R., Toronto.

COUPLINGS, FRICTION
Bernard Industrial Co., The A., Fortierville, Que.
Can. Link Belt Co., Ltd., Toronto, Ont.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto.

COUPLINGS, RAPID HOSE
Ont. Machinery & Supply Co., Ltd., Montreal, Que.

COILING MACHINERY, WIRE AND SPRING
Garlock-Walker Machinery Co., Toronto.

BUCKET
Hanna & Co., M. A., Cleveland, O.

COUPLINGS, PLAIN, FLEXIBLE AND CUT OFF
Cleveland Pneumatic Tool Co. of Canada, Toronto.

CRANES, OVERHEAD, HAND AND
Gardner, Robt. & Son, Montreal.
Independent Pneumatic Tool Co., Chicago

CRANES, LOCOMOTIVE
Can. Link-Belt Co., Ltd., Toronto, Ont.
Northern Crane Works, Walkerville.

ELECTRIC
Volta Manufacturing Co., Welland, Ont.

CUPS, OIL
Can. Winkley Co., Ltd., Windsor, Ont.

COVERS, OIL HOLE
Can. Winkley Co., Ltd., Windsor, Ont.

CRANES, GRAVITY
Brown Hoisting Machinery Co., Cleveland, Ohio.
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.

CRANE RUNWAYS
MacKinnon Steel Co., Sherbrooke, Que.

CRANES, JIB
Brown Hoisting Machinery Co., Cleveland, Ohio.

CRANES, LOCOMOTIVE
Brown Hoisting Machinery Co., Cleveland, Ohio.
Holden Co., Ltd., Montreal, Que.

CRANES, GOLLIATH, PNEUMATIC AND PORTABLE
Brown Hoisting Machinery Co., Cleveland, Ohio.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Morris Crane and Hoist Co., Herbert Niagara Falls, Ont.
Northern Crane Works, Walkerville.
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Brown Hoisting Machinery Co., Cleveland, Ohio.

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Lyman Tube & Supply Co., Montreal, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Rice Lewis & Son, Toronto, Ont.
Petrie, Ltd., H. W., Toronto.
Williams Mchy. Co., A. R. Toronto, Ont.

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Can. Link-Belt Co., Toronto, Ont.
Curtis Pneumatic Machy. Co., St. Louis
Dominion Bridge Co., Montreal.
Hepburn, John T., Ltd., Toronto.
Lyman Tube & Supply Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Niles-Bement-Pond Co., New York.
Northern Crane Works, Walkerville.
Oliver Engineering Co., Montreal.

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Can. Found'n & Forgings Ltd., Welland
Williams & Co., J. H., Brooklyn, N.Y.

CRANK PIN TURNING MACHINE
Herbert, Ltd., Alfred, Toronto, Ont.

CRIMPS, LEATHER
Graton & Knight Mfg. Co., Worcester, Mass.

CRUSHERS
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Elec. Steel & Metals, Welland, Ont.

CUPOLAS
Can. Blower & Forge Co., Kitchener.
Northern Crane Works, Walkerville.

CURB PUMPS FOR OIL, GASOLINE
Bowser Co., Ltd., S. F., Toronto, Ont.

CURRENT TRANSFORMERS
Volta Manufacturing Co., Welland, Ont.

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CUTTERS, BOLT
See Bolt Cutters

CUTTERS, GEARS
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Fellows Gear Shaper Co., Springfield, Vt.

CUTTERS, FLUE
Cleveland Pneumatic Tool Co., Toronto

CUTTER HEADS
Oliver Machinery Co., Grand Rapids, Mich.

CUTTERS, PIPE (See Pipe Cutters)

CUTTERS, HIGH SPEED
Madison Mfg. Co., Madison, Wis.

CUTTERS, MILLING
Butterfield & Co., Rock Island, Que.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Cleveland Twist Drill Co., Cleveland.
Foss Mchy. & Sply. Co., G. F., Montreal.
Garvin Machine Co., New York.
Ingersoll Machine Co., Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Toronto, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Whitney Mfg. Co., Hartford, Conn.
Wilt Twist Drill Co., Walkerville, Ont

CUTTER RELIEVING MACHINES
Cleveland Milling Machine Co., Cleveland

CUTTING-OFF MACHINES
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Atkins & Co., E. C., Hamilton, Ont.
Bertram & Sons Co., John, Dundas.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal
G. F. Foss Mchy. & Sply. Co., Montreal.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield, Mass.
Kennedy & Sons, Wm., Owen Sound
Lyman Tube & Supply Co., Montreal, Que.
Niles-Bement-Pond Co., New York.
Prest-O-Lite Co., Inc., Toronto, Ont.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
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Wells Bros., of Can., Galt, Ont.
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Cataract Refining Co., Ltd., Toronto
Swan & Finch, Inc., New York.

CUTTING OIL, RECLAIMING SYSTEM
Bowser Co., Ltd., S. F., Toronto, Ont.

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Swedish Crucible Steel Co., Windsor.

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Ford-Smith Machine Co., Hamilton, Ont.

DEHUMIDIFYING
B. F. Sturtevant Co., Galt, Ont.

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Aikenhead Hardware Co., Toronto, Ont.
Dominion Bridge Co., Montreal.
Hepburn Co., Ltd., J. T., Toronto, Ont.
Morris Crane & Hoist Co., Sherbrook.

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Furniss, Clarke & Co., Montreal, Que.

DIAMOND TOOLS
Can. Desmond-Stephan Mfg. Co., Hamilton
Ford-Smith Machine Co., Hamilton, Ont.
Furniss Clark & Co., Montreal, Que.
Joyce-Koebel Co., Inc., New York City
Wheel Trueing Tool Co., Detroit.
Petrie Ltd., H. W., Toronto.

DIAMONDS, CARBON AND BORTZ
Joyce Koebel Co., Inc., New York, N.Y.
Wheel Trueing Tool Co., Detroit.

DIAMONDS, BLACK AND ROUGH
Joyce, Koebel & Co., Inc., New York.
Wheel Trueing Tool Co., Windsor, Ont.

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Tallman Brass & Metals Ltd., Hamilton, Ont.

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Greenfield Tap & Die Corp., Greenfield Mass.
Wells Bros. of Can., Galt, Ont.
Petrie, Ltd., H. W., Toronto.

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Butterfield & Co., Rock Island, Que.
Crescent Mchc. Co., Ltd., Montreal, P.Q.
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Wells Brothers Co., of Canada, Galt.

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Ackworthie Ltd., J., Birmingham, Eng.
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Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Rock Island, Que.
Brown, Boggs Co., Hamilton, Ont.
Crescent Mchc. Co., Ltd., Montreal, P.Q.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardner, Robt. & Son, Montreal.
Herbert Ltd., Alfred, Toronto, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Jones & Lamson, Springfield, Vt.
Landis Machine Co., Waynesboro, Pa.
Marshall, Son & Bunner, Toronto.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Acme Co., Cleveland, Ohio.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Stoll Co., Inc., D. H., Buffalo, N.Y.
Strelinger, Chas. A. Co., Windsor, Ont.
Wells Brothers of Canada, Galt, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

DIES, HAMMERED
Kimber & Hillier Mfg., Co., St. Catharines, Ont.

DIES, DROP FORGE.
Kimber & Hillier Mfg., Co., St. Catharines, Ont.

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Ackworthie Ltd., J., Birmingham, Eng.
Crescent Mchc. Co., Ltd., Montreal, P.Q.
Elliott & Whitehall, Galt, Ont.

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Ackworthie Ltd., J., Birmingham, Eng.
A. B. Jardine & Co., Ltd., Hespeler, Ont
Crescent Mchc. Co., Ltd., Montreal, P.Q
Landis Machine Co., Waynesboro, Pa.

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Butterfield & Co., Inc., Rock Island, Que
Crescent Machine Co., Ltd., Montreal.
Greenfield Tap & Die Corp., Greenfield Mass
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Garvin Machine Co., New York.
Kimber & Hillier Mfg., Co., St. Catharines, Ont.
Pratt & Whitney Co., Dundas, Ont.
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Firth & Sons, Thos., Montreal, Que.
Landis Machine Co., Waynesboro, Pa.
Wells Brothers Co. of Canada, Galt.

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Wells Bros. of Canada, Galt, Ont.

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Geometric Tool Co., New Haven.
Herbert, Ltd., Alfred, Toronto, Ont.
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Murchey Machine & Tool Co., Detroit
Wells Brothers Co. of Can., Galt, Ont
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.

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Oliver Mach. Co., Grand Rapids, Mich

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Atkins & Co., Ltd., Wm., Sheffield, Eng
Marshall, Son & Bunner, Toronto.
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Pratt & Whitney Co., Dundas, Ont.
Wells Bros., Co., of Can., Galt, Ont

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Pratt & Whitney Co., Dundas, Ont.
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Can. Desmond-Stephan Mfg. Co., Hamilton
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Petrie, Ltd., H. W., Toronto.
Wheel Trueing Tool Co., Windsor, Ont.

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Foss Mchy. & S'ply Co., G. F., Montreal
Garlock-Walker Machinery Co., Toronto
Garvin Machine Co., New York.
A. B. Jardine & Co., Ltd., Hespeler, Ont
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
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A. R. Williams Machinery Co., Toronto.

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Lincoln Electric Co. of Canada, Ltd. Toronto, Ont
Marshall, Son & Bunney, Toronto.
Swedish Steel & Importing Co., Ltd., Montreal.

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Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal
Garlock-Walker Mach. Co., Toronto.
Garvin Machine Co., New York.
Hoefer Mfg., Co., Freeport, Ill.
Henry & Wright Mfg. Co., Hartford, Conn
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Landis Tool Co., Waynesboro, Pa.
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Niles-Bement-Pond Co., New York.
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Garlock-Walker Mach. Co., Toronto, Ont.
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Strelinger Co., C. A., Windsor, Ont.
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Morrow Screw & Nut Co., John, Ingersoll, Ont.
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Garlock-Walker Machinery Co., Toronto.
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Cleveland Twist Drill Co., Cleveland.
Garlock-Walker Mchy. Co., Toronto, Ont.
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Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Mch. Co., New Bedford Mass.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
Wilt Twist Drill Co. of Can., Walkerville.

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Holden Co., Ltd., Montreal, Que.
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Strelinger, Chas. A. Co., Windsor, Ont.
A. R. Williams Machy. Co., Toronto.

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Morse Twist Drill & Mch. Co., New Bedford, Mass.
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DRIVES, CHAIN
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Electric Furnace Construction Co., Philadelpria, Pa.
Volta Manufacturing Co., Welland, Ont.

EECTRIC FURNACE REGULATORS, WINCHES, ROOF COOLERS AND ELECTRODE HOLDERS
Volta Manufacturing Co., Welland, Ont.

ELECTRIC HOISTS, STATIONARY AND MONO RAIL
Canadian Link-Belt Co., Ltd., Toronto,
Volta Manufacturing Co., Welland, Ont.

ELECTRIC MOTORS
Lincoln Electric Co. of Canada, Ltd., Toronto, Ont.
Sturtevant Co., B. F., Galt, Ont.
Volta Manufacturing Co., Welland, Ont.

ELECTRIC TRUCKS
Cowan Truck Co., Holyoke, Mass.

ELEVATOR ENCLOSURES
Volta Mfg. Co., Welland, Ont.
Canada Wire & Iron Goods Co., Hamilton

ELEVATOR WEIGHTS
Katie Foundry, Galt, Ont.

ELEVATORS AND BUCKETS
Can. Link-Belt Co., Toronto, Ont.
Curtis Pneumatic Machy. Co., St. Louis.

ELEVATING AND CONVEYING MACHINERY
Can. Link-Belt Co., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Petrie, Ltd., H. W., Toronto.

EMBOSSING PRESSES
Dom. Steel Products Co., Ltd., Brantford.
Oliver Machinery Co., Grand Rapids, Mich

EMERY GRINDERS (PNEUMATIC)
Can. Ingersoll-Rand Co., Ltd., Sherbrooke.
Cleveland Pneumatic Tool Co., Toronto.
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.

EMERY CLOTH
Atkins & Co., E. C., Hamilton, Ont.

EMERY PAPER
Atkins & Co., E. C., Hamilton, Ont.

EMERY AND EMERY WHEELS
Atkins & Co., E. C., Hamilton, Ont.
Brantford Emery Wheel Co., Brantford, Canada.
The Foss Mchy. & Supply Co., Montreal.
Garvin Machine Co., New York.
Canadian Fairbanks-Morse Co., Montreal.
Canada Emery Wheels Co., Hamilton.
Dominion Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Mach. Co., Hamilton, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.
Wilkinson & Kompass, Hamilton, Ont.
Dominion Abrasive Wheel Co., Ltd., Mimico, Ont.

EMERY WHEEL DRESSINGS
Dominion Abrasive Co., Ltd., Mimico, Ont.
Wheel Truing Tool Co., Windsor Ont.

ENAMELWARE
Crane, Ltd., Montreal, Que.

END MILLS
John Morrow Screw & Nut Co., Ingersoll

ENGINEERS—INDUSTRIAL CLEANING (Free Consultation)
Oakley Chemical Co., New York, N.Y.

ENGINEERS
Samuel Osborne (Canada) Ltd., Montreal.

ENGINES, STEAM, GAS, GASOLINE
Furniss, Clerke & Co., Montreal, Que.
Canadian Fairbanks-Morse Co., Montreal.
Holden Co., Ltd., Montreal, Que.
Johnson Mach. Co., Carlyle, Manchester, Conn.
MacGovern & Co., Montreal, Que.
Sturtevant Co., B. F., Galt, Ont.

ENGINES, HORIZONTAL AND VERTICAL
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Johnson Mach. Co., Carlyle, Manchester, Conn.
Petrie, Ltd., H. W., Toronto.
A. R. Williams Machy. Co., Toronto.

ENGINES, OIL
Holden Co., Ltd., Montreal, Que.
Ker & Goodwin Machine Co., Ltd., Brantford, Ont.

ENGINES, HEAVY OIL, DIESEL TYPE
Dom. Steel Products Co., Ltd., Brantford
Holden Co., Ltd., Montreal, Que.

ENGINES, MARINE
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Sturtevant Co., B. F., Galt, Ont.

ENGINES, STATIONARY, FUEL, OIL, GAS OR GASOLINE
Holden Co., Ltd., Montreal, Que.

ESCUTCHEON PINS
Parmenter & Bulloch, Gananoque, Ont.

EXHAUST HEADS AND HOODS
Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Sturtevant Co., B. F., Galt, Ont.

EXHAUSTERS
Can. Blower & Forge Co., Kitchener, Ont.
Petrie, Ltd., H. W., Toronto.
Sturtevant Co., B. F., Galt, Ont.
Can. Driver-Harris Co., Walkerville, Ont.

EXTRACTORS, TAP
Walton Co., The, Hartford, Conn.

EYE BOLTS AND NUTS
Can. Foundries & Forgings, Ltd., Welland, Ont.

EYE PROTECTORS
Standard Optical Co., Geneva, N.Y.

FACTORY LOCATIONS
City of St. Johns, Quebec.

FACTORY SITES
City of St. Johns, Quebec.

FANS
Baird Machine Co., Bridgeport, Conn.
Can. Blower & Forge Co., Kitchener, Ont.
Sturtevant Co., B. F., Galt, Ont.

FENCE, IRON AND FACTORY
Can. Wire & Iron Goods, Hamilton, Ont.

FERRO-TUNGSTEN
Vanadium-Alloys Steel Co., Pittsburgh, Pa

FIBRE, RODS AND SHEETS
Diamond State Fibre Co., Bridgeport, Pa.

FILES
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Wm., Sheffield, Eng.
Ingersoll File Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Marshall, Son & Bunney, Toronto, Ont.
Nicholson File Co., Port Hope, Ont.
Rice Lewis & Son, Toronto, Ont.
Simonds Mfg. Co., Fitchburg, Mass.
Strelinger, Chas. A. Co., Windsor, Ont.
Wilkinson & Kompass, Hamilton, Ont.

FILES, COMMUTATOR SLOTTING
Lyman Tube & Supply Co., Montreal, Que.

FILING MACHINES, BENCH AND MOTOR DRIVEN
Cochrane-Bly Co., Rochester, N.Y., U.S.A

FILTERING AND CIRCULATING SYSTEMS FOR LUBRICATING OIL
Bowser Co., Ltd., S. F., Toronto, Ont.
Can. Wire & Iron Goods, Hamilton, Ont.

FIRE BRICK
Elk Fire Brick Co., Hamilton, Ont.
General Combustion Co., Ltd., Montreal, Que.

FIRE CLAY
Elk Fire Brick Co., Can., Ltd., Hamil
General Combustion Co., Ltd., Montreal, Que.

FINISHING MACHINES
Brown & Sharpe Mfg. Co., Providence, R.I.

FITTINGS, CAST IRON, SCREWED, FLANGED
Crane, Ltd., Montreal, Que.

FIXTURES
Brown Engineering Corp., Toronto, Ont.
Crescent Mchc. Co., Ltd., Montreal, Que.

FLAT SPRINGS
The Dunbar Brothers Co., Bristol, Conn

FLEXIBLE SHAFT EQUIPMENT
R. C. Haskins Co., Chicago, Ill.

FLOODLIGHTS, ELECTRIC
Holden Co., Ltd., Montreal, Que.
Northern Electric Co., Ltd., Montreal, Que

FLOTATION MACHINERY
Elec. Steel & Metals, Welland, Ont.

FLUMES
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
William Hamilton Co., Peterboro, Ont.

FORGES, HAND PORTABLE
Hardware Co., Toronto, Ont.
& Forge Co., Kitchener.
A. B. Jardine & Co., Ltd., Hespeler, Ont
Rice Lewis & Son, Toronto, Ont.
Sturtevant Co., B. F., Galt, Ont.

FORGE TOOLS
Kimber & Hillier Mfg., Co., St. Catharines, Ont.

FORGES, OIL
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.

FORGINGS
Mesta Machine Co., Pittsburgh, Pa
Can. Found. & Forgings, Ltd., Welland
Nova Scotia Steel & Coal Co., New Glasgow, N.S.

FORGINGS, DROP, AUTOMOBILE AND LOCOMOTIVE FORGING AND WELDING
Dominion Bridge Co., Montreal, Que.
Dom. Forge & Stamp'g Co., Walkerville
Steel Co. of Canada, Ltd., St. Catharines
Victoria Foundry Co., Ottawa.
Williams & Co., J. H., Brooklyn, N.Y.

FORGING MACHINERY
John Bertram & Sons Co., Dundas, Ont
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Ont
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Toronto, Ont
National Machy. Co., Tiffin, Ohio.
Petrie, Ltd., H. W., Toronto.

FORGINGS, SPECIAL
Armstrong-Whitworth of Can., Montreal
Can. Found. & Forgings, Ltd., Welland
Williams & Co., J. H., Brooklyn, N.Y

FORMING
Brown & Sharpe Mfg. Co., Providence, R.I.

FOUNDRY EQUIPMENT
Herbert Ltd., Alfred, Toronto, Ont.

FRICTION LEATHERS
Graton & Knight Mfg. Co., Montreal

FRICTION SURFACE BELTING
Can. Consolidated Rubber Co., Montreal

FUEL OIL SYSTEMS
Bowser Co., Ltd., S. F., Toronto, Ont.

FURNACES, ANNEALING, CASE HARDENING AND TEMPERING
Bellevue Furnace Co., Detroit, Mich.
Brown & Sharpe Mfg. Co., Providence, R.I
Gen. Combustion Co, Can., Ltd, Montreal
Mechanical Eng'r'g Co., Three Rivers, Q
W. S. Rockwell Co., New York, N.Y.
Petrie, Ltd., H. W., Toronto.

FURNACES, BLAST
Bellevue Industrial Furnace Co., Detroit
W. S. Rockwell Co., New York, N.Y.
Toronto Iron Works, Ltd., Toronto.

FURNACES — BRASS MELTING
General Combustion Co., Ltd., Montreal

FURNACES, ELECTRIC
Electric Furnace Construction Co., Philadelpria, Pa.

FURNACES, FORGING
Gen. Combustion Co. of Can., Ltd., Montreal.
W. S. Rockwell Co., New York, N.Y.

FUSE BOXES, STEEL
Dom. Forge & Stamp. Co., Walkerville

FUSE PLUGS AND FUSES
Northern Electric Co., Ltd., Montreal Que

GALVANIZING FLUX
British Smelting & Refining Co., Ltd Montreal, Que.

GANG PLANER TOOLS
Armstrong Bros. Tool Co., Chicago.

GAS AND STEAM ENGINES
Mesta Machine Co., Pittsburgh, Pa.

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Graton & Knight Mfg. Co., Montreal
Holden Co., Ltd., Montreal, Que.

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Look at the sample illustrated. Unusual durability is assured by the three coverings with which the specially annealed steel is protected. First a heavy coat of pure asphalt is applied hot—then a thick layer of high quality asbestos felt—finally, a coat of tough, impervious waterproofing completes the process.

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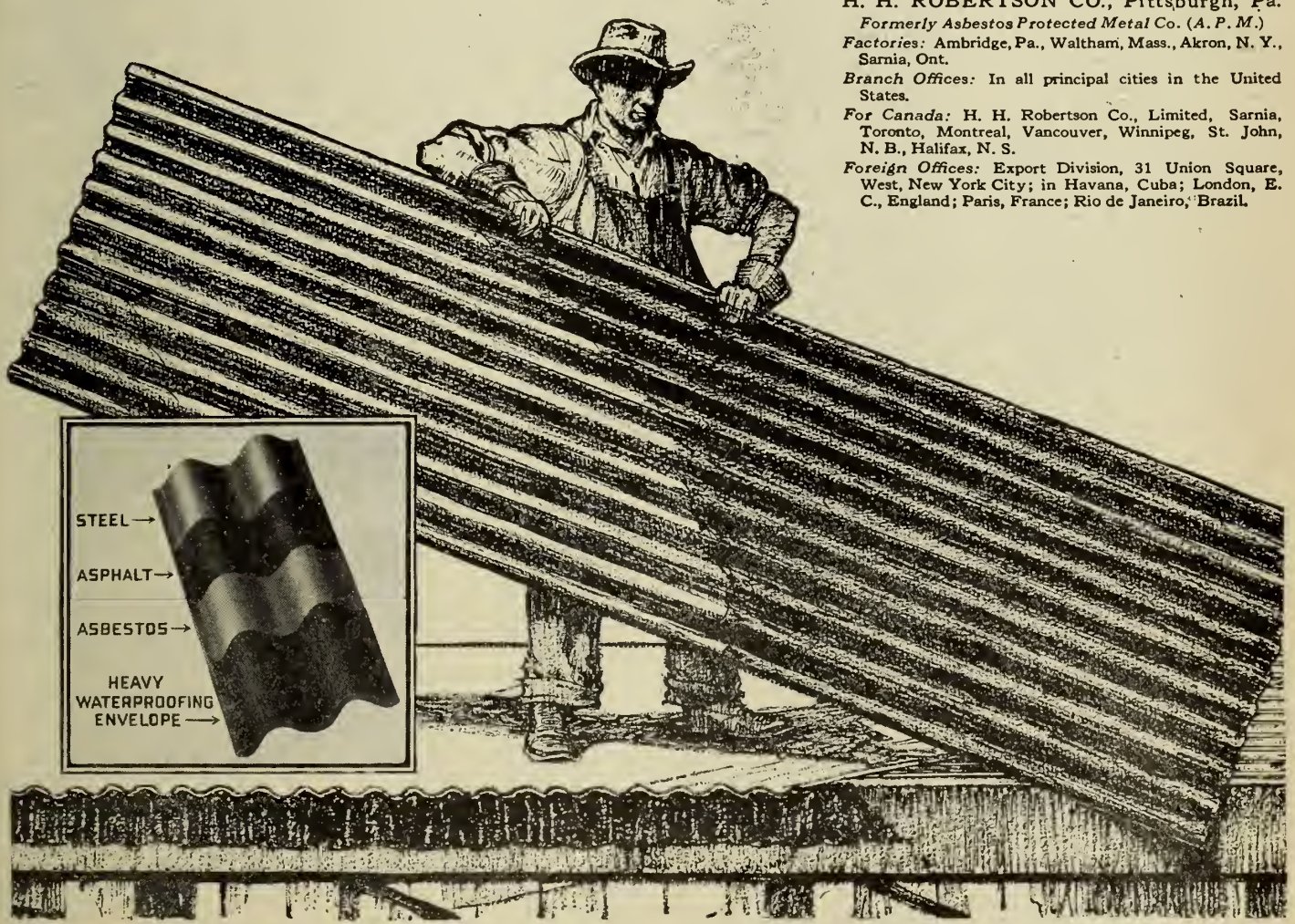

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Crescent Mach. Co., Ltd., Montreal, P.Q.

GAUGES, CALIPERS
Williams & Co., J. H., Brooklyn, N.Y.

GAUGES, DIAL
Herbert, Ltd., Alfred, Toronto, Ont.

GAUGES, MERCURY COLUMN, DRAFT
Taylor Instrument Co., Rochester, N.Y.

GAUGES, HYDRAULIC
Taylor Instrument Co., Rochester, N.Y.

GAUGES, MANUFACTURERS, LIMIT, THREAD
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Can., Galt, Ont.

GAUGES, SNAP, THREAD AND CYLINDRICAL
C. E. Johanson, Inc., Toronto, Ont.

GAUGES, VACUUM AND PRESSURE
Bristol Co., Waterbury, Conn.
Taylor Instrument Co., Rochester, N.Y.

GAUGES, STANDARD
Brown Engineering Corp., Toronto, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Crescent Mchc. Co., Ltd., Montreal, Que.
Garvin Machine Co., New York.
C. E. Johanson, Inc., Toronto, Ont.
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Hartford, Conn.
Strelinger, Chas. A. Co., Windsor, Ont.
Taylor, J. A. M., 318 Stair Bldg., Toronto
Wells Brothers Co. of Canada, Galt, Ont.

GEAR BLANKS
Can. Steel Foundries, Ltd., Montreal.
Dom. Found. & Steel, Hamilton, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

GEAR BLANKS, CAST
Katz Foundry, Galt, Ont.

GEAR BLANKS, RAWHIDE
Lyman Tube & Supply Co., Montreal, Que.

GEAR BOXES ,REDUCTION
Can. Link-Belt Co., Ltd., Toronto, Ont.

GEAR SHAPERS AND CUTTERS
Fellows Gear & Shaper Co., Springfield, V.

GEAR-CUTTING MACHINERY
Bilton Mach. Tool Co., Bridgeport, Conn.
Fellows Gear & Shaper Co., Springfield, V.
Garlock-Walker Mchy. Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto.
A. R. Williams Machy. Co., Toronto.

GEAR-TESTING MACHINE
Gisholt Machine Co., Madison, Wis.

GEARS, CHAIN
Can. Link-Belt Co., Ltd., Toronto, Ont.
Morse Chain Co., Ithaca, New York.
Renold of Canada Ltd., Montreal.

GEARS, COMPENSATING
Morse Chain Co., Ithaca, New York.
Can. Link-Belt Co., Ltd., Toronto, Ont.

GEARS, CUT, MORTISE, ANGLE, WORM
Can. Link-Belt Co., Toronto, Ont.
Diamond State Fibre Co., Bridgeport, Pa.
Dom. Steel Products Co., Ltd., Brantford.
Dominion Bridge Co., Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Gardner, Robt., & Son, Montreal.
Hamilton Gear & Machine Co., Toronto.
Hull Iron & Steel Found., Ltd., Hull, Q.
Jones & Glasco, Montreal.
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Philadelphia Gear Works, Philadelphia.
Victoria Foundry Co., Ottawa.

GEARS, RAWHIDE
Gardner, Robt., & Son, Montreal.
Grant Gear Works, Boston, Mass.
Hamilton Gear & Machine Co., Toronto.
Hamilton Co., Ltd., Wm., Peterborough,
Jones & Glasco, Montreal.
Lyman Tube & Supply Co., Montreal, Que.
Philadelphia Gear Works, Philadelphia.
A. R. Williams Machy. Co., Toronto.

GENERATORS, GEAR
Fellows Gear & Shaper Co., Springfield, V

GEARS, SILENT CHAIN
Can. Link-Belt Co., Ltd., Toronto, Ont.

GEARS, SPRING
Morse Chain Co., Ithaca, New York.

GEARS, SPUN, BENCH, SPIRAL
Brown & Sharpe Mfg. Co., Providence, R.I.

GENERATORS AND CONVERTORS
Northern Elec. Co., Ltd., Montreal, P.Q.

GENERATORS, MOTOR
MacGovern & Co., Montreal.
Northern Elec. Co., Ltd., Montreal, P.Q.
Sturtevant Co., B. F., Galt, Ont.

GENERATORS, STEAM TURBO
Can. Link-Belt Co., Ltd., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

GILDING
Brown's Copper and Brass Rolling Mills New Toronto.

GLUE HEATERS
Oliver Machinery Co., Grand Rapids, Mich

GLASSES, SAFETY
Willson & Co., Inc., T. A., Reading, Pa.

GRAPHITE
Aikenhead Hardware, Ltd., Toronto.
Rice Lewis & Son, Toronto.

GOGGLES
Standard Optical Co., Geneva, N.Y.

GRAB BUCKETS—CLAMSHELL and ORANGE PEEL
Canadian Link-Belt Co., Ltd., Toronto, Ont.

GRAVITY CARRIERS
Can. Link-Belt Co., Toronto, Ont.
Jones & Glasco, Montreal.
Morris Crane & Hoist Co., Ltd., Herbert Niagara Falls, Ont.

GREASE CUPS, PRESSED STEEL, BRASS
Can. Winkley Co., Ltd., Windsor, Ont.

GREASES (See Lubricants)

GRINDERS, AUTOMATIC KNIFE
Canada Machinery Corp., Galt, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal
Garlock-Walker Machinery Co., Toronto.

GRINDERS, AUTOMATIC SURFACE
La Salle Tool Co., La Salle, Ill.

GRINDERS, BENCH
Superior Machinery Co., London, Ont.

GRINDERS, CENTRE COLUMN, PEDESTAL AND BENCH
Can. Machinery Corp., Galt, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Haskins & Co., R. C., Chicago, Ill.
Wisconsin Electric Co., Inc., Racine, Wis
Cleveland Pneumatic Tool Co., Toronto.
Ford-Smith Mach. Co., Hamilton, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machinery Co., Toronto.
Holden Co., Ltd., Montreal, Que.
Katz Foundry, Galt, Ont.
Morse Twist Drill & Machine Co., New Bedford.
Niles-Bement-Pond Co., New York, N.Y.
Perfect Machine Co., Galt, Ont.
United States Elec. Tool Co., Cincinnati.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

GRINDERS, CUTTER
Brown & Sharpe Mfg. Co., Providence, R.I
Cincinnati Milling Mach. Co., Cincinnati.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garvin Machine Co., New York.
Globe Engineering Co., Hamilton, Ont.
Greenfield Machine Co., Greenfield, Mass.
Greenfield Tap & Die Corp., Greenfield, M.
Heald Machine Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.
Manhattan Machine & Tool Co., Grand Rapids, Mich.
Norton Co., Worcester, Mass.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. of Can., Galt, Ont.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

GRINDERS, DIE AND CHASER
Haskins & Co., R. C., Chicago, Ill.
Landis Machine Co., Waynesboro, Pa.
National-Acme Co., Cleveland, Ohio.

GRINDERS, DISK
Armstrong Bros. Tool Co., Chicago, Ill.
Atkins & Co., E. C., Hamilton, Ont.
Ford-Smith Mach. Co., Hamilton.
Gardner Machine Co., Beloit, Wis.
Heald Machine Co., Worcester, Mass.

GRINDERS, FLEXIBLE CASTING
Manhattan Machine & Tool Co., Grand Rapids, Mich.

GRINDERS, DRILL
Aikenhead Hardware Co., Toronto.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield,
La Salle Tool Co., La Salle, Ill.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
United States Elec. Tool Co., Cincinnati.
Wells Bros. of Canada, Galt, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

GRINDERS, CYLINDER, INTERNAL
Brown & Sharpe Mfg. Co., Providence, R.I
Foss Mchy. & S'ply Co., G. F., Montreal.
Greenfield Machine Co., Greenfield, Mass.
Heald Machine Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.
Norton Co., Worcester, Mass.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

GRINDERS, PORTABLE, ELECTRIC HAND, TOOL POST, FLOOR AND BENCH
Baird Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Ford-Smith Mach. Co., Hamilton, Ont.
Haskins & Co., R. C., Chicago, Ill.
Garlock-Walker Machinery Co., Toronto.
Greenfield Machine Co., Greenfield, Mass.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool Co., Chicago
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
United States Elec. Tool Co., Cincinnati
Wisconsin Electric Co., Inc., Racine, Wis.
Williams Mchy Co., A. R., Toronto, Ont.
Wilkinson & Kompass, Hamilton, Ont.

GRINDERS, HOLE, HOLE AND AND DEEP HOLE
Barber Mchy. Co., Ltd., Toronto, Ont.
Bryant Chucking Grinder Co., Springfield, Vermont.
Heald Machine Co., Worcester, Mass.

GRINDERS, PNEUMATIC
Can. Ingersoll-Rand Co., Montreal.
Cleveland Pneumatic Tool Co., Toronto.
Garlock-Walker Machinery Co., Toronto.
Heald Machine Co., Worcester, Mass.
Independent Pneumatic Tool Co., Chicago
MacGovern & Co., Montreal, Que.

GRINDERS, PROFILE
Cleveland Milling Machine Co., Cleveland.

GRINDERS, ROTARY SURFACE
Brown & Sharpe Mfg. Co., Providence, R.I
Bristol Machine Tool Co., Bristol, Conn.
Manhattan Machine & Tool Co., Grand Rapids, Mich.

GRINDERS, TOOL AND HOLDER
Armstrong Bros. Tool Co., Chicago.
Blount & Co., J. G., Everet, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I
Ford-Smith Machine Co., Hamilton, Ont.
Greenfield Machine Co., Greenfield, Mass.
Greenfield Tap & Die Corp., Greenfield.
National-Acme Co., Cleveland, Ohio.
Tabor Mfg. Co., Philadelphia, Pa.
Wells Bros. of Canada, Galt, Ont.

GRINDERS, UNIVERSAL, PLAIN
Manhattan Machine & Tool Co., Grand Rapids, Mich.
Norton Co., Worcester, Mass.
Williams Mchy Co. Ltd., A. R., Montreal

GRINDERS, VERTICAL SURFACE
Brown & Sharpe Mfg. Co., Providence, R.I
Can. Fairbanks-Morse Co., Montreal.
Heald Machine Co., Worcester, Mass.
Herbert, Ltd., Alfred, Toronto, Ont.
La Salle Tool Co., La Salle, Ill.
Petrie, Ltd., H. W., Toronto.
Pratt & Whitney Co., Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Norton Co., Worcester, Mass.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont

GRINDING AND POLISHING MACHINES, PORTABLE, PNEUMATIC AND SPRING FRAME
Can. Fairbanks-Morse Co., Montreal.
Cincinnati Elec. Tool Co., Cincinnati, O.
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner & Son, Robt., Montreal.
Garvin Machine Co., New York.
Garlock-Walker Machy. Co., Toronto.
Greenfield Machine Co., Greenfield, Mass.
Haskins & Co., R. C., Chicago, Ill.
Hall & Sons, John H., Brantford, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Niles-Bement-Pond Co., New York, N.Y
Norton Co., Worcester, Mass.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
Wisconsin Electric Co., Racine, Wis.
Williams Mchy Co., A. R., Toronto, Ont.
Williams Tool Corp. of Can. Ltd., Brantford, Ont.

GRINDING MACHINES, CAR WHEEL, CUTTER, CYLINDRICAL, CRANKSHAFT
Brown & Sharpe Mfg. Co., Providence, R.I
Norton Co., Worcester, Mass.

GRINDING WHEELS
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., E. C., Hamilton, Ont.
Brantford Emery Wheel Co., Brantford.
Can. Fairbanks-Morse Co., Montreal.
Carborundum Co., Niagara Falls, N.Y.
Dominion Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Mchy. & S'ply Co. G. F., Montreal.
Norton Co., Worcester, Mass.

GRINDING WHEEL DRESSER
Dominion Abrasive Wheel Co., Ltd., Mimico, Ont.

GUARDS, WINDOW AND MACHINE
Canada Machinery Corp., Galt, Ont.
Canada Wire & Iron Goods Co., Hamilton
Dennis Wire & Iron Works, London, Ont.
B. Greening Wire Co., Hamilton, Ont.

GUTTERS AND SKYLIGHTS
H. H. Robertson, Ltd., Sarnia, Ont

HACK SAW BLADES
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., E. C., Hamilton, Ont.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Can. Fairbanks-Morse Co., Montreal.
Diamond Saw & Stamping Wks., Buffalo.
Ford-Smith Machine Co., Hamilton, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal
Pilot Steel & Tool Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto.
Rice Lewis & Son, Toronto, Ont.
Simonds Mfg. Co., Fitchburg, Mass.
L. S. Starrett Co., Athol, Mass.
Standard Machy. & Supplies, Montreal.
Strelinger, Chas. A. Co., Windsor, Ont.
Victor Saw Works, Ltd., Hamilton.
Wilkinson & Kompass, Hamilton.
Williams Mchy Co. A. R., Toronto, Ont.

HANDLES, BALANCE, CRANK AND MACHINE
Williams & Co., J. H., Brooklyn, N.Y.

HANGERS, SHAFT
Can. Link-Belt Co., Ltd. Toronto, Ont.

HACK SAW FRAMES
Aikenhead Hardware Co., Toronto.
Atkins & Co., E. C., Hamilton, Ont.
Can. Fairbanks-Morse Co., Montreal.
Ford-Smith Machine Co., Hamilton, Ont.
Garvin Machine Co., New York City.
Victor Saw Works, Hamilton, Ont.
Rice Lewis & Son, Toronto, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
Wilkinson & Kompass, Hamilton, Ont.

HACK SAWS, POWER
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., E. C., Hamilton, Ont.
Can. Fairbanks-Morse Co., Montreal.
Diamond Saw & Stamping Wks., Buffalo.
Foss Mchy. & S'ply Co., G. F., Montreal
Ford-Smith Machine Co., Hamilton.
Perfect Machine Co., Galt, Ont.
Starrett Co., L. S., Athol, Mass.
Victor Saw Works, Hamilton, Ont.
Williams Machy. Co., A. R., Toronto.
Williams Mchy Co., A. R., Toronto, Ont

HAMMERS, FORGING
Nazel Eng. & Mach. Wks., Philadelphia

HAMMERS, ELECTRIC
Hoskins & Co., R. C., Chicago, Ill.

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Beaudry & Co., Boston, Mass.
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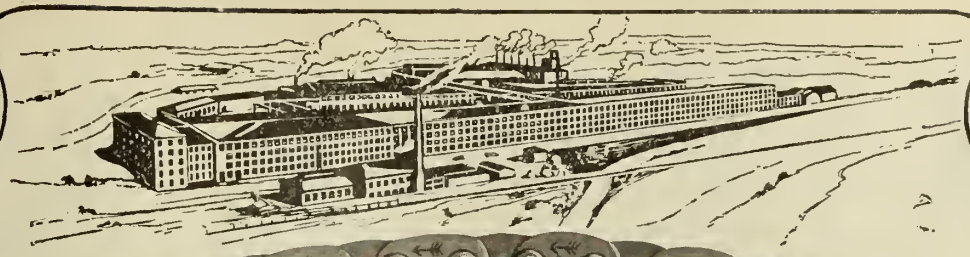

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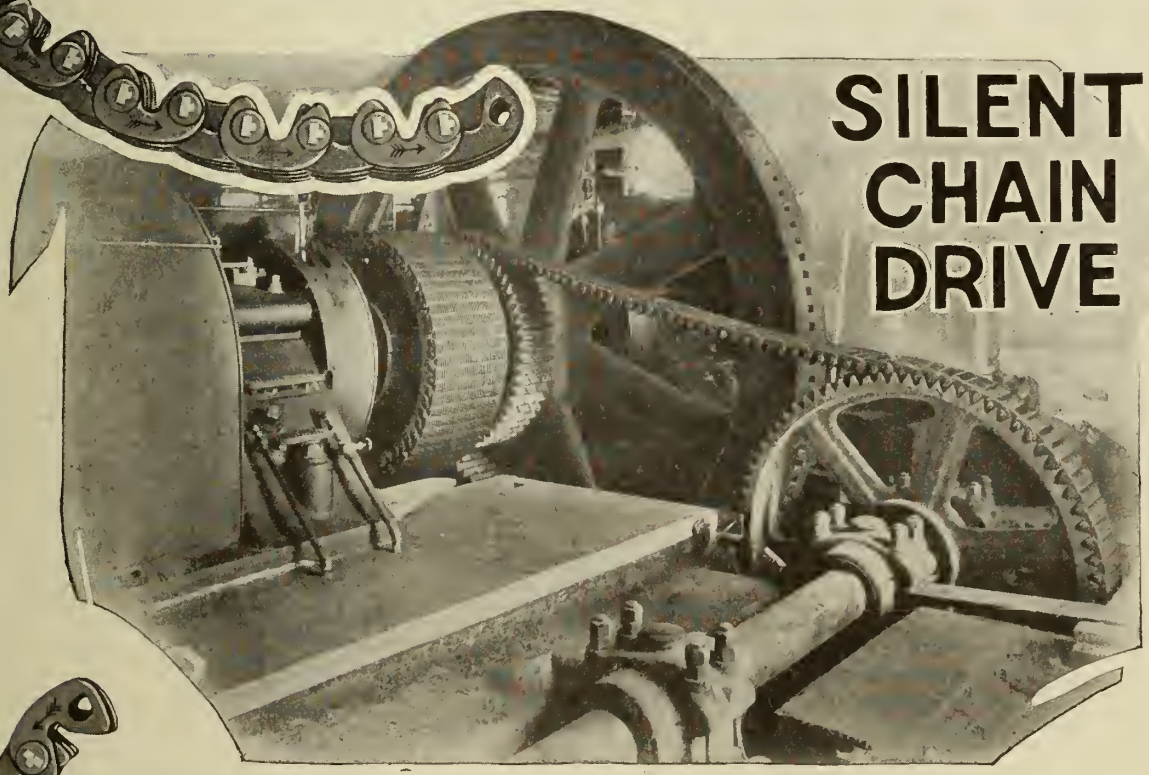

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Elec. Steel & Metals, Welland, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
Pratt & Whitney Co., Dundas, Ont.

MINING MACHINERY

Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Elec. Steel & Metals, Welland, Ont.
Holden Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto.
Williams Machy. Co., A. R., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

MIXERS, SAND

Frost Mfg. Co., Chicago, Ill.

MORTISING CHAINS

Renold of Canada Ltd., Montreal.

MORTISING MACHINES

Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.

MOTORS, ELECTRIC

Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Toronto.
Lincoln Electric Co. of Canada, Ltd., Toronto, Ont.
MacGovern & Co., Montreal, Que.
Northern Elec. Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Sturtevant Co., B. F., Galt, Ont.
Volta Mfg. Co., Welland, Ont.
Williams Mach'y Co., A. R., Toronto.

MOTOR SPRINGS

The Dunbar Brothers Co., Bristol, Conn.

MOTORCYCLE FRAME AND FORK

The Dunbar Brothers Co., Bristol, Conn.

MOTORS, PNEUMATIC

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto.
Holden Co., Ltd., Montreal, Que.

MOULDS, RUBBER

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

MULTIPLE INDEX CENTRES

Garvin Machine Co., New York.
Graton & Knight Mfg. Co., Worcester, M.

MULTI-DRILLING, MULTI-BORING, MULTI-TAPPING MACHINERY.

Nat. Automatic Tool Co., Richmond, Ind.

MUNICIPALITIES

City of St. John, Quebec.

NAIL SETS

Morrow Screw & Nut Co., J., Ingersoll, Ont

NAME PLATES, BRONZE, ETCHED AND STAMPED

Turner Brass Works, Sycamore, Ill.

NICHROME CASTINGS

Can. Driver-Harris Co., Ltd., Walkerville

NICKEL

Pilot Steel & Tool Co., Montreal, Que.

NICKEL STEEL

See Steel.

NICKEL SILVER—SHEETS, ROLLS, PLATES and RODS

Brown's Copper and Brass Rolling Mills, New Toronto.

NIPPLE THREADING MACHINES

Landis Machine Co., Waynesboro, Pa.
Williams Tool Corp. of Can. Ltd., Braotford, Ont.

NITROGEN

Carbor Welding Co., Toronto, Ont.

NUTS, STEEL, CASTELLATED AND COLD PRESSED

Galt Machine Screw Co., Ltd., Galt, Ont.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Williams & Co., J. H., Brooklyn, N.Y.

NUTS, SEMI-FINISH AND FINISHED

Galt Machine Screw Co., Galt, Ont.
National-Acme Co., Cleveland, Ohio.
Wilkinson & Kompass, Hamilton.

NUT LOCKS

Edw. W. Robinson Co., Ltd., Montreal.

NUT BURRING AND NUT MACHINES (HOT)

National Machy. Co., Tiffin, Ohio.

NUT FACING AND BOLT SHAVING MACHINES

Garvin Machine Co., New York.
National Machinery Co., Tiffin, Ohio.
Petrie, Ltd., H. W., Toronto.
Victor Tool Co., Waynesboro, Pa.

NUT TAPPERS

Bertram & Sons Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
Jardine & Co., A. B., Hespeler.
Landis Machine Co., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Tool Corp. of Can. Ltd., Brantford, Ont.

OILERS

All-Way Oiler Mfg. Co., Toronto, Ont.

OIL SEPARATORS

Can. Fairbanks-Morse Co., Montreal.

OIL STONES

Aikenhead Hardware Co., Toronto, Ont.
Carborundum Co., Niagara Falls, N.Y.
Norton Co., Worcester, Mass.
Rice Lewis & Son, Toronto, Ont.

OIL STONE GRINDERS

Oliver Machy. Co., Grand Rapids, Mich

OIL STORAGE SYSTEMS

Bowser Co., Ltd., S. F., Toronto, Ont.

OPENING DIE HEADS

Greenfield Tap & Die Corp, Greenfield
Wells Bros. of Canada, Galt, Ont.

ORE HANDLING EQUIPMENT

Brown Hoisting Machinery Co., Cleveland, Ohio.
Canadian Link-Belt Co., Ltd., Toronto, Ont.

OSCILLATING VALVE GRINDERS (PNEUMATIC)

Cleveland Pneumatic Tool Co. of Canada, Toronto.

OVENS FOR BAKING, BLUING, DRYING, ENAMELING, JAPANNING AND LACQUERING

Brantford Oven & Rack Co., Brantford

OVEN TRUCKS, STEEL

Brantford Oven & Rack Co., Brantford
MacKinnon Steel Co., Sherbrooke, Que.

OVENS FOR DRYING, TEMPER AND OXYGEN, ELECTROLYTIC CELLS UNDER TRUCKS

Brantford Oven & Rack Co., Brantford

OXY-ACETYLENE WELDING AND CUTTING AND OUTFITS

Carter Welding Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
L'Air Liquide Society, Toronto, Ont.
Prest-o-Lite Co., Inc., Toronto, Ont.
Davis-Bournonville Co., Toronto, Ont.

OXYGEN

Carter Welding Co., Ltd., Toronto, Ont.
Dominion Oxygen Co., Ltd., Toronto, Ont.
Nat. Electro Products Ltd., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.

OXYGEN PLANTS (ELECTROLYTIC)

Davis-Bournonville Co., Toronto, Ont.

PACKINGS, ASBESTOS

Cleveland Wire Spring Co., Cleveland.

PACKING, ROD AND SHEET

Dunlop Tire & Rubber Goods Co., Ltd. Toronto.
Goodyear Tire & Rubber Co., Can., Ltd. Toronto
Gutta Percha & Rubber, Ltd., Toronto.
International Mach. Spls., Ltd., Montreal
Petrie, Ltd., H. W., Toronto.
Quaker City Rubber Co., Philadelphia, Pa

PANS, WET AND DRY

Frost Mfg. Co., Chicago, Ill.

PAPER MILL CONVEYORS AND DRIVES

Bertrams, Ltd., Edinburgh, Scotland
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Can. Link-Belt Co., Toronto, Ont.
Gutta Percha & Rubber, Ltd., Toronto.
MacKinnon Steel Co., Sherbrooke, Que

PARTITIONS, WIRE

See Guards

PAPER MILL MACHINERY

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Machinery Co., Toronto
Hamilton Co., Ltd., Wm., Peterborough Ont.
MacKinnon Steel Co., Sherbrooke, Que.

PATTERN SHOP EQUIPMENT

Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto
Oliver Machy. Co., Grand Rapids, Mich
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.

PATTERN MAKERS' LATHES

See Lathes.

PATENT SOLICITORS

Fetherstonhaugh & Co., Ottawa.
Marion & Marion, Montreal.
Ridout & Maybee, Toronto.

PECK CARRIERS FOR POWER PLANTS

Can. Link-Belt Co., Toronto, Ont.

PENSTOCKS

William Hamilton Co., Peterboro, Ont.

PERFORATED METALS AND ORNAMENTAL IRON GOODS

Canada Wire & Iron Goods Co., Hamilton

PHOSPHOR TIN, COPPER AND BRONZE

British Smelting & Refining Co., Ltd., Montreal, Que.

PHOTOSTATS

Commercial Camera Co., Providence, R.I.

PIG IRON

Hanna & Co., M. A., Cleveland, O.
Steel Co. of Canada, Ltd., Hamilton, Ont.

PINS, TAPER

Morrow Screw & Nut Co., J., Ingersoll, Ont

PINS, BELT-LACING

Clipper Belt Lacer Co., Grand Rapids.

PIPE, BLACK & GALVANIZED

Crane, Ltd., Montreal, Que.

PIPE FITTINGS, MALLEABLE AND CAST IRON

International Malleable Iron Co., Guelph

PIPE CUTTING AND THREADING MACHINES

Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
McDougall Co., R., Galt.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Wells Bros. Co. of Canada, Galt, Ont.
Williams Machy. Co., A. R., Toronto.
Williams Tool Corp. of Can. Ltd., Brantford, Ont.

PIPE, JOINT COMPOUNDS

Crane, Ltd., Montreal, Que.

PIPE RIVETED STEEL

Toronto Iron Works, Ltd., Toronto.
William Hamilton Co., Peterboro, Ont.

PIERCING

Oliver Machy. Co., Grand Rapids, Mich

PIPE CUTTERS, ROLLING

Greenfield Tap & Die Corp., Greenfield.
Wells Bros. Co. of Canada, Galt, Ont
Williams Tool Corp. of Can. Ltd., Brantford, Ont.

PIPE TOOLS AND DIES

Ackworthie Ltd., J., Birmingham, Eng.
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PIPE CUTTERS AND REAMERS

Greenfield Tap & Die Corp., Greenfield.
Strelinger, Chas. A. Co., Windsor, Ont.
Wells Bros. of Canada, Galt, Ont.

PIPE STOCKS AND THREADERS

Greenfield Tap & Die Corp., Greenfield.
Strelinger, Chas. A. Co., Windsor, Ont.
Wells Bros. of Canada, Galt, Ont.

PIPE TAPS AND VISES

Ackworthie Ltd., J., Birmingham, Eng.
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PIPE WRENCHES

Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PISTON AND PISTON RING MACHINES

National Acme Co., Windsor, Vt.

PLANER BOLTS

Atkins & Co., E. C., Hamilton, Ont.
Morrow Screw & Nut Co., J., Ingersoll, Ont

PLANER JACKS

Armstrong Bros. Tool Co., Chicago.

PLANERS, STANDARD AND ROTARY

Betts Machine Co., Rochester, N.Y.
Bertram & Sons Co., John, Dundas.
Oliver Machy. Co., Grand Rapids, Mich.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal
Gardner & Son, Robt., Montreal.
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Herbert Ltd., Alfred, Toronto, Ont.
Morton Mfg. Co., Muskegon Heights, Mich
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
Standard Equipment & Tool Wks., Montreal.

PLANING AND SHAPING MACHINERY

Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal
Garlock-Walker Machinery Co., Toronto
Garvin Machine Co., New York.
Herbert, Ltd., Alfred, Toronto, Ont.
Niles-Bement-Pond Co., New York.
Perrin, Ltd., William, Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co. Ltd., A. R., Montreal

PLANER-SHAPER, COMBINED OPEN SIDE

Petrie, Ltd., H. W., Toronto.

PLANING MILL EXHAUSTERS

Can. Blower & Forge Co., Kitchener, Ont.
MacGovern & Co., Montreal, Que.
Niles-Bement-Pond Co., New York.
Sturtevant Co., B. F., Galt, Ont.

PLATES, Q.M., SHEARED AND CHEQUERED

Peckovers, Ltd., Toronto, Ont.

PLIERS

Aikenhead Hardware Co., Toronto.
Rice Lewis & Son, Toronto, Ont.

PNEUMATIC CYLINDERS

Holden Co., Ltd., Montreal, Que.

PNEUMATIC EQUIPMENT

Strelinger Co., C. A., Windsor, Ont.

PNEUMATIC TOOLS

Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co., Can., Toronto
Curtis Pneumatic Machy. Co., St. Louis.
Garlock-Walker Machy. Co., Toronto.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool Co., Chicago.
Int. Mach. & Supply Co., Ltd., Montreal.
Strelinger, Chas. A. Co., Windsor, Ont.

POWER CRANES, HAND

MacKinnon Steel Co., Sherbrooke, Que.

POLISHING MACHINES

Ackworthie Ltd., J., Birmingham, Eng.
Brown & Sharpe Mfg. Co., Providence, R.I.
Ford-Smith Machine Co., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto.

POLISHING PLATES

Greenfield Tap & Die Corp., Greenfield.
Petrie, Ltd., H. W., Toronto.
Wells Bros. of Canada, Galt, Ont.

POTS AND KETTLES, CAST STEEL

Elec. Steel & Metals, Welland, Ont.

POWER HOUSE CONVEYORS

Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

PORTABLE MACHINERY

Hanchett & Co., R. C., Chicago, Ill.

POWER TRANSMISSION MCHY.

Canadian Link-Belt Co., Ltd., Toronto, Hamilton Co., Ltd., Wm., Peterborough, Ont.
Petrie, Ltd., H. W., Toronto.

PRECISION MACHINES

Herbert Ltd., Alfred, Toronto, Ont.

PRESSED STEEL PARTS

Ackworthie Ltd., J., Birmingham, Eng.

PRESSERS, ARBOR

Atlas Press Co., Kalamazoo, Mich.
Metalwood Mfg. Co., Detroit, Mich.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
Lourie Manufacturing Co., Springfield, Ill.

PRESSES, BROACHING, FORGING AND FLANGING

Atlas Press Co., Kalamazoo, Mich.
Bliss Co., E. W., Brooklyn, N.Y.
Dom. Steel Products Co., Ltd., Brantford.
Eastern Production Co., Detroit, Mich.
Metalwood Mfg. Co., Detroit, Mich.
Petrie, Ltd., H. W., Toronto.
Toledo Machine & Tool Co., Toledo.
Stoll Co., D. H., Buffalo, N.Y.
Williams Mchy Co., Ltd., A. R., Montreal

PRESSES, CAM, TOGGLE, EYELET

Baird Machine Co., Bridgeport, Conn.
Bliss Co., E. W., Brooklyn, N.Y.
Toledo Machine & Tool Co., Toledo.
Stoll Co., D. H., Buffalo, N.Y.

PRESSES, FILTER

Perrin, Ltd., William R., Toronto.

PRESSES, PNEUMATIC

Dom. Steel Products Co., Ltd., Brantford.
Eastern Production Co., Detroit, Mich.
Metalwood Mfg. Co., Detroit, Mich.
Toledo Machine & Tool Co., Toledo.

PRESSES, DROP AND FORGING

Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs Co, Ltd., Hamilton.
Can. Fairbanks-Morse Co., Montreal.
Niles-Bement-Pond Co., New York.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co, Toledo.

PRESSES, HYDRAULIC

Bertram & Sons Co., John, Dundas.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Dom. Steel Products Co., Ltd., Brantford.
Eastern Production Co., Detroit, Mich.
Lourie Manufacturing Co., Springfield, Ill.
Metalwood Mfg. Co., Detroit, Mich.
Niles-Bement-Pond Co., New York.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.
Toledo Machine & Tool Co., Toledo.
Stoll Co., Inc., D. H., Buffalo, N.Y.
Williams Machy Co., A. R., Toronto.

PRESSES, HYDRAULIC, HORIZONTAL

Eastern Production Co., Detroit, Mich.

PRESSES, HYDRAULIC, VERTICAL

Eastern Production Co., Detroit, Mich.

PRESSES, HYDRO-PNEUMATIC

Eastern Production Co., Detroit, Mich.

PRESSES, BALING

Perrin, Ltd., William R., Toronto.

ST. JOHNS QUEBEC

Insure the future success of your new plant by locating there

To the manufacturer locating in St. Johns go all the advantages of a commanding geographical location, unequalled transportation facilities and a cheap and abundant power supply. These features assure every facility in manufacturing and allow him to successfully meet competition.

St. Johns is only 27 miles from Montreal and is directly connected by rail with the Montreal docks, providing unusual ocean shipping advantages. It is particularly suitable as a Canadian location for the American manufacturer wishing to trade within the British Empire.

Seven railroads, including the Canadian Pacific and Grand Trunk, pass through the city and are inter-connected in the St. Johns Yards by a terminal switching company at very low rates.

Skilled and unskilled labour is always plentiful, and owing to an unusually low cost of living labour troubles are practically unknown.

To the manufacturer seeking a location for his plant the following inducements offered by St. Johns are especially attractive: Exemption from taxes for a period of fifteen years, same being subject to extension; all public improvements required, such as street extensions, sidewalks, waterworks and sewage; five per cent. bonus on your payroll for five years. If you wish it this bonus will be advanced to you to be applied to the construction of any building suitable to your purpose.

For more detailed information write

The Secretary, City Council

ST. JOHNS, QUEBEC, CANADA

PRESSES, POWER
Baird Machine Co., Bridgeport, Conn.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machinery Co., Toronto.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Machy. Co., A. R., Toronto.

PRESSES, SPRING FOOT
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Ont.
Toledo Machine & Tool Co., Toledo.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., Ltd., A. R., Montreal

PRESSES, SCREW
Bliss Co., E. W., Brooklyn, N.Y.
Manhattan Machine & Tool Co., Grand Rapids, Mich.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.

PRESSES, TIRE
Can. Ingersoll-Rand Co., Ltd., Sherbrooke.

PRESSES, TRIMMING
Bliss Co., E. W., Brooklyn, N.Y.
Canada Machinery Corp., Galt, Ont.
Petrie, Ltd., H. W., Toronto.
Stoll Co., D. H., Buffalo, N.Y.

PROFILING MACHINES
Herbert Ltd., Alfred, Toronto, Ont.

PROJECTORS, FLOOD LIGHTING
Holden Co., Ltd., Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que

PROPELLERS
Kennedy & Sons, Wm., Owen Sound.

PROTECTIVE COATINGS
H. H. Robertson, Ltd., Sarnia, Ont.

PSYCROMETERS, SLING
Taylor Instrument Co., Rochester, N.Y.

PULLEYS
Algoma Steel Corp., Sault Ste. Marie, Ont
American Pulley Co., Philadelphia.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., Fortierville, Que.
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke.
Diamond State Fibre Co., Bridgeport, Pa.
Ford-Smith Machine Co., Hamilton, Ont.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Kennedy & Sons, Ltd., W., Owen Sound.
Positive Clutch & Pulley Works Ltd., Toronto.
Petrie, Ltd., H. W., Toronto.

PULLEYS, STEEL SASH, STEEL BELT
American Pulley Co., Philadelphia, Pa.

PULLEYS, FRICTION, CLUTCH
American Pulley Co., Philadelphia, Pa.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., A., Fortierville, Q.
Can. Link-Belt Co., Toronto, Ont.
Carlyle Johnson Mch. Co., Manchester, Ct.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Jones & Glassco, Montreal.
Positive Clutch & Pulley Works, Toronto.
Petrie, Ltd., H. W., Toronto.

PULP MILL MACHINERY
Can. Ingersoll-Rand Co., Ltd., Sherbrooke.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

PUMPS, AIR LIFT
Can. Ingersoll-Rand Co., Ltd., Sherbrooke.
Holden Co., Ltd., Montreal, Que.

PUMPS, BOILER FEED
Can. Ingersoll-Rand Co., Ltd. Sherbrooke.

PUMPS, CENTRIFUGAL
Bowser Co., Ltd., S. F., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Ingersoll-Rand Co., Montreal, Que.
Darling Bros., Ltd., Montreal, Que.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

PUMPS, FUEL OIL
Bowser Co., Ltd., S. F., Toronto, Ont
Brown & Sharpe Mfg. Co., Providence, R.I.
Darling Bros., Ltd., Montreal, Que.
Trahern Pump Co., Rockford, Ill.

PUMPS, GEARED
Darling Bros., Ltd., Montreal, Que
Globe Engineering Co., Hamilton, Ont.

PUMPS, HIGH PRESSURE
Perrin, Ltd., William R., Toronto.

PUMPS, HYDRAULIC
Can. Ingersoll-Rand Co., Ltd., Sherbrooke.
Clarke & Co., Furniss, Montreal, Que.
Garlock-Walker Machinery Co., Toronto.
Darling Bros., Ltd., Montreal, Que
Elec. Steel & Metals, Welland, Ont.
Metalwood Mfg. Co., Detroit, Mich.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

PUMPS, LUBRICATING, OIL STORAGE
Bowser Co., Ltd., S. F., Toronto, Ont.

PUMPS, RETURN AIR
Can. Ingersoll-Rand Co. Ltd., Sherbrooke.

PUMPS, SPECIAL
Elec. Steel & Metals, Welland, Ont.

PUMPS, RUBBER CEMENT
Bowser Co., Ltd., S. F., Toronto, Ont.

PUMPS, KEROSENE, OIL, SELF-MEASURING
Bowser Co., Ltd., S. F., Toronto, Ont.

PUMPS, LUBRICANT, OIL, WATER
Darling Bros., Ltd., Montreal, Que.
Trahern Pump Co., Rockford, Ill.

PUMPS — ROTARY
General Combustion Co., Ltd., Montreal, Que.

PUMP LEATHERS
Graton & Knight Mfg. Co., Worcester.

PUNCHES AND DIES
Atkins & Co., Ltd., Wm., Sheffield, Eng.
E. W. Bliss Co, Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Can.
Can. Blower & Forge Co., Kitchener, Ont.
Crescent Mach. Co., Ltd., Montreal, P.Q.
Can. Fairbanks-Morse Co., Montreal.
Gardner & Son, Robert, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Marshall, Son & Blunney, Toronto.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, O.
Williams Mchy Co., A. R., Toronto, Ont.

PUNCHES, POWER
John Bertram & Sons Co., Dundas, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd, Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machinery Co., Toronto.
A. B. Jardine & Co., Hespeler, Ont.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
D. H. Stoll Co., Buffalo, N.Y.
Williams Mchy Co., A. R., Toronto, Ont.

PUNCHING MACHINES, HORIZONTAL
Bertrams, Ltd., Edinburgh, Scotland.
Bertrams & Sons, John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co, Ltd., Hamilton, Ont.
Garlock-Walker Mach'y. Co., Toronto.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

PUNCHES, HAND
Niles-Bement-Pond Co., New York.

PYROMETERS
Bristol Co., Waterbury, Conn.
Shore Instrument & Mfg. Co., New York.
Taylor Instrument Co., Rochester, N.Y.

QUARTERING MACHINES
Bertram & Sons, John, Dundas, Ont.
Niles-Bement-Pond Co., New York.

RAIL BENDERS
Algoma Steel Corp., Sault Ste. Marie, Ont.

RAILROAD TOOLS
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machinery Co., Toronto.
Holder Co., Ltd., Montreal, Que.
Niles-Bement-Pond Co., New York.
Petrie Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

RASPS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall, Son & Bunney, Toronto.

RAWHIDE PINIONS (See Gears)

REAMERS
Butterfield & Co., Inc., Rock Island, Que.

REAMERS, ADJUSTABLE
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Elliott & Whitehall Machine and Tool Co., Galt, Ont.
Greenfield Tap & Die Corp., Greenfield.
Ingersoll Machy. Co., Ingersoll, Ont.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
McCrosky Tool Corp., Meadville, Pa., U. S. A.
Plewes, Ltd., Winnipeg, Man.
Pratt & Whitney Co., Dundas, Ont.
The Kelly Reamer Co., Cleveland, O.
J. A. M. Taylor, 318 Stair Bldg., Toronto.
Wells Bros. of Can., Galt, Ont

REAMERS, BRIDGE, EXPANDING AND HIGH SPEED
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Aikenhead Hardware Co., Toronto.
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Gisholt Machine Co., Madison, Wis.
Lyman Tube & Supply Co., Montreal, Que
Marshall, Son & Bunney, Toronto.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Morse Twist Drill & Mch. Co., New Bedford Mass.
McCrosky Tool Corp., Meadville, Pa., U. S. A.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont
Samuel Osborne, Ltd., Montreal, P.Q.
Strelinger, Chas. A. Co., Windsor, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

REAMERS, STEEL, TAPER AND SELF-FEEDING
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

REAMERS, CHUCKING
Ackworthie Ltd., J., Birmingham, Eng.
Atkins & Co., Ltd., Wm., Sheffield, Eng
Butterfield & Co., Inc., Rock Island, Que
Greenfield Tap & Die Corp., Greenfield.
Ingersoll Machy. Co., Ingersoll, Ont.
Marshall, Son & Bunney, Toronto.
J. Morrow Screw & Nut Co., Ingersoll, Ont
Strelinger, Chas. A. Co., Windsor, Ont.
Wells Bros. of Canada, Galt, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

REAMERS, HAND
Ackworthie Ltd., J., Birmingham, Eng.
Butterfield & Co., Inc., Rock Island Que.
Greenfield Tap & Die Corp., Greenfield.
J. Morrow Screw & Nut Co., Ingersoll, Ont
Wells Bros. of Can., Galt, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

REAMERS, PIN
Ackworthie Ltd., J., Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield.
Morrow Screw & Nut Co., John, Ingersoll
Wells Bros. of Can., Galt, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

REAMER FLUTING MACHINES
Garvin Machine Co., New York.

REAMING MACHINES, PNEUMATIC
Cleveland Pneumatic Co. of Can., Toronto
Garlock-Walker Machinery Co. Toronto.
Holden Co., Ltd., Montreal, Que.

RECORDING INTRUMENTS
Bristol Co., Waterbury, Conn.
Gisholt Machine Co., Madison, Wis.
Taylor Instrument Co., Rochester, N.Y.

REELS, WIRE AND TEXTILE MFG.
American Pulley Co., Philadelphia, Pa.

REGULATORS, AUTOMATIC
Electric Steels & Metals, Ltd., Welland.

REGULATORS, PRESSURE, TEMPERATURE
Can. Fairbanks-Morse Co., Montreal.
Taylor Instrument Co., Rochester, N.Y.

REPAIR WORK — SAWS
Atkins & Co., E. C., Hamilton, Ont.

REPAIR WORK, ALL KINDS
Elec. Steel & Metals, Welland, Ont.

RIVETS
Aikenhead Hardware Co., Toronto, Ont.
Parmenter & Bulloch Co., Gananoque.
Rice, Lewis & Son, Toronto.
Steel Co. of Canada, Ltd., Hamilton.

RIVETERS, PNEUMATIC, HYDRAULIC, HAMMER, COMPRESSION
Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Montreal.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co. Toronto.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.

RIVETING MACHINES, ELASTIC, ROTARY BLOW
High-Speed Hammer Co., Rochester.
Petrie, Ltd., H. W., Toronto.
B. B. Shuster Co., New Haven, Conn.
Strelinger Co., C. A., Windsor, Ont.

ROAD BUILDING EQUIPMENT
Can. Ingersoll-Rand Co., Ltd., Sherbrooke.
Holden Co., Ltd. Montreal, Que.

ROAD-MAKING MACHINERY
G. F. Foss Mchy & Sply. Co., Montreal.

RODS, PURE NICKEL, MONEL METAL, NICHROME
Can. Driver-Harris Co., Ltd., Walkerville.

ROLLER CHAINS
Can. Link-Belt Co., Toronto.
Jones & Glassco, Montreal.
Lyman Tube & Supply Co., Montreal, Que
Renold of Canada Ltd., Montreal.

ROLLS, BENDING, STRAIGHTENING
John Bertram & Sons Co., Dundas.
Brown, Boggs Co., Ltd. Hamilton.
Can. Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machinery Co. Toronto
Niles-Bement-Pond Co. New York.
Petrie Ltd. H. W., Toronto.
Toledo Machine & Tool Co., Toledo, O.

ROLLS CRUSHING
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

ROLLS AND TABLES
Dominion Foundries & Steel Ltd., Hamilton, Ont.
Elec. Steel & Metals, Welland, Ont.

ROOFING
H. H. Robertson, Ltd., Sarnia, Ont.

ROPE, GALV. MONEL METAL, BRONZE, TILLER AND SASH CORD
Can. Driver-Harris Co., Ltd., Walkerville

ROLLING MACHINES, SHEET METAL
Manhattan Machine & Tool Co., Grand Rapids, Mich.

ROLLING MILL MACHINERY
Dom. Steel Products Co., Ltd., Brantford
Mesta Machine Co., Pittsburgh, Pa.

ROLL LATHES
Mesta Machine Co., Pittsburgh, Pa.

ROLLS, BENDING, STRAIGHTENING
Manhattan Machine & Tool Co., Grand Rapids, Mich.

ROLLS, CRUSHING
Can. Link-Belt Co., Toronto.

ROOF COOLERS
Electric Steels & Metals, Ltd., Welland

RUBBER MILL DRIVES
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Dom. Steel Products Co., Ltd., Brantford
Can. Link-Belt Co., Toronto.

RUBBER MILL MACHINERY
Bertrams Ltd., Edinburgh, Scotland.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Dom. Steel Products Co., Ltd., Brantford

RUBBER MOULDS & CORES
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

RUBBER PRODUCTS, MECHANICAL
Dunlop Tire & Rubber Goods Co., Ltd., Montreal.

RUBBING BRICKS
Dominion Abrasive Co., Mimico, Ont.

RULES
Brown & Sharpe Mfg. Co., Providence.
James Chesterman & Co., Ltd., Sheffield
Rice, Lewis & Son, Toronto.
L. S. Starrett Co., Athol, Mass.

RUST PREVENTATIVES
Oakley Chemical Co., New York, N.Y.

SAW MILL CONVEYORS
Can. Link-Belt Co., Toronto.
Petrie, Ltd., H. W., Toronto.

SAND MILLS
Frost Mfg. Co., Chicago, Ill.

SAND MIXING MACHINERY
Frost Mfg. Co., Chicago, Ill.

SANITARY DRINKING FOUNTAINS
Puro Sanitary Drinking Fountain Co., Haydenville.

SANDING MACHINES
Canada Machinery Corp., Galt.

SAW MILL MACHINERY
Can. Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt.
Bowes Gardner & Son, Montreal.
Curtis Pneumatic Machy Co., St. Louis
Hamilton Co., Ltd., Wm., Peterborough, Ont.
A. R. Williams Machy. Co., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

SASH SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

SAWS FOR EVERY USE
Atkins & Co., E. C., Hamilton, Ont.

SAWS, CIRCULAR METAL
Atkins & Co., E. C., Hamilton, Ont.
Cochrane-Bly Co., Rochester, N.Y., U.S.A.
Wm. Atkins & Co., Ltd., Sheffield, Eng
Marshall, Son & Bunney, Toronto
Simonds Mfg. Co., Fitchburgh, Mass.
Tabor Mfg. Co., Philadelphia, Pa.

SAWS, HACK (See Hack Saws)

SAW GUARDS
Ackworthie Ltd., J., Birmingham, Eng.
Atkins & Co., E. C., Hamilton, Ont.

SAWING MACHINES, METAL
Herbert, Ltd., Alfred, Toronto, Ont.

SAWING MACHINES, CIRCULAR, FOR COLD METAL
Cochrane-Bly Co., Rochester, N.Y., U.S.A.

SAWS, METAL, HACK AND BAND
Atkins & Co., E. C., Hamilton, Ont.

SAWS, SILVER STEEL
E. C. Atkins & Co., Inc., Indianapolis.

SAW SHARPENERS
Cochrane-Bly Co., Rochester, N.Y., U.S.A.
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Can., Galt, Ont.

SAWS, SLITTING
J. A. M. Taylor, Stair Bldg., Toronto
Atkins & Co., E. C., Hamilton, Ont.

SAWS — HIGH-SPEED FRICTION
Atkins & Co., E. C., Hamilton, Ont.

SAWS — PATTERN SHOP
Atkins & Co., E. C., Hamilton, Ont.

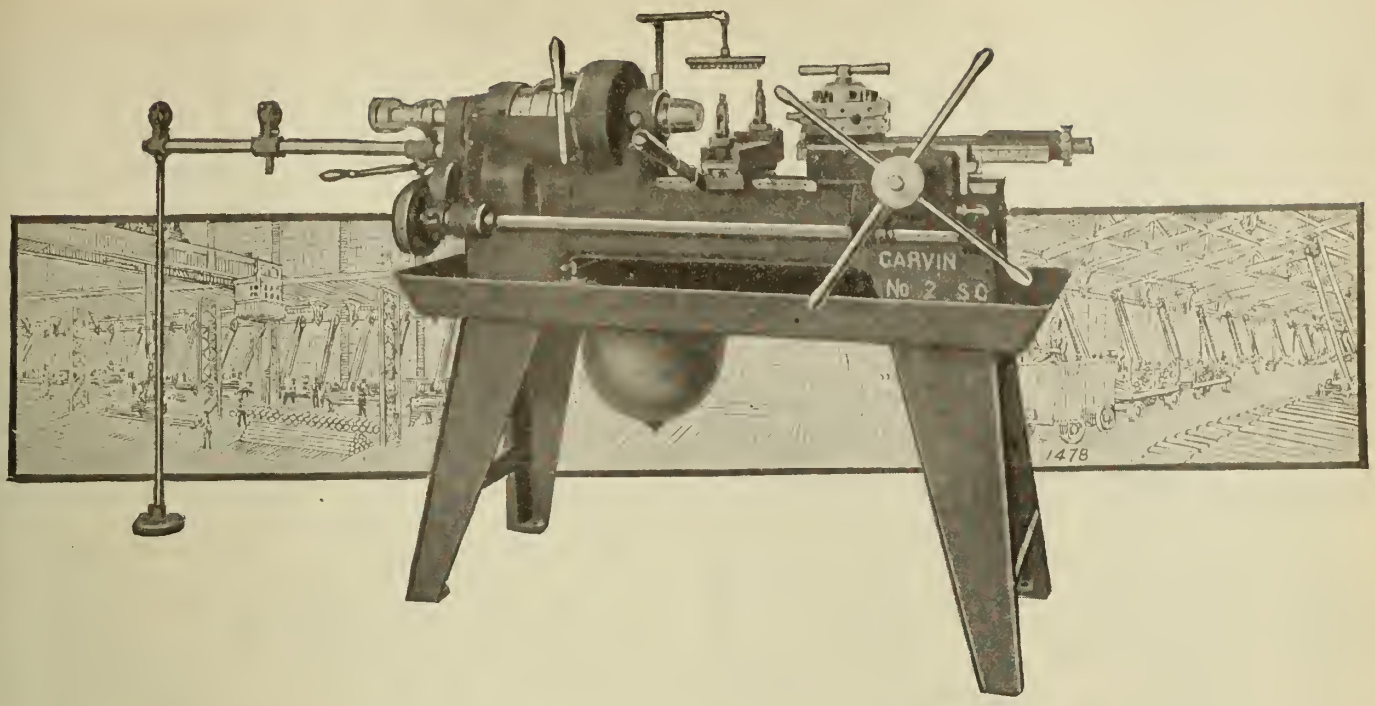
SAWS — SWING
Atkins & Co., E. C., Hamilton, Ont.

SCLEROSCOPES
Shore Instrument & Mfg. Co., New York.

SCREENING MACHINERY
Can. Link-Belt Co., Toronto.

SCREW EXTRACTORS
Cleveland Twist Drill Co., Cleveland.

SCREW MACHINES, HAND, AUTOMATIC
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Ltd., Toronto
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield.
Herbert, Ltd., Alfred, Toronto, Ont.
A. B. Jardine & Co., Hespeler.
National Acme Co, Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto.
Pratt & Whitney Co., Dundas, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
Warner & Swasey Co., Cleveland, O.
Wells Bros. of Can., Galt, Ont.



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GARVIN

BUILDER OF BETTER MACHINE TOOLS

G-57

If interested tear out this page and place with letters to be answered.

SCREWS, MACHINE, SET, CAP AND SPECIAL
Galt Machine Screw Co., Galt.
John Morrow Screw & Nut Co., Ingersoll.
National Acme Co., Montreal.
Rice Lewis & Son, Toronto.
Steel Co. of Canada, Ltd., Hamilton.
Wilkinson & Kompass, Hamilton.

SCREW COLLARS
Galt Machine Screw Co., Ltd., Galt, Ont.
John Morrow Screw & Nut Co., Ingersoll.

SCREW MACHINES, PLAIN
Brown & Sharpe Mfg. Co., Providence, R.I.
Herbert, Ltd., Alfred, Toronto, Ont.

SCREW PLATES
Ackworthie Ltd., J., Birmingham, Eng.
Butterfield & Co., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield.
A. B. Jardine & Co., Hespeler.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto.
J. A. M. Taylor, Stair Bldg., Toronto.
Wells Bros. of Can., Galt.
Wilkinson & Kompass, Hamilton.

SCREWS, SAFETY SET
Galt Machine Screw Co., Ltd., Galt, Ont.

SCREW SLOTTERS
Butterfield & Co., Inc., Rock Island, Que.
Garvin Machine Co., New York.
National Acme Co., Cleveland, O.
Pratt & Whitney Co., Dundas, Ont.

SELF-OPENING DIES
See Dies.

SET SCREWS, SAFETY
Aikenhead Hardware Co., Toronto.
Bristol Co., Waterbury, Conn.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wilkinson & Kompass, Hamilton.

SHANKS, STRAIGHT AND TAPER
Jacobs Mfg. Co., Hartford, Conn.

SHAPERS
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Cochrane-Bly Co., Rochester, N.Y., U.S.A.
Geo. F. Foss Mchy. & Sply. Co., Montreal
Robt. Gardner & Son, Montreal.
Garlock-Walker Mach'y. Co., Toronto.
Herbert, Ltd., Alfred, Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Standard Equipment & Tool Wks., Montreal.
Walcott Lathe Co., Jackson, Mich.
Williams Mchy Co., A. R., Toronto, Ont.

SHAPERS, GEAR
Fellows Gear & Shaper Co., Springfield, V.

SHAFTING
Algoma Steel Corp., Sault Ste. Marie, O.
Can. Fairbanks-Morse Co., Montreal.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machy. Co., Ltd., Toronto
Jones & Glasco, Montreal.
Niles-Bement-Pond Co., New York.
Can. Drawn Steel Co., Hamilton.
Peckovers, Ltd., Toronto, Ont.
Petrie, Ltd., H. W., Toronto.
Pratt & Whitney Co., Dundas.
Rice, Lewis & Son, Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
A. R. Williams Machy. Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

SHARPENING STONES
Norton Co, Worcester, Mass.
Rice, Lewis & Son, Toronto.

SHEARING MACHINES, ANGLE IRON, BAR AND GATE
John Bertram & Sons Co., Dundas.
Bertrams Ltd., Edinburgh, Scotland.
Canada Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machy. Co., Ltd., Toronto
A. B. Jardine & Co., Hespeler, Ont.
Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co., Toledo, O.

SHEARS, POWER
John Bertram & Sons Co., Dundas.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co, Ltd., Hamilton.
Can Blower & Forge Co, Kitchener.
Canada Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machy. Co., Ltd., Toronto
A. B. Jardine & Co., Hespeler, Ont.
National Machy. Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
H. D. Stoll Co., Inc., Buffalo, N.Y.
Strelinger, Chas. A. Co., Windsor, Ont.
Toledo Machine & Tool Co., Toledo, O.
Williams, White & Co., Moline, Ill.
Williams Mchy Co., A. R., Toronto, Ont.

SHEARS, PNEUMATIC
Toledo Machine & Tool Co., Toledo, Ohio

SHEARS, PLATE CUTTING, SLITTING
Dom. Steel Products Co., Ltd., Brantford.

SHEARS, SPLITTING
Dom. Steel Products Co., Ltd., Brantford.

SHEARS, IRREGULAR AND CIRCLE CUTTING
D. H. Stoll Co., Inc., Buffalo, N.Y

SHEARS, SQUARING
Brown, Boggs & Co., Hamilton, Ont.
D. H. Stoll Co., Inc., Buffalo, N.Y.

SHEET METAL WORKING MACHINERY
Herbert, Ltd., Alfred, Toronto, Ont.
D. H. Stoll Co., Inc., Buffalo, N.Y.

SHEET METAL WORKING TOOLS
Baird Machine Co., Bridgeport, Conn.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton.
Petrie, Ltd., H. W., Toronto.
D. H. Stoll Co., Inc., Buffalo, N.Y.
Strelinger, Chas. A. Co., Windsor, Ont.

SHEETS, CRUCIBLE, CAST
British Smelting & Refining Co., Ltd., Montreal, Que.

SHEETS, BLACK AUTO AND GALVANIZED
Peckovers, Ltd., Toronto, Ont.

SHEETS, NICKEL, RESIST, ALLOY
Can. Driver-Harris Co., Ltd., Walkerville.

SHELVING, STEEL
Dennis Wire & Iron Works, London.

SHIPYARD MACHINERY, SHOP FURNITURE
Dennis Wire & Iron Works, London.

SIDE TOOLS
Armstrong Bros. Tool Co., Chicago.
J. H. Williams & Co., Brooklyn, N.Y.

SILENT CHAINS
Can. Link-Belt Co., Toronto, Ont.
Jones & Glasco, Montreal.
Renold of Canada Ltd., Montreal.

SLEDGES
Aikenhead Hardware Co., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.
Wilkinson & Kompass, Hamilton, Ont

SLINGS, CHAINS
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

SLOTTERS
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
Herbert, Ltd., Alfred, Toronto, Ont.
National-Acme Co., Cleveland, Ohio.
Niles-Bement-Pond Co., New York.

SMOKESTACKS
William Hamilton Co., Peterboro, Ont.
MacKinnon Steel Co., Sherbrooke, Que

SNIPS, TINNERS AND SHEET METAL WORKERS
Kearney & Trecker Co., Milwaukee, Wis
J. Morrow Screw & Nut Co., Ingersoll, Ont

SOCKETS
Brown & Sharpe Mfg. Co., Providence.
Butterfield & Co., Inc., Rock Island, Que
Cleveland Twist Drill Co., Cleveland.
J. Morrow Screw & Nut Co., Ingersoll, Ont
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.

SOIL PIPE FITTINGS, CAST IRON
Katie Foundry, Galt, Ont.

SOLDERING IRONS
Aikenhead Hardware Co., Toronto, Ont.
Brown, Boggs & Co., Hamilton, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.

SOLDER
British Smelting & Refining Co., Ltd. Montreal, Que.
Aikenhead Hardware Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Hoyt Metal Co., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.
Tallman Brass & Metal Co., Hamilton.

SPELTER
British Smelting & Refining Co., Ltd. Montreal, Que.

SPEED REDUCING GEARS
Can. Link-Belt Co., Toronto, Ont.
Jones & Glasco, Montreal.

SPRINGS, MACHINERY
Barnes, Wallace Co., Bristol, Conn.
Can. Steel Foundries, Ltd., Montreal.
Cleveland Wire Spring Co., Cleveland.
Dunbar Bros. Co., Bristol, Conn.
Garlock-Walker Machinery Co., Toronto.

SPECIAL MACHINERY
Baird Machine Co., Bridgeport, Conn.
Bertram, John, & Sons Co., Dundas.
Bliss, E. W. Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada
Brown Engineering Corp., Toronto, Ont.
Dom. Steel Products Co., Ltd., Brantford
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Machinery Co., Toronto
Garvin Machine Co., New York.
Globe Engineering Co., Ltd., Hamilton.
Hamilton Co., Ltd., Wm., Peterborough
A. B. Jardine & Co., Hespeler, Ont.
Katie Foundry, Galt, Ont.
Ker & Goodwin Machine Co., Ltd., Brantford, Ont.
McCrosky Tool Corp., Meadville, Pa., U. S. A.
National-Acme Co., Cleveland, Ohio.
Mesta Machine Co., Pittsburgh, Pa.
Stoll Co., D. H., Buffalo, N.Y.
Victoria Foundry Co., Ottawa, Ont.
William R. Perrin, Ltd., Toronto.
Williams Tool Corp. of Can. Ltd., Brantford, Ont.

SPECIAL TOOLS, MACHINERY
Crescent Machine Co., Ltd., Montreal, Que.
McClean Machine & Tool Co., Ltd., Hamilton, Ont.

SPOT FACERS, INTERCHANGEABLE
Eclipse Counterbore Co., Ltd., Walkerville, Ont.

SPRING COILING AND WINDING MACHINERY
Baird Machine Co., Bridgeport, Conn.
Garvin Machine Co., New York.

SPRING MAKING MACHINERY (AUTOMATIC)
Baird Machine Co., Bridgeport, Conn.

SPRINGS, SPIRAL, TOOL
The Dunbar Bros. Co., Bristol, Conn.

SPRINGS STEEL
Barnes Co., Wallace, Bristol, Conn.

SPROCKETS, COMPENSATING
Morse Chain Co., Ithaca, New York.

SPROCKETS, SPRING
Morse Chain Co., Ithaca, New York.

SPROCKETS, CHAIN
Can Link-Belt Co., Toronto, Ont.
Jones & Glasco, Montreal.
Lyman Tube & Supply Co., Montreal, Que
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia
Renold of Canada Ltd., Montreal.

SPRINGS FOR TOYS AND ELECTRIC DEVICES
The Dunbar Bros. Co., Bristol, Conn.

SPROCKET WHEELS, CAST
Can. Link Belt Co., Toronto, Ont.
Lyman Tube & Supply Co., Ltd., Montreal

SAFETY CYLINDERS
Oliver Mach. Co., Grand Rapids, Mich.

SANDERS
Oliver Mach. Co., Grand Rapids, Mich.

SAW BENCHES
Oliver Mach. Co., Grand Rapids, Mich.

SAW GUARDS
Oliver Mach. Co., Grand Rapids, Mich.

SAWING MACHINES
Herbert Ltd., Alfred, Toronto, Ont.

SAWS SWING
Oliver Mach Co., Grand Rapids, Mich.

SMALL TOOLS
Herbert Ltd., Alfred, Toronto, Ont.

STAYBOLT TOPS
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

STAIRS, IRON
Canada Wire & Iron Goods Co., Hamilton, Ont.

STAMPINGS, SHEET BRASS, COPPER, ALUMINUM AND STEEL
Dom. Forge & Stamping Co., Walkerville
Globe Engineering Co., Hamilton, Ont.

STAMPING MACHINERY
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs, & Co., Hamilton, Can.
Canada Machinery Corp., Galt, Ont.

SAFETY CYLINDERS
Oliver Mach. Co., Grand Rapids, Mich.

STEAM APPLIANCES
Darling Bros., Ltd., Montreal, Quebec.

STEAM SEPARATORS AND TRAPS
Can. Fairbanks-Morse Co., Montreal.

STEAM TURBINES
General Combustion Co., Ltd., Montreal, Que.
Sturtevant Co., B. F., Galt, Ont.

STEEL BALLS
See Balls Steel.

STEEL, CRUCIBLE TOOL
Atkins & Co., Ltd., Wm. Sheffield, Eng
Illingworth Steel Co., John. New York
Marshall, Son & Bunney, Toronto

STEEL, CARBON, FERRO-TUNGSTEN
Armstrong, Whitworth of Can., Montreal
Atkins & Co., Ltd., Wm., Sheffield, Eng
Firth & Sons, Thos., Montreal, Que
Latrobe Electric Steel Co., Latrobe, Pa
Lincoln Electric Co. of Canada, Ltd Toronto, Ont.
Marshall, Son & Bunney, Toronto.
Peckovers, Ltd., Toronto, Ont.
Samuel Osborne (Can.), Ltd., Montreal
Vanadium-Alloys Steel Co., Pittsburgh

STEEL, CHROME MOLYBDENUM
United Alloy Steel Corp., Canton, Ohio.

STEEL CHROME VANADIUM
Norton, Ralph B., Agent, Montreal.
Atkins & Co., Ltd., Wm. Sheffield, Eng
Marshall, Son & Bunney, Toronto
United Alloy Steel Corp., Canton, Ohio.

STEEL CHROME NICKEL
Firth & Sons, Ltd., Thos., Montreal,
Lyman Tube & Supply Co., Ltd., Montreal
Norton, Ralph B., Agent, Montreal.
Atkins & Co., Ltd., Wm., Sheffield, Eng
Marshall, Son & Bunney, Toronto
United Alloy Steel Corp., Canton, Ohio.

STEEL CASTINGS
Can. Elec. Steel Casting Co., Aurora, Ont
Davidson Mfg. Co., Ltd., Montreal, Que
Dominion Foundries & Steel Ltd., Hamilton, Ont.
Dom. Iron & Steel, Sydney, N.S.
Kennedy & Sons, Wm., Owen Sound
Electric Steel & Metals Co., Welland.
Nova Scotia Steel & Coal Co., Windsor
Swedish Crucible Steel Co., Windsor.

STEEL, COLD DRAWN
United Alloy Steel Corp., Canton, Ohio.

STEEL, COLD ROLLED
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Can. Drawn Steel Co., Hamilton, Ont.
Rice Lewis & Son, Toronto, Ont.
Swedish Steel & Importing Co. Ltd., Montreal.
Union Drawn Steel Co., Hamilton, Ont.

STEEL, ELECTRIC FURNACE
United Alloy Steel Corp., Canton, Ohio.

STEEL FJAB
Lincoln Electric Co., of Canada, Ltd., Toronto, Ont.

STEEL, NICKEL
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall, Son & Bunney, Toronto.
United Alloy Steel Corp., Canton, Ohio.

STEEL, HIGH SPEED
Armstrong-Whitworth of Can., Montreal
Wm. Atkins & Co., Sheffield, Eng.
Can. Fairbanks-Morse Co., Montreal
Deloro Smelting & Refining Co., Ltd. Toronto, Ont.
H. A. Drury Co., Ltd., Montreal.
Firth & Sons, Thos., Montreal, Que.
Illingworth Steel Co., J., New York.
Latrobe Electric Steel Co., Latrobe, Pa.
Marshall, Son & Bunney, Toronto, Ont.
Osborne, Samuel, Montreal, P.Q.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Toronto, Ont.
Swedish Steel & Importing Co., Ltd., Montreal.
Vanadium-Alloys Steel Co., Pittsburgh.

STEEL, OPEN HEARTH
Illingworth Steel Co., John, New York.
United Alloy Steel Corp., Canton, Ohio.

STEEL PLATES
Dominion Foundries & Steel Ltd., Hamilton, Ont.

STEEL PRODUCTS AND MACHINERY
Dom. Steel Products Co., Ltd., Brantford.

STEEL, ROCK DRILL
Armstrong, Whitworth of Canada, Montreal, Que.
Lincoln Electric Co. of Canada, Ltd., Toronto, Ont.

STEEL, SPECIAL ANALYSIS
United Alloy Steel Corp., Canton, Ohio.

STEEL, SPRING AND REINFORCING
Peckovers, Ltd., Toronto, Ont.
United Alloy Steel Corp., Canton, Ohio.

STEEL, STRUCTURAL
Algoma Steel Corp., Sault Ste. Marie
MacKinnon Steel Co., Sherbrooke, Que.
Peckovers, Ltd., Toronto, Ont.

STEEL, TOOL
Armstrong, Whitworth of Can., Montreal
Atkins & Co., Wm., Sheffield, Eng.
Can. Fairbanks-Morse Co., Montreal
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Drury Co., H. A., Montreal, Que.
Deloro Smelting & Refining Co., Ltd, Toronto, Ont.
Firth & Sons, Thos., Montreal, Que.
Lincoln Electric Co., of Canada, Ltd., Toronto, Ont.
Lyman Tube & Supply Co., Ltd., Montreal
Marshall, Son & Bunney, Toronto, Ont.
Latrobe Electric Steel Co., Latrobe, Pa.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son Toronto, Ont.
Vanadium-Alloys Steel Co., Pittsburgh.

STEEL TUBING
Tube Co. of Canada, Ltd., Toronto, Ont.

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Wm. Atkins & Co., Ltd., Sheffield, Eng.
Armstrong Whitworth of Can., Montreal
Dominion Foundries & Steel Ltd., Hamilton, Ont.
Drury, H. A., Co., Montreal, Que.
Marshall, Son & Bunney, Toronto.
Vanadium-Alloys Steel Co., Pittsburgh.
Wells Bros. of Can., Galt, Ont.

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Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

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Rice Lewis & Son, Toronto, Ont.
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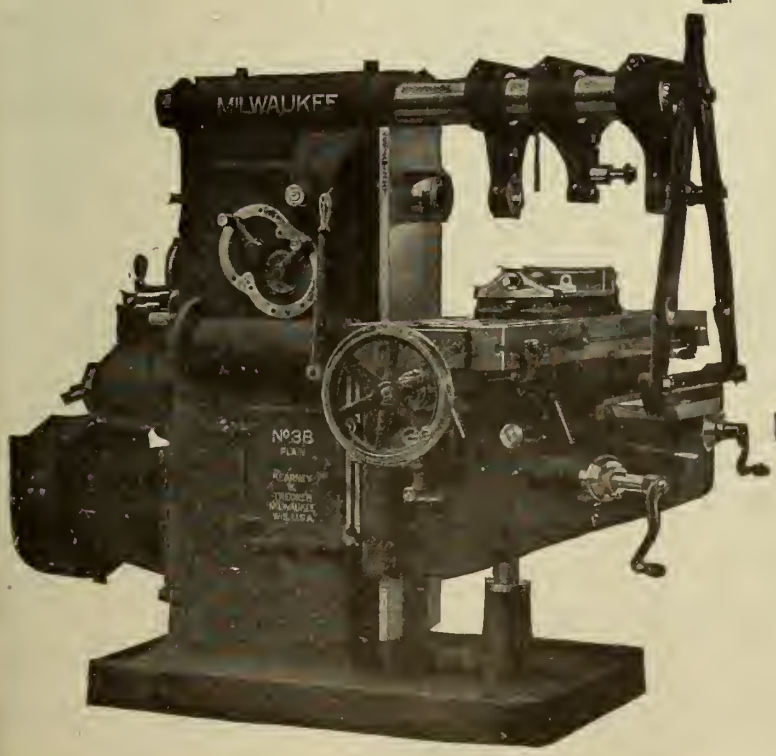

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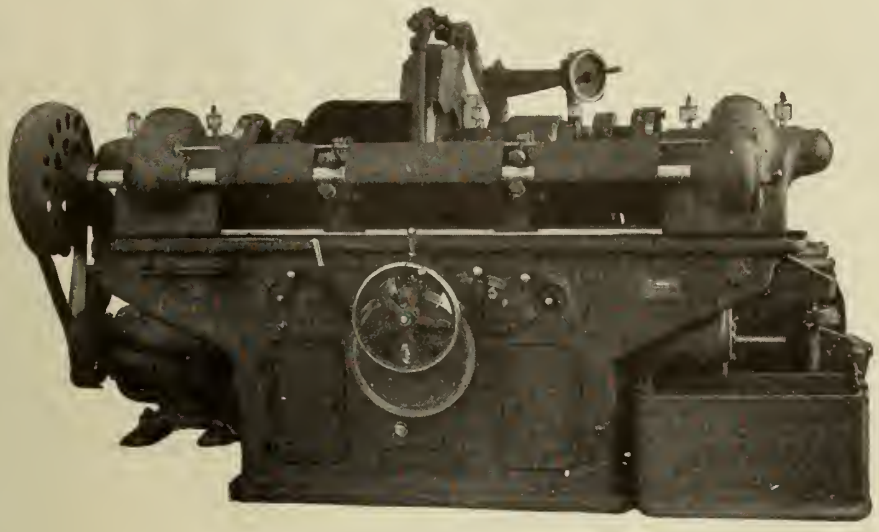

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143 UNIVERSITY AVE., TORONTO, CANADA

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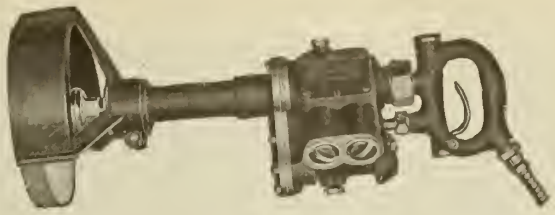

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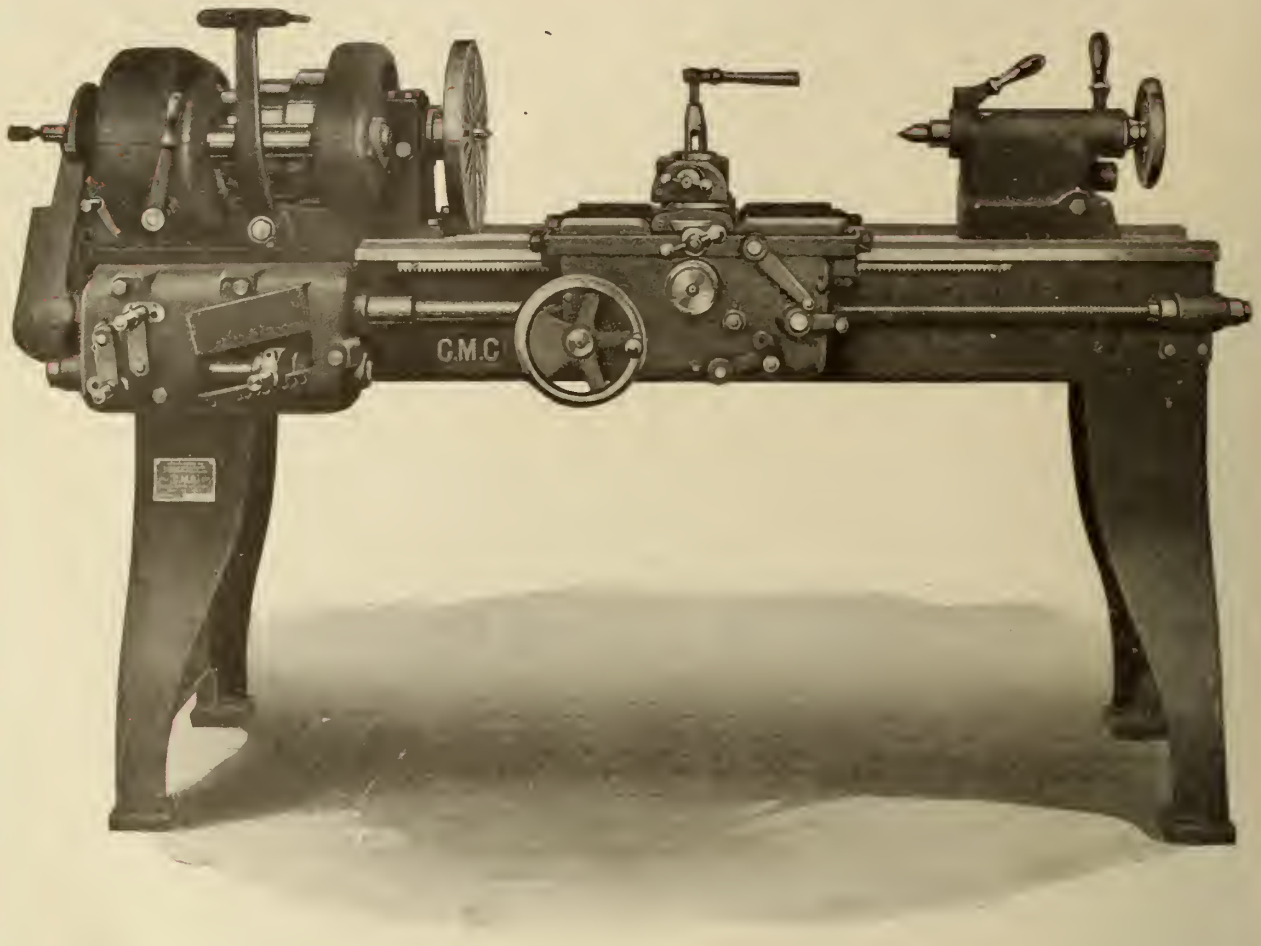

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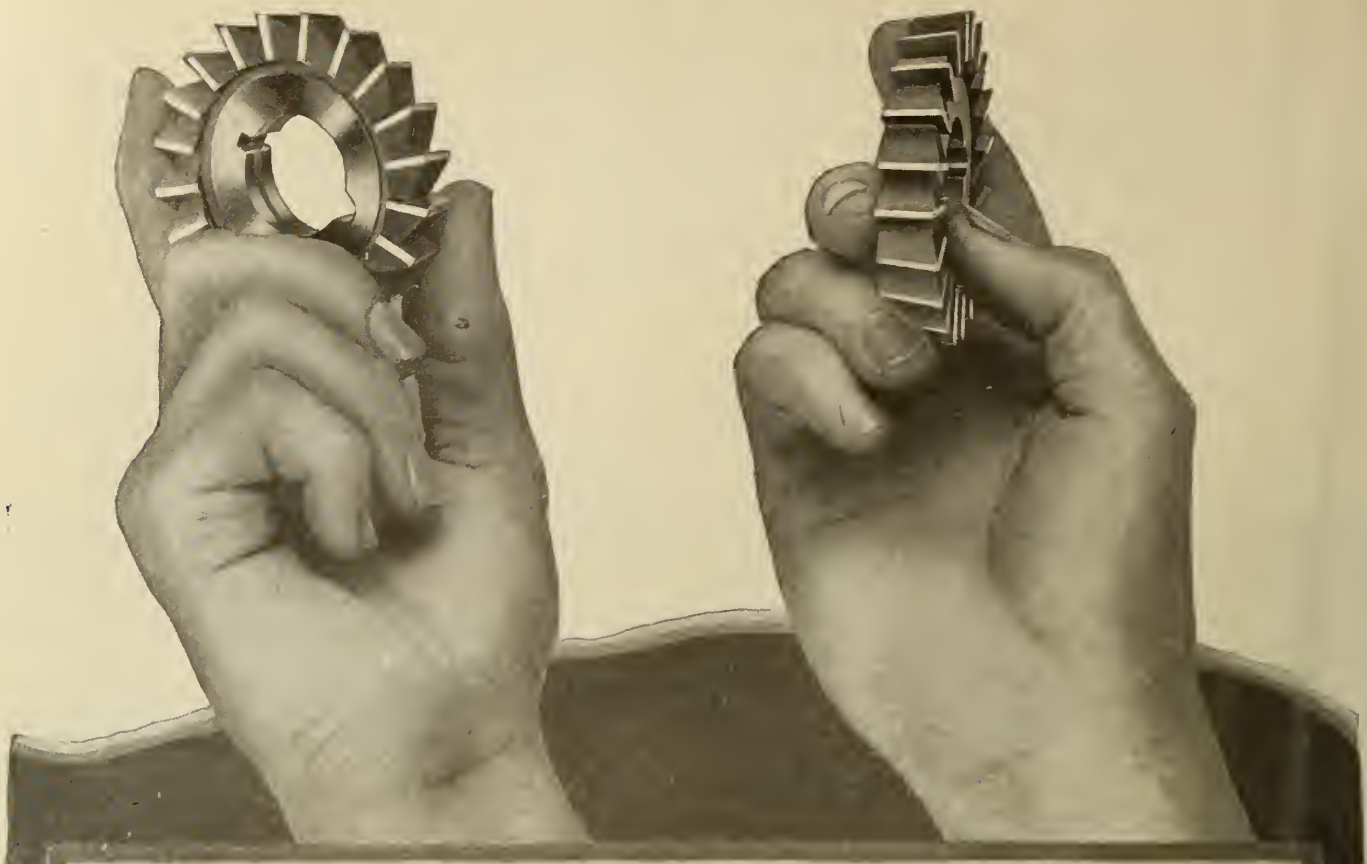

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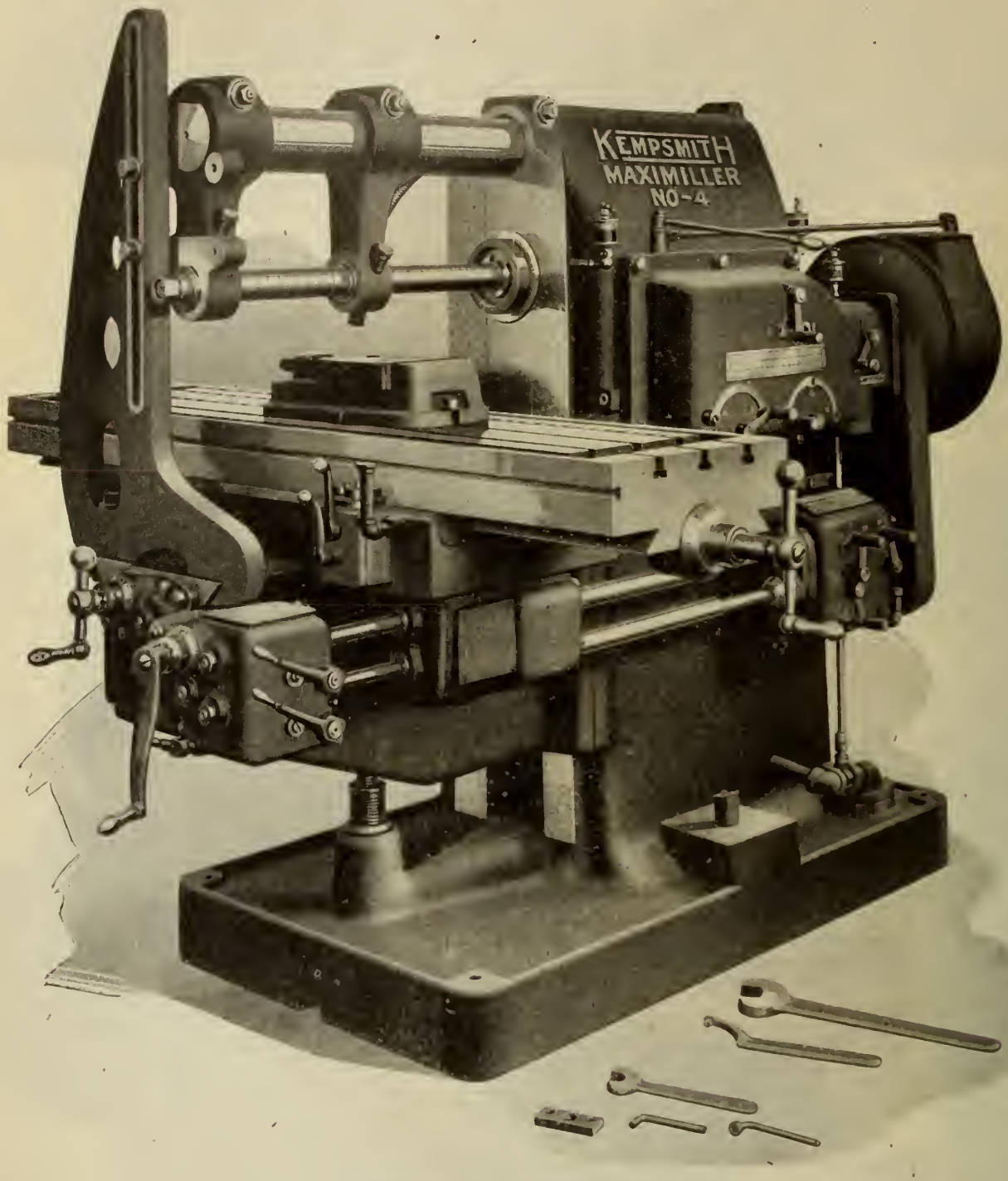

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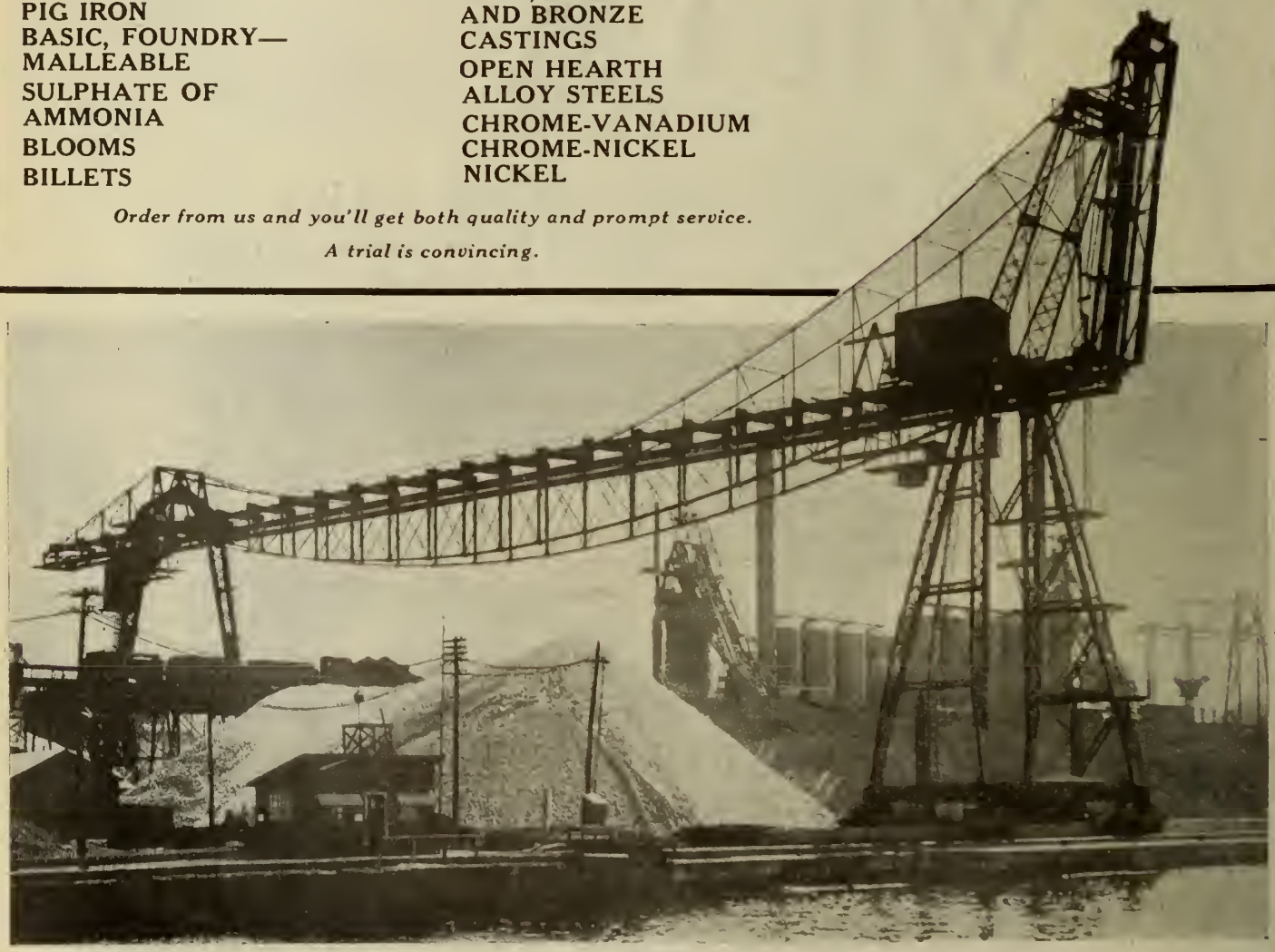

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Stone Crushers
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Scales
Oil Cups

Packing, Steam, Hydraulic
Fittings, Engine, Boiler, Iron, Pipe

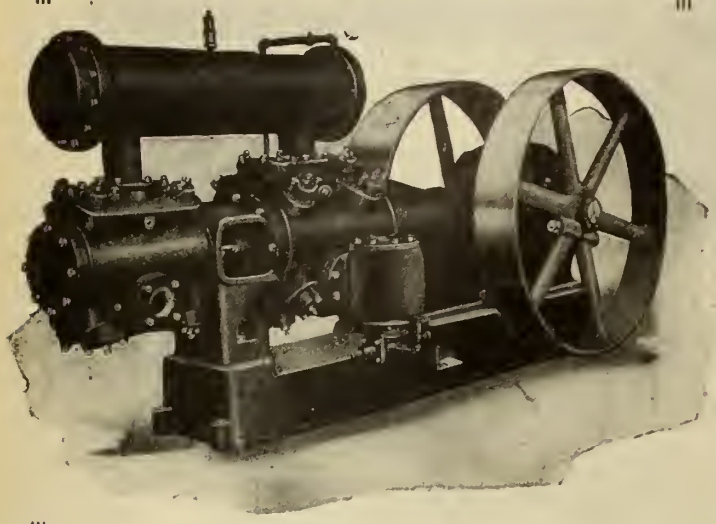
EVEN IF IT'S NOT LISTED HERE WE HAVE IT!

PETRIE

MACHINERY AND SUPPLIES

If interested tear out this page and place with letters to be answered.

Class "EL-2" Compressors



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This BLOUNT Motor-driven Lathe is well adapted to all speed lathe uses. It is of late design, and has a number of features in which you will be interested. Provided with constant-speed motor. Lathe spindle made of hollow, high-carbon steel, ground to size and bored for Morse taper. Runs in self-oiling bronze bearings.

"We will accept Canadian funds at par"

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Uniform Quality of the Utmost Importance

Owing to the difficulty of securing uniform quality in Canadian-made grinding wheels in the past many manufacturers have now a prejudice against all Made-in-Canada wheels. One shipment would be of the finest quality—the next greatly inferior.

We have solved the problem of uniformity by making our own abrasives! Firms which test Dominion Wheels against the best imported quality immediately make repeat orders of Dominion Wheels a regular practice.

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The

NAZEL AIR HAMMER

NOTED FOR ITS BLOW AND CONTROL

A self-contained unit, HAMMER AND COMPRESSOR COMBINED, built in three types, six sizes arranged for BELT OR DIRECT MOTOR DRIVE, with capacities up to 7 inches square, for all manner of jobbing, manufacturing and certain classes of drop forgings.

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Gray Iron and Semi-Steel Castings of all Descriptions

From 5 lbs. up to 4 tons

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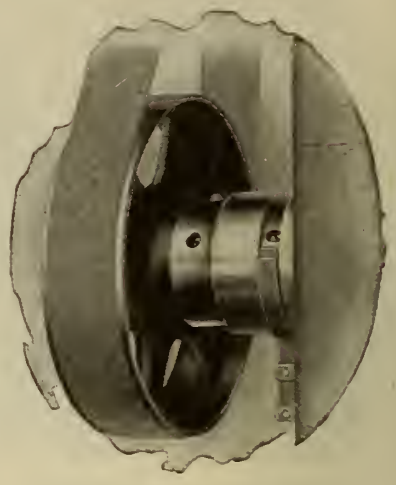
Put Johnson Clutches on Your Machines

The tight and loose pulley is passing from favor. With all its disadvantages, it long survived because a reliable friction clutch was not in evidence.

But in the Johnson Clutch, builders of high grade machinery have found real clutch service. It has been thoroughly tested and adopted on the finest machines made.

Replace your tight and loose pulleys with Johnson Clutches.

Write for our Yellow Catalog, and Booklet, "Clutches As Applied To Machine Building."



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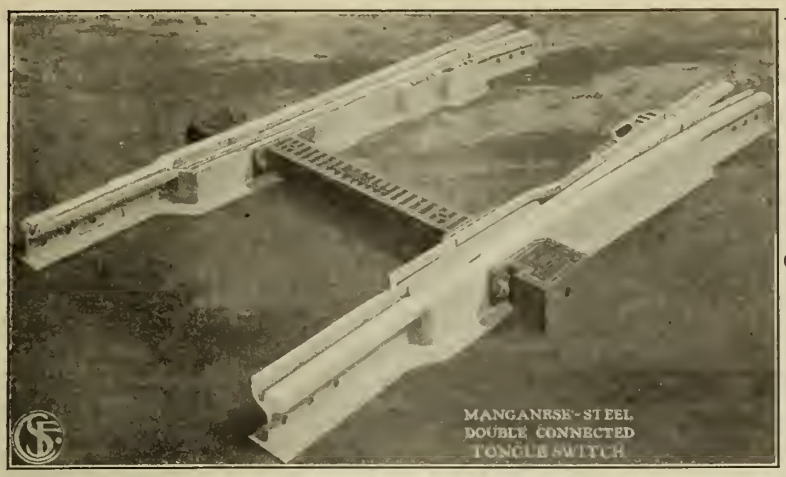

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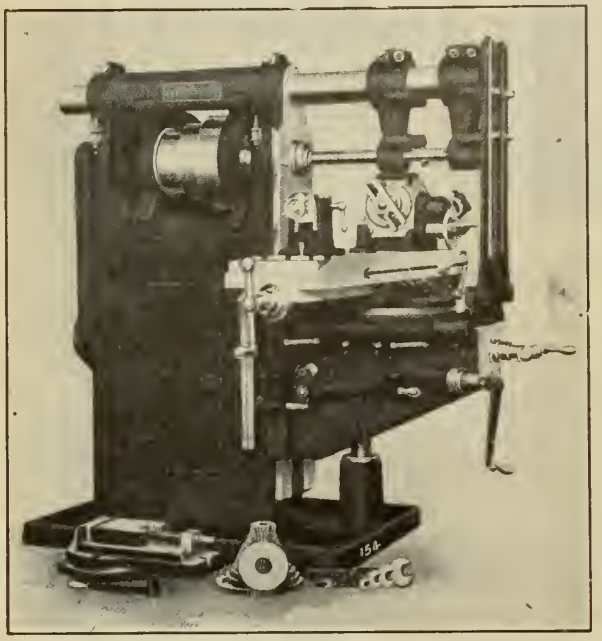

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Ford-Smith Millers are high-grade, Canadian-made machines in every particular; machines designed to give **quality** as well as **quantity** production.

The extensive use of Ford-Smith Millers throughout the country is proof of their popularity.

Our plant is located in the centre of the industrial section and allows us excellent shipping facilities.

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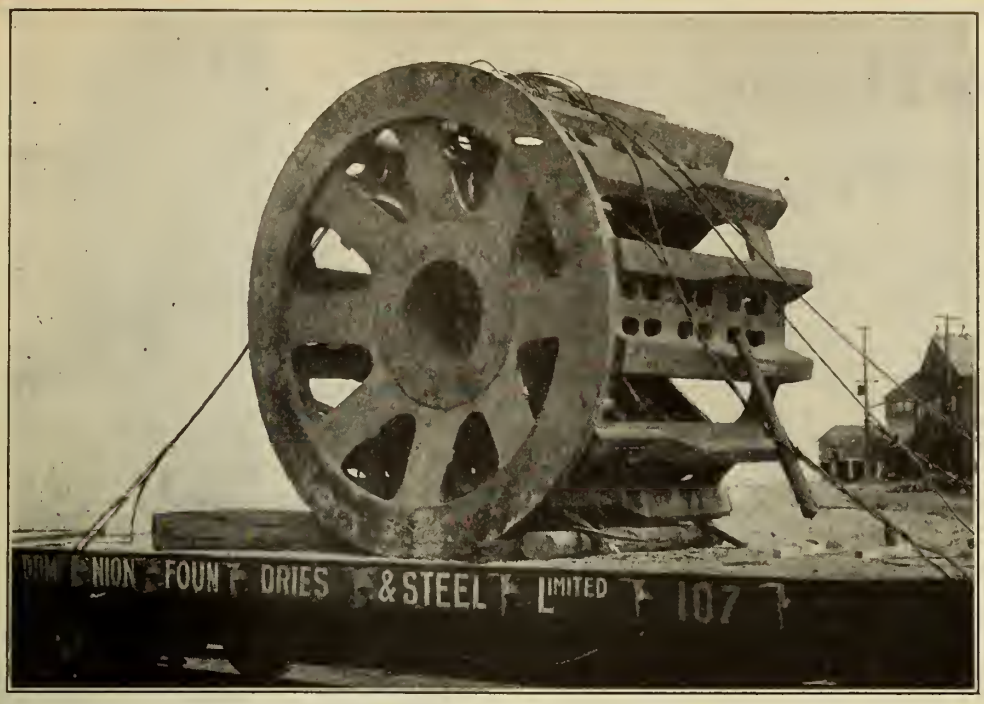

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Complications in the construction of our High Speed Hydro-Pneumatic Press are so few that its operation is more readily understood than that of a more intricate machine.

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Particularly adapted for straightening cam, crank, pinion and wheel shafts, axle tubes, pinion tubes, assembling differential housings, assembling bearings in hubs, bushings in spindles and wheel rims, testing springs front and rear, broaching brake levers.

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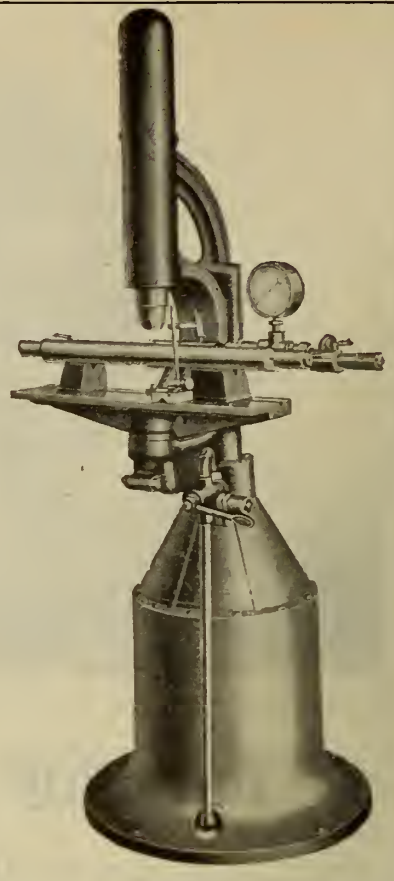

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When a chaser on a Murchey is ground it may be adjusted to compensate for wear. This cannot be done with a solid tap, with the fineness, the finish, the accuracy which characterizes Murchey adjustable taps. A solid tap loses its accuracy with every grinding, and the more grindings the greater the inaccuracy.

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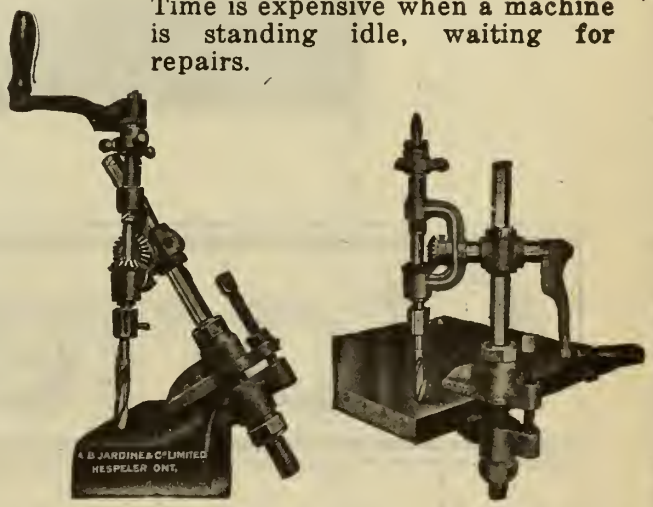
Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.



On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, $26.50 net.

Sold by all Machinery and Supply Houses

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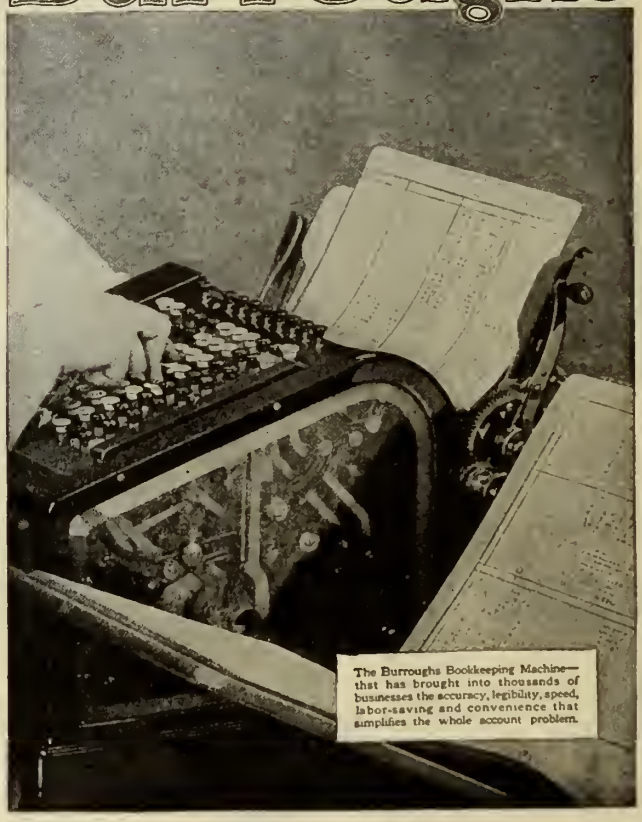

The Burroughs Bookkeeping Machine—that has brought into thousands of businesses the accuracy, legibility, speed, labor-saving and convenience that simplifies the whole account problem.

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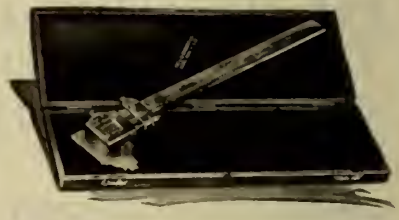
STARRETT HACK SAWS CUT QUICKER LAST LONGER

Since 1880, for all machine work where unvarying accuracy was of paramount importance, skilled workmen have placed unqualified reliance on

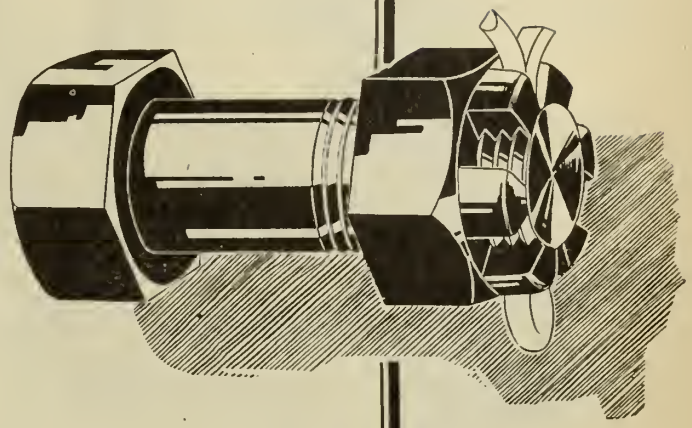
Starrett Tools



Starrett Tools

42-95

Cap & Set SCREWS



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V., S. A. E. & U. S. S. Cap Screws
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Special Screw Products
To Specifications.
Capacities up to 2¼ in. diam.

"Owing to the market shortage of raw material it is to the customers' advantage that they anticipate requirements as far ahead of use as possible."

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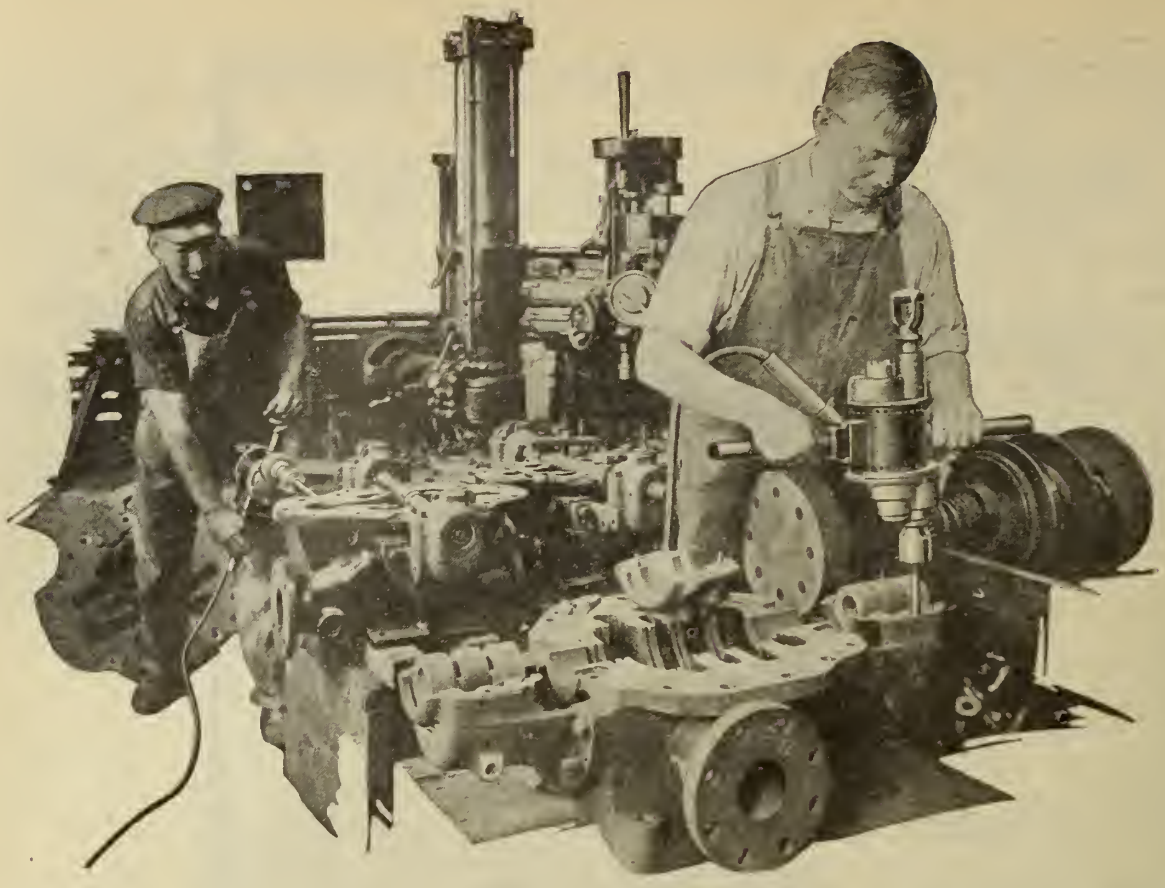

They take the tool to the job!

THERE are three ways to handle the job illustrated—

1—Hire extra labor to carry heavy castings to the expensive stationary machine in the background.

2—Slow up the work and increase man-hour costs by tedious hand drilling.

3—Hustle up the work, reduce tool expense, and lower man-hour costs by taking a Little Giant Portable Electric Drill to the job.

Little Giants don't stop with saving over hand or stationary drilling—they are *built* for and *give* lower-cost-per-year performance to the drill user who demands *cheaper drilling* —*not* cheaper drills.

Little Giants are not *orphans* by any means! They're backed by a nation-wide chain of Service Branches completely stocked with new tools and spare parts, and by the largest builder of portable electric tools in the world.

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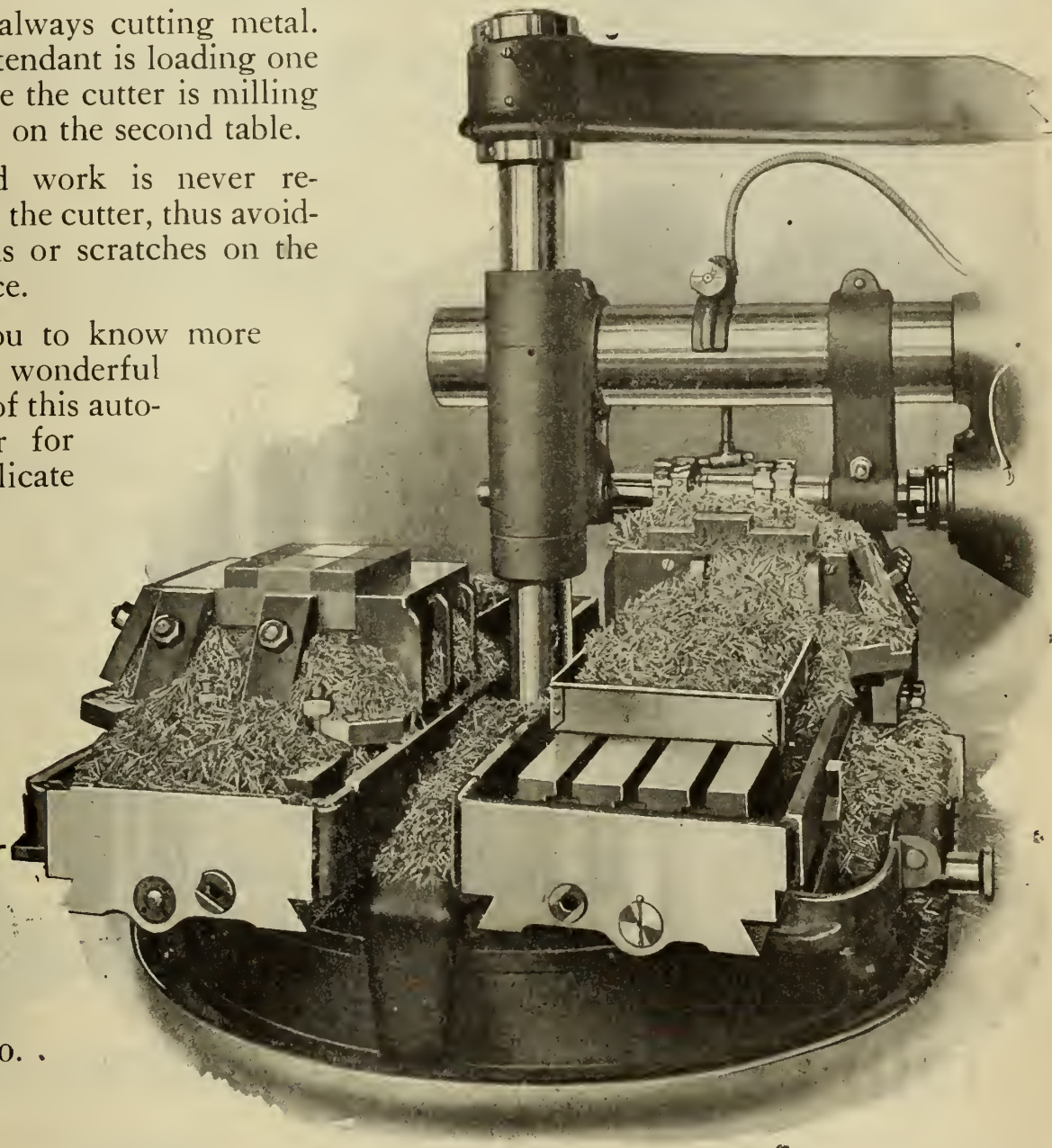
LITTLE *Electric* **GIANT** *Tools*

Automatic Milling is Economical Milling

Machine is always cutting metal. While the attendant is loading one vise or fixture the cutter is milling work carried on the second table.

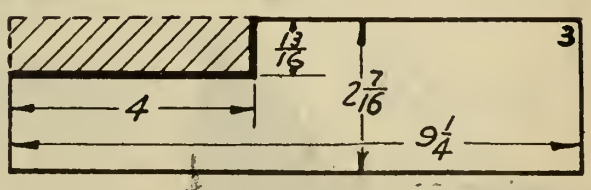
The finished work is never returned under the cutter, thus avoiding all marks or scratches on the milled surface.

We want you to know more about the wonderful possibilities of this automatic miller for your duplicate milling.



Bulletin 40.

4 pieces held in each fixture, making a total length of cut of 7 inches.



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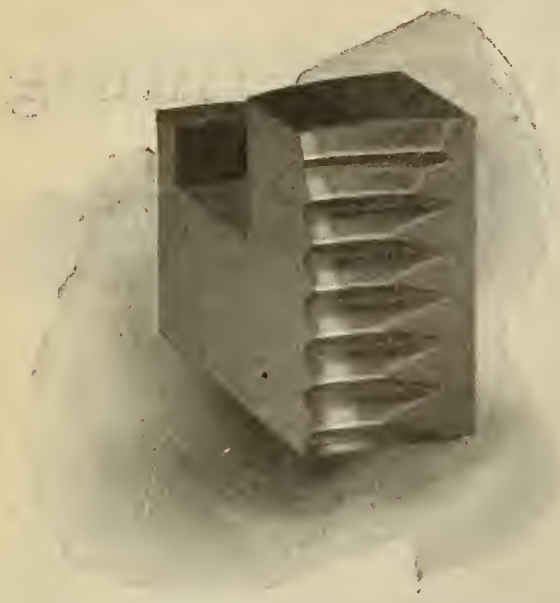

Don't Scrap the other Chasers

If one in a set breaks

Put in a New Chaser

Grinding set to uniformity.

This *Is* Practicable *If* You Use

HARTNESS AUTOMATIC DIES

Jones & Lamson Machine Company

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Universal motor for direct or alternating current, 110-220 volts. (Licensed under Buche Universal Motor Patent.)

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Jacobs Chucks, Regular equipment.

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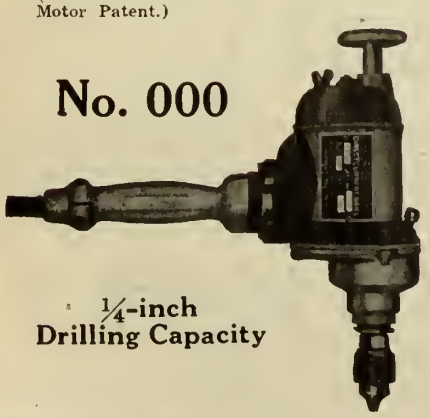

1/4-inch Drilling Capacity

Points of Superiority:

Light weight—The internal gear driver permits the use of smaller gears and gear case—3 teeth in contact instead of one.
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Safety — The Thor switch breaks both sides of the line, leaving no current in the drill when idle. It would be impossible to make a switch insuring greater safety.

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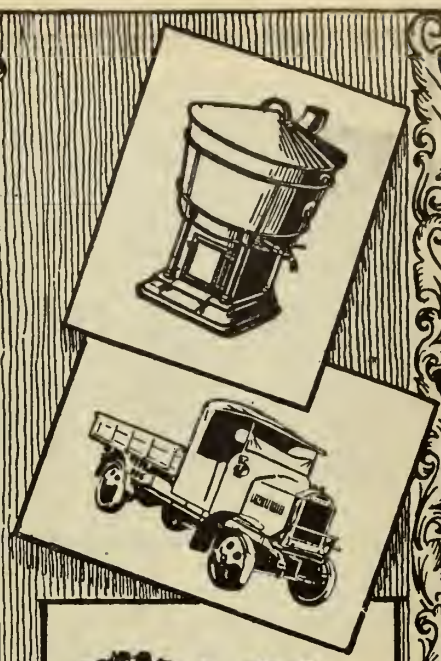

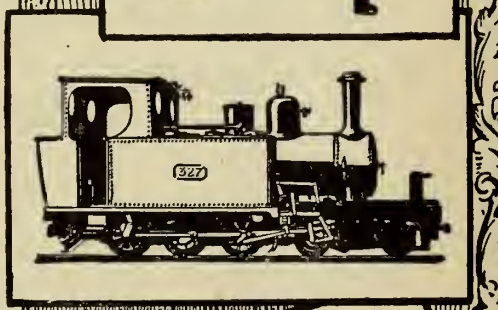
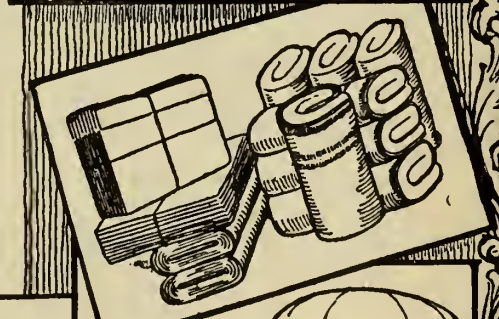

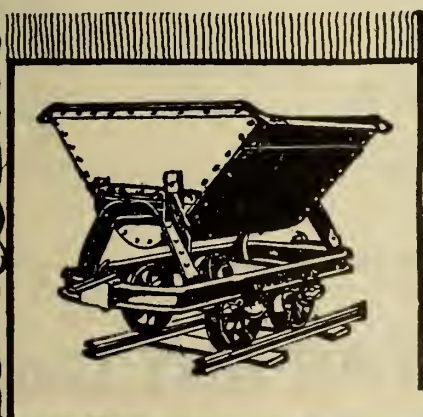
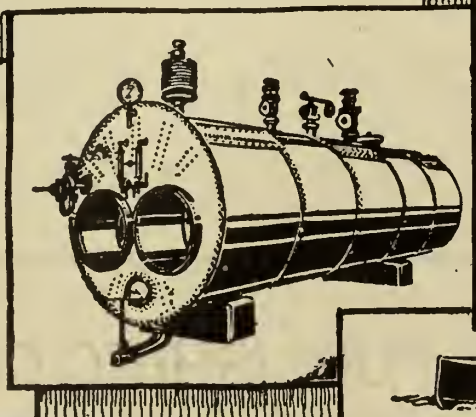
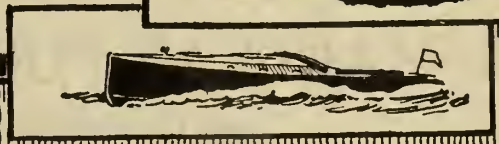

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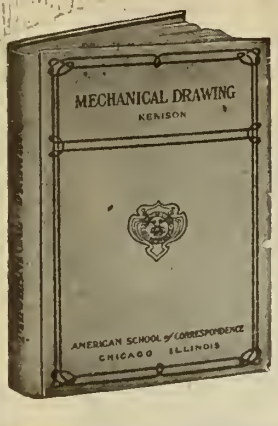

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Title of Book	Name of Author.	Binding	No. of pages	Illustrated	Price
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Electricity Simplified	T. O. Sloane	Cloth	172	Yes	.85
Electrical Motor	E. E. Burns	Cloth	197	Yes	1.25
Starting a Printing Office	R. C. Mallet and W. H. Jackson	Cloth	90	Yes	1.45
Modern Printing Machinery	Wilson & Gray	Cloth	455	Yes	4.50
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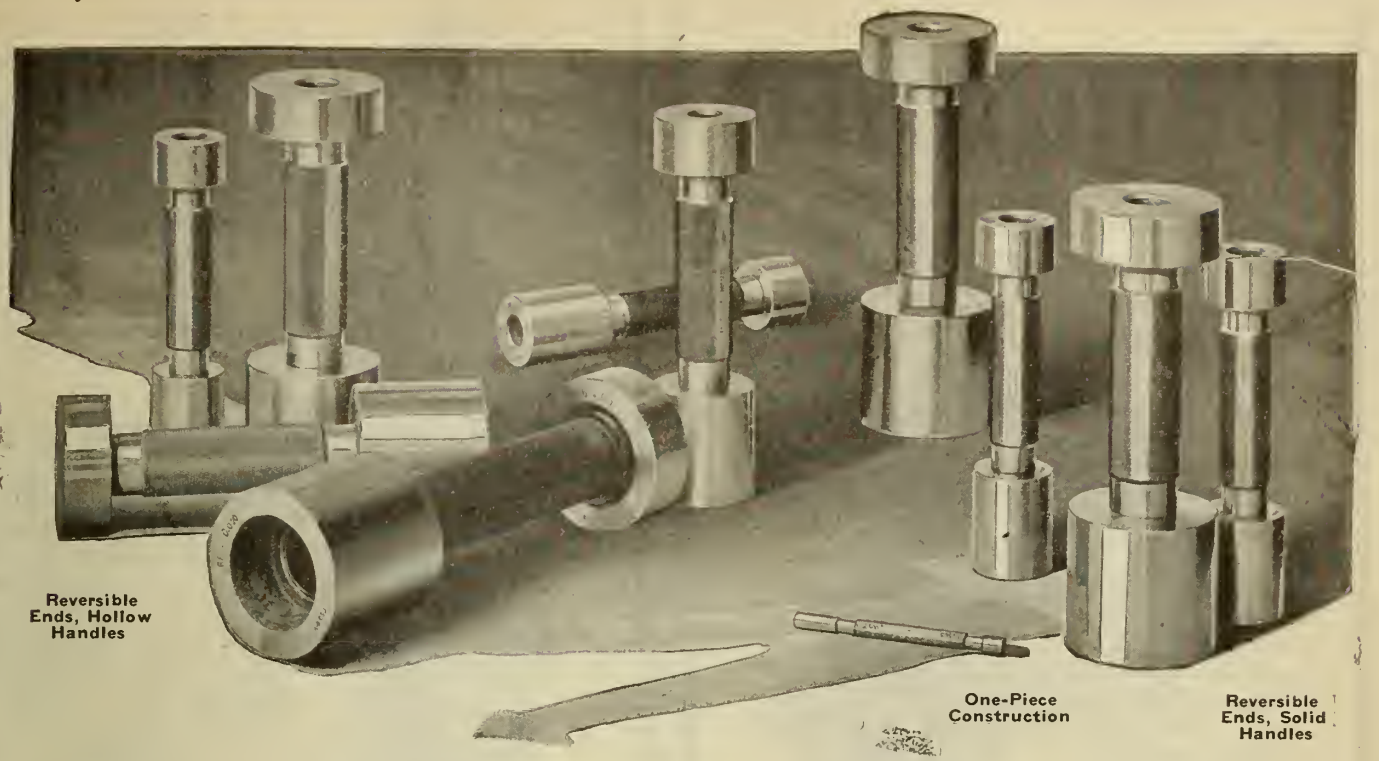

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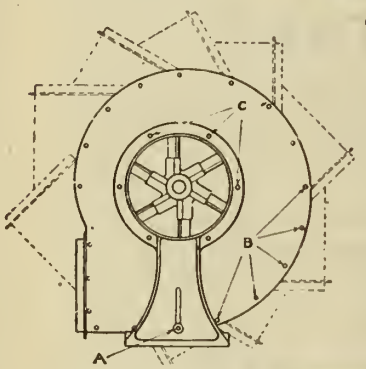

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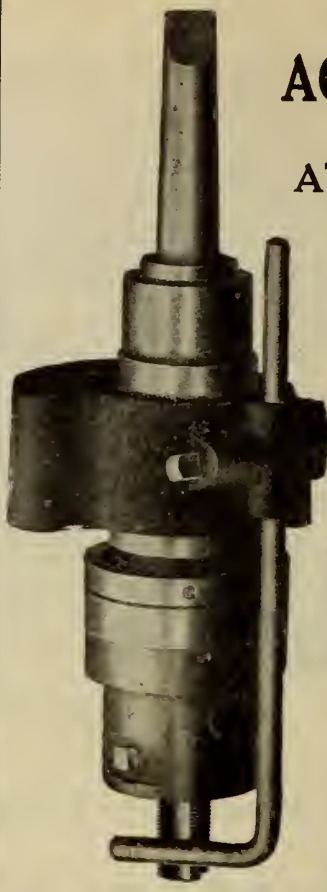

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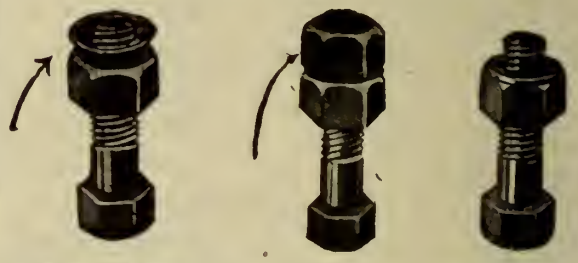

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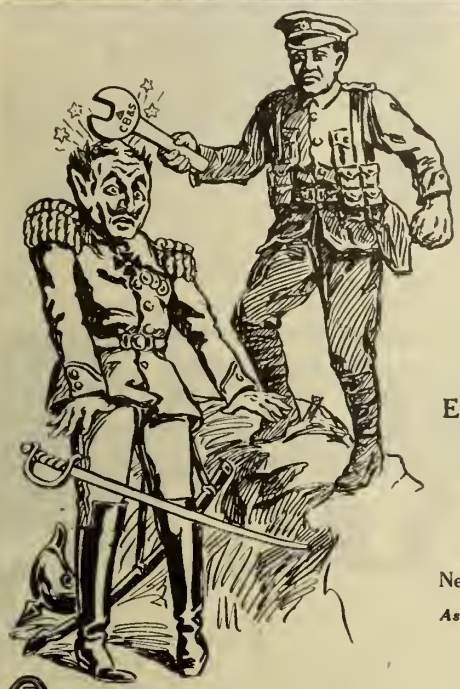

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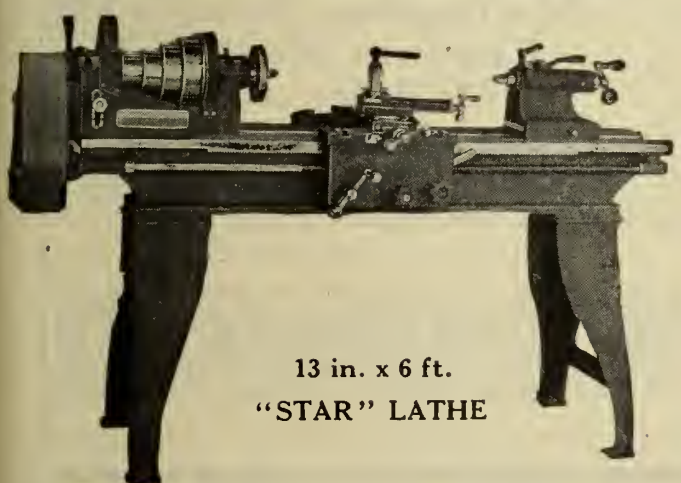

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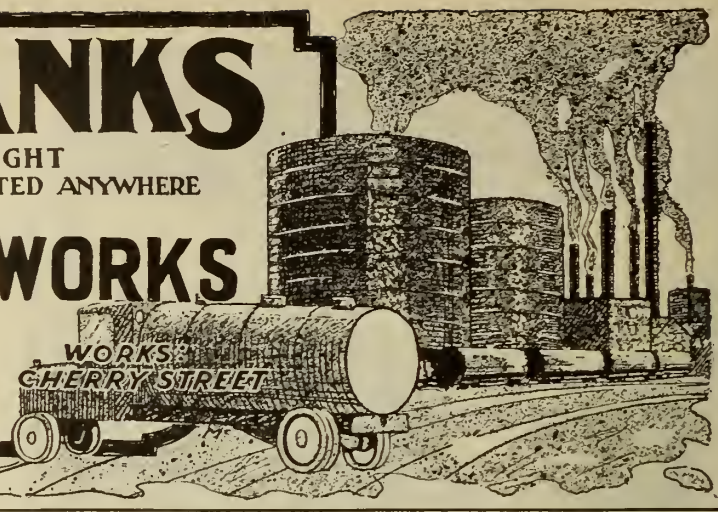

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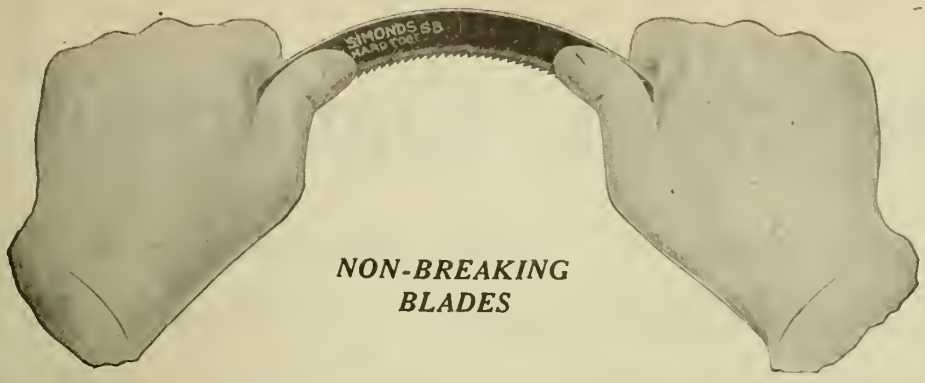

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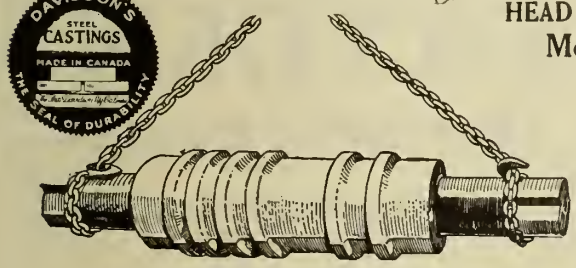

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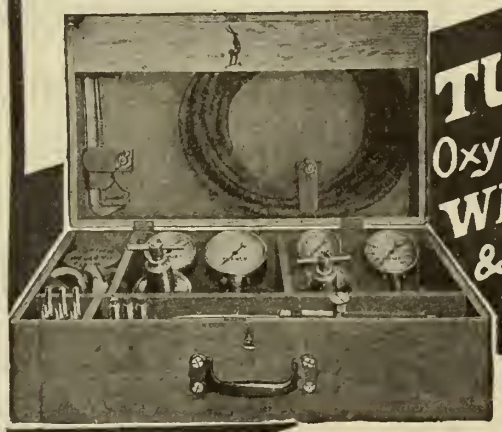

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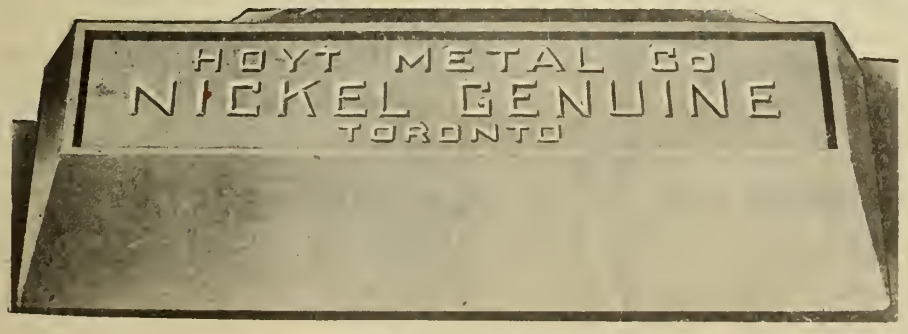

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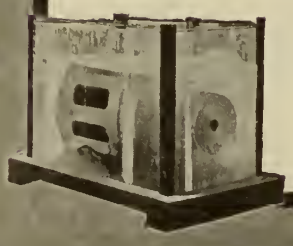

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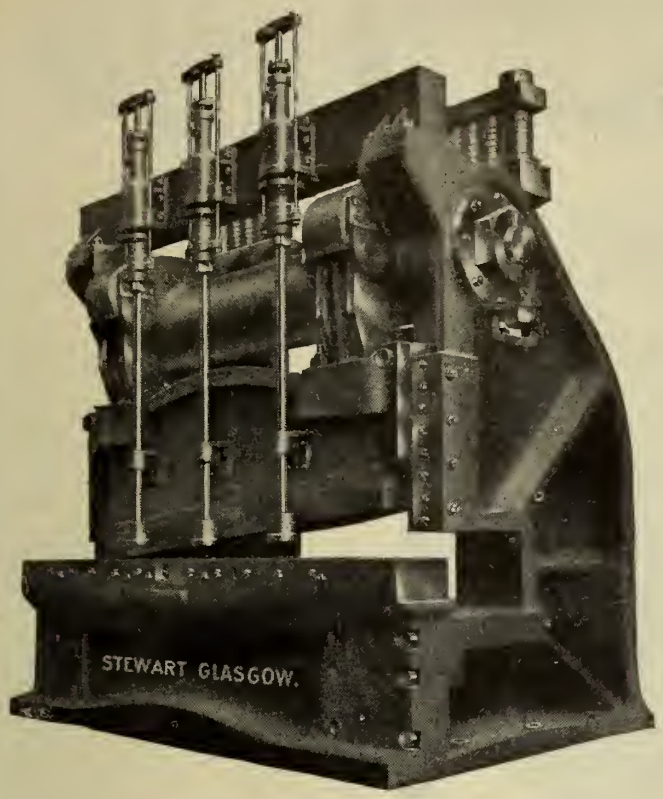

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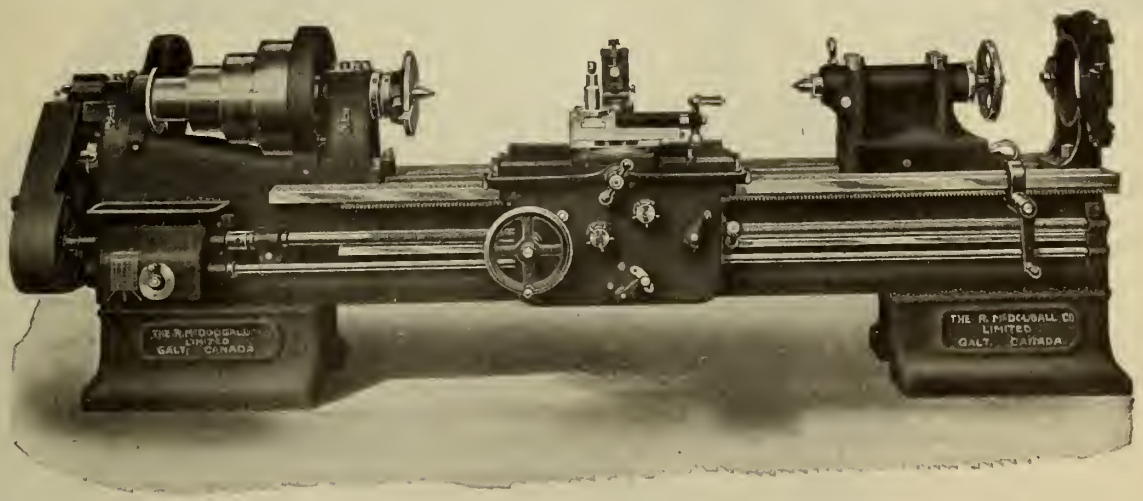

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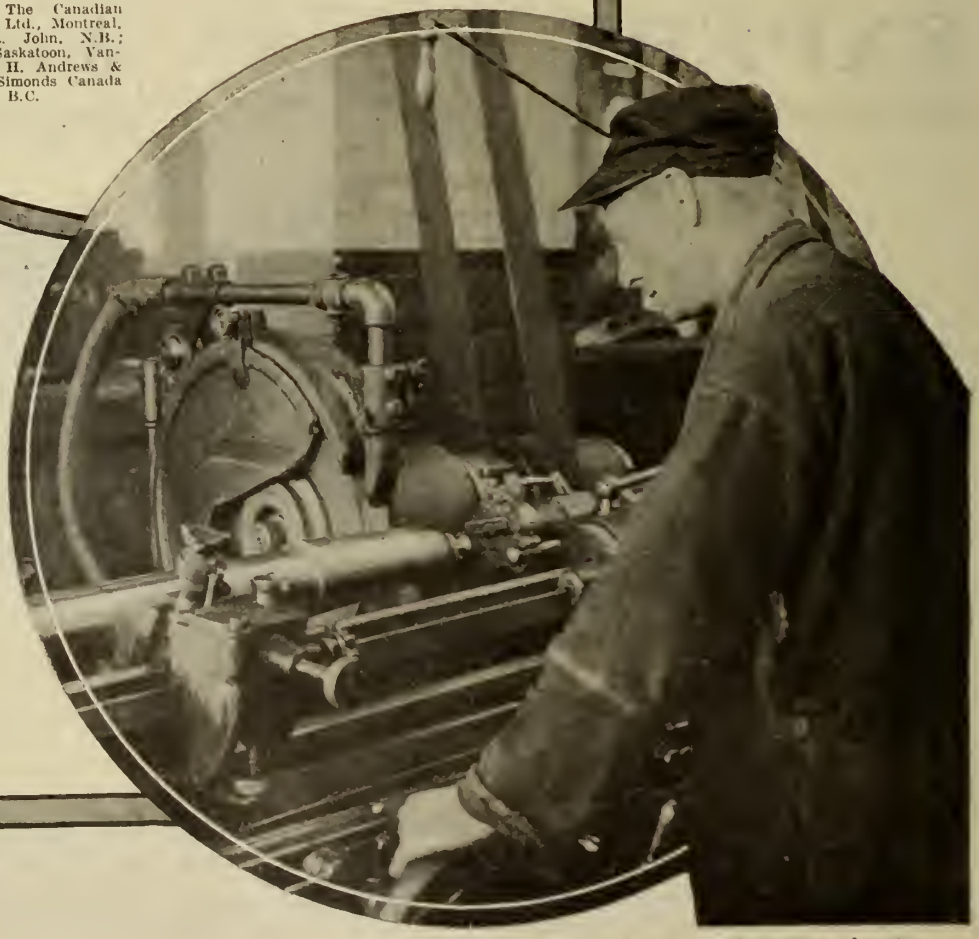

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CANADIAN MACHINERY
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MANUFACTURING NEWS

Vol. XXIV. No. 13 September 23, 1920

Belting as a Means of Power Transmission

In a Previous Article We Dealt with the Chain as a Medium, But in This Present Case We Speak of the Uses of Belting and How to Care for It.

By J. H. MOORE.

READERS will no doubt recall an article dealing with chain drives, which appeared in a previous issue. In the present article we will take up the other extreme, namely that of transmission by means of belting. It is of course understood as before that we are not advocating any particular style of drive, but are merely presenting for readers' benefit the two sides of the case.

When we speak of a belt drive we can infer anything from the 1 in. single-ply belt up to the larger and heavier class of belting as used for extreme heavy service. We might not necessarily refer to leather belting alone, for there are many fabric belts of various natures being used at the present time. Each manufacturer has his own particular claims regarding the merits of his own product, and as we have no intention of entering into a controversy on this subject we suggest to readers, who desire comparison, that they study at all times the advertisements as appearing in this and other technical journals. Manufacturers in general are only too pleased to tell you about their wares in such advertisements, and a study of the same will prove worth while.

The point we wish to emphasize is not so much what each type of belt will accomplish but rather where belts can be used and what care they require.

Take a tour through any manufacturing plant to-day and what do you find? Line after line of shafting on which are pulleys almost innumerable. Over each pulley we notice a belt leading to still another pulley, this latter one being on either a countershaft or on the machine which is being driven. If the former case holds true, we see yet another belt leading from the countershaft to the machine, and so it goes on. Trace the source of power from the motor to the line shaft and we generally find that even the motor has a belt leading from its pulley to the driving pulley on the line shaft.

In other words it is a case of belts, and then more belts. In some instances you will find the machine tools driven by individual motors, but even in such cases a belt is often used to transmit the motion from the line, or motor shaft itself, to the other portions of the machine. To state everywhere that belts can be used is an utter impossibility, for we would be sure to miss something or other, but generally speaking we have the manufacturing plant, the machine shop, the power house, agricultural machinery, and in fact every source of revolving motion can make use of belts of some kind.

The Belt to Use

To find the type of belt best adapted for a particular drive is not always an easy problem as many demands are made on belts, these demands differing under various conditions. In some cases weight of material is the big requirement. For instance, belts used for compressors and hammers require good weight. Then there is the belt used on a grinder. Such a belt should run absolutely true and have no side play.

So it goes on, each problem entirely different. No one type of belt is good for all conditions, so that it is up to the user to watch how his various belts stand the grind. When you find one that gives you real service, stick to that type and do not go around experimenting with some inferior belting which may cost a little less but cause unending trouble. The cost of a belt is only one item in the programme, and a very small item at that. Of course there are cases where you can make a change for the better, but be sure it is for the best. This may sound contradictory after saying do not experiment, but what we imply is this, never purchase a large quantity of untried belting at one time. If you hear of a belting that you believe would be better for your purpose, secure enough for one machine only. Run a trial run on this new belt, making it undergo a real test, studying the result.

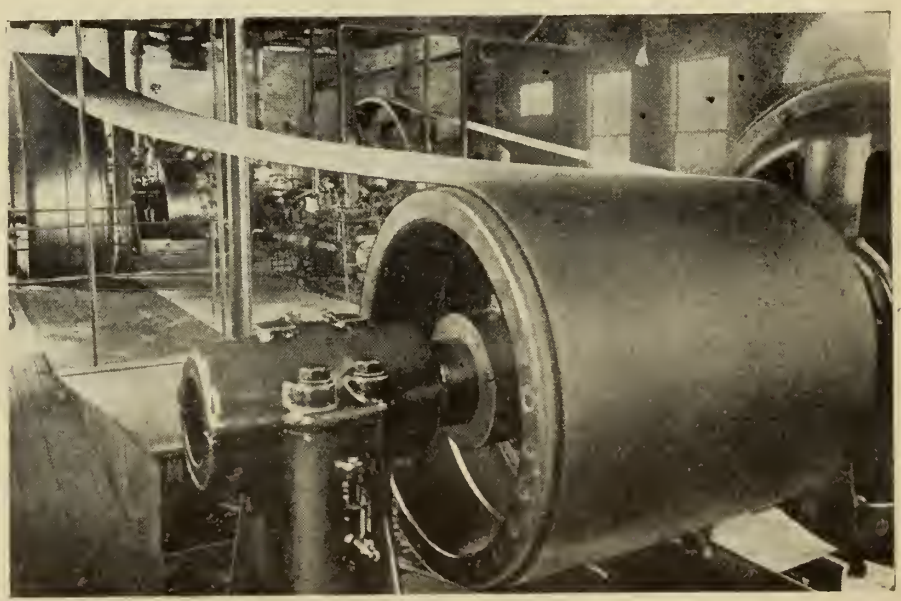


FIG. 1—A 34" BELT ON A GENERATOR DRIVE.

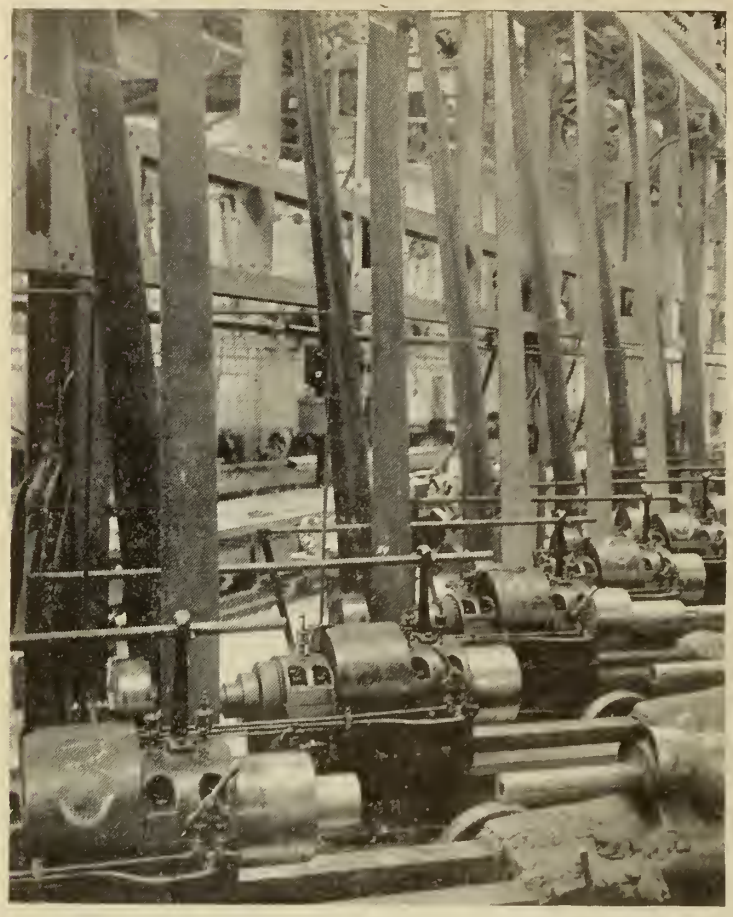


FIG. 3—A NEAT BELTING ARRANGEMENT.

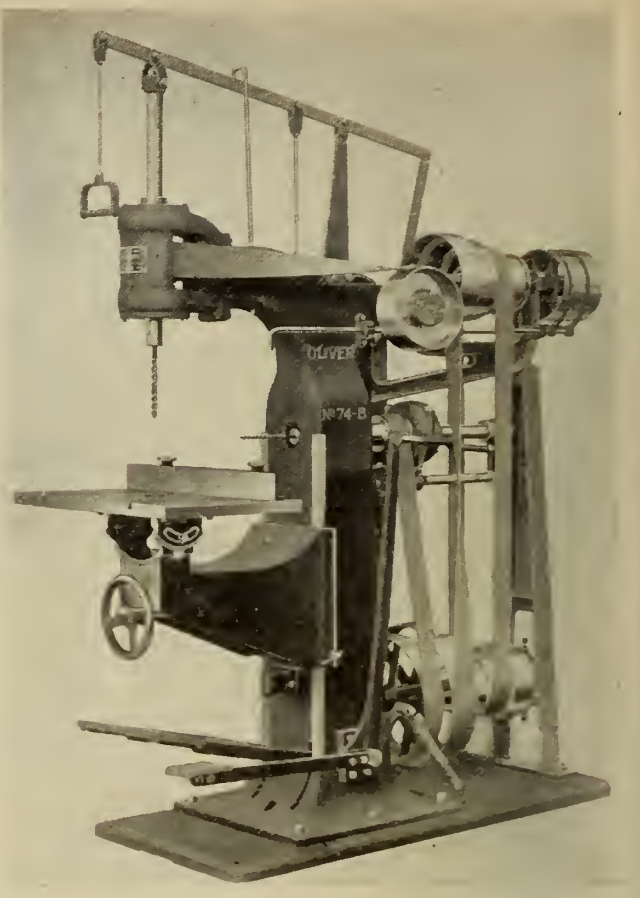


FIG. 4—A GOOD ARRANGEMENT OF BELTING.

You are then able to form a true opinion as to its merits.

Points to Watch

If testing a belt be sure you give it a fair trial. You can ruin a belt's chances in various ways. For instance, don't expect any Tom, Dick, or Harry to place your belts on the machines. Have a man for that purpose who knows enough to make his belt joints properly and so on. Metal fasteners put in crooked, holes too large, in the case of belt lacing, rivets put in any old way, if belt is riveted, etc. These are just a few things that one must not do if a belt is to be given a fair trial. Another point to watch is that of roof clearance.

In many cases the roof of factories consists of beams or joists, these having to be cut away slightly to give the belt clearance. The average worker seems to be afraid to weaken the roof or something, for he cuts barely enough to allow the belt to pass. The result is that if the load on the belt fluctuates at all the belt flops up and down, this action naturally decreasing its life to a considerable extent, especially at the joint. This point of proper clearance is one that should be carefully watched. Crowned pulleys are a great help to the smooth action of a belt, and luckily manufacturers in general are realizing this point more than ever before.

Quantities of Belt Used

To illustrate clearly that this discussion is not one-sided, we will boldly state that very often more belt is used than is absolutely necessary. For example, heavy machinery should, whenever possible, be arranged near the main drive so as to economize both in the length of heavy shafting carried and in the length of belting used. Where machines do not run continuously these should be grouped together, as continual starting and stopping involves considerable wear and tear on any belting. We have viewed many a case where a machine has been planted down with no thought of ideal position, with the result that not only more belt was used than required, but loss of power resulted.

Another cause of wear and tear on belts is that of improperly aligned shafting. Poorly laid out shafting means wobbly pulleys, these in turn adding to the already existing strain on the belt.

Care for Your Belts

And now a word regarding the care of belting. The life of any belt depends upon the good judgment with which the belt is selected for its work and the care which it receives. Take for example a leather belt. It requires very little attention in service, but nevertheless it requires some. It should be kept clean, and if the ends are not lapped the lacing or whatever connection is used should be kept in order, so that the ends of the belt may be held perfectly square with each other.

Whenever possible a belt should be made endless on the pulley. A new endless belt will of course require to be tightened after being used a short time, but this is a small matter, and after this has been done the belt will run for a long time with no other attention except occasional cleaning and dressing. Should there be lacings or hooks which have injured the ends of a belt, new pieces may be cemented on them. If possible never have more than one joint to a belt. A wide belt is often cut in half, longitudinally, and used as two belts for smaller width pulleys. This is practical where one cannot procure the width they desire, but it is good practice to stick to standard widths of belt wherever possible.

Belt Dressing

To increase the pull of a leather belt the use of belt dressing is often resorted to. When judiciously applied this is a good idea, but where careless or thoughless application is made, the result is detrimental and is very destructive to the belt. First, before placing belt dressing on any belt be sure of the belt dressing. Be positive that there is nothing injurious to the leather in the dressing. As we are all aware, the driving power of a belt depends upon its flexibilty and adhesive properties. The object of a dressing therefore must be such as to retain these essential qualities. The adhesive action can be increased by careful application of a guaranteed dressing, but it takes a liquid or semi-liquid preparation to penetrate the

pores of a belt, thus giving it pliability. Never use a dressing to maintain the pull on a belt. As an aid it is ideal, but at the first opportunity take up the unnecessary slack.

Should you use too much dressing the pulleys will get all gummy, large patches of dressing sticking up on the periphery. This forms air pockets, so to speak, between the belt and these patches, thus decreasing instead of increasing the driving power.

Never allow such a condition to exist. If necessary knock off the belt, scrape both the pulley and the belt, and start afresh. In other words, if you must use dressing, use it wisely, not lavishly.

Examples of Belt Drives

Fig. 1 depicts an interesting belt drive at the Morristown Water and Electric Light Co., Morristown, Tenn. This illustrates a 34 in. Heart double belt on a generator drive. Note the smooth action of the belt, and as this cut is from an untouched photograph it still more emphasizes the fact of the belt's smooth motion.

The second example, Fig. 2, illustrates a 34 in. Spartan double belt handling a heavy drive at the Railroad building in St. Paul, Minn. Note the idler pulley used and its method of adjustment. Both these photographs are reproduced through the courtesy of the Canadian Graton and Knight, Ltd., of Montreal, Canada.

It will be noted that two different style belts were used in these cases, which once more proves that the belt used depends entirely upon condition. In some cases a belt is specially tanned to resist exposure, steam, oil, chemical fumes, etc., and it is always a safe plan to state your conditions to a reliable belt manufacturer and secure his opinion as to the style of belt to use.

Fig. 3 is merely shown as an example of neat belting arrangement. Note how the lathes are set at a definite angle and the belt drive arranged according. Personally we prefer a straight drive to the twist drive depicted, but in this case shop conditions were such that the style illustrated was absolutely necessary, the saving in floor space alone being considerable.

The last example, Fig. 4, illustrates a good arrangement of belting. As the photograph is self-explanatory we need not dwell upon the matter.

To depict all the conditions of belt drives would take a volume, but enough has been shown for practical purposes.

In conclusion we would strongly emphasize the need of caution in the choice of any belt drive. Study it, weigh the conditions carefully, see if the load is steady or irregular, and above all, get to know the merits of the various styles of belts, both leather and fabric. It is only by being conversant with such conditions that one can expect belt satisfaction.

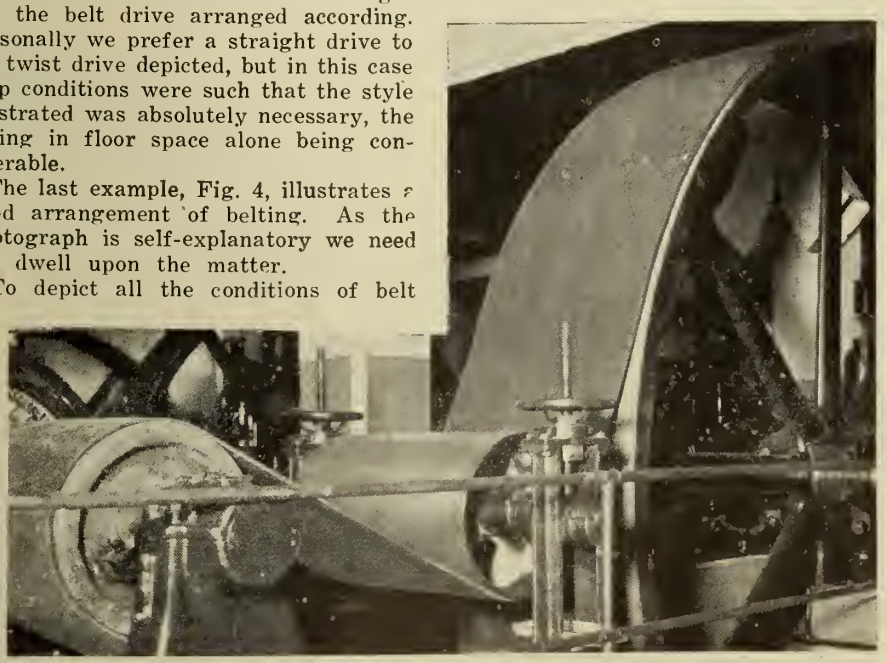


FIG. 2—A 34" DOUBLE BELT HANDLING A HEAVY DRIVE

RECOVERING OIL FROM SHALE

By E. R. Hassrick

The next ten years will see a revolution in the use of raw coal, and oil shales will be used extensively in oil recovery, according to a statement by Dr. George H. Ashley, chief of the Topographic and Geological Survey of the Pennsylvania Department of Internal Affairs.

Believing that the increased consumption of oil and gasoline in this country will necessitate the finding of additional sources of supply, he has commenced a study of the possibilities of recovering oil from shales. The use of shale for distillation purposes, according to Dr. Ashley, is an extremely expensive proposition, and he believes that this method of procuring oil for the making of gasoline will hardly be brought into general use until the price of gasoline reaches 50 cents a gallon. At the present time, he says, there has been no decrease in the supply of oil and gasoline in the country, but rather a continuous increase in production. During the last year, however, the demand has exceeded the supply, and the country's reserve stock has been considerably reduced.

In addition, it has been necessary, on account of the exportation of gasoline from this country, to import it from other quarters. He also points out that, although there has been an increase in oil production in this country, the initial production of oil in new wells has been far below the initial production of wells in years gone by. With increasing costs of machinery and operation and a smaller initial flow from new wells, he believes that the present high price of gasoline can, in a measure, be attributed to these items.

In discussing the possibility of securing oil from coal, Dr. Ashley says: "Today, except for metallurgical purposes, we burn coal in a raw state, wasting, when used for power, from 80 to 95 per cent. of the heat and energy in the coal, and all of the oil, gas, tar and other by-products, except as they are burned in the fire. "It may be safely predicted that the next ten years will see a revolution in our use of raw coal. Already the by-products coke oven is replacing the old bee-hive oven. The coke is made by the distillation of bituminous coal at a high temperature, around 1,200 degrees F., the by-products being used for heating and illuminating, tar and ammonia. If, however, bituminous coal is distilled at a moderately low temperature, below 750 degrees F., the quantity of gas given off is reduced and coke is replaced by a smokeless fuel, called in one process 'coalite,' having the same heating value as an equal weight of coal, and—oil.

Products Obtained

"A plant operating in England with English coal is reported as obtaining from one ton of coal three gallons of motor spirits suitable for every purpose for which gasoline is used, 16 gallons of oil similar to crude petroleum, which can be used for burning, light, lubricating or for distillation; 7,000 feet of gas, richer in heat and higher in candle-power than ordinary coal gas; 20 pounds of sulphite of ammonia for fertilizing and high explosives, and 1,400 pounds of smokeless fuel.

"Contrasting these figures with those showing the production from by-product coke ovens at high temperature in the Pittsburgh district, it should be noted that these ovens give only 1,100 pounds of coke and no oil, but give 300 pounds of tar and only six and one-half pounds of ammonia sulphite, three gallons of benzol and 7,000 feet of gas."

Pennsylvania is at this time mining about 180 million tons of bituminous coal a year. "If one hundred million tons of that were first passed through such a process as that mentioned," continued Dr. Ashley, "it would increase our oil supply by over one billion gallons, and, remembering that smoke is unburned coal, it may be questioned if the 'coalite' left over and the distilled gas would not supply nearly or quite as much heat as the one hundred million tons of coal."

A Danish company proposes to develop some iron ore deposits in the north-western peninsula of Iceland. These are said to contain from twenty to thirty million tons of ore. The material is a brown oxide containing from 40 to 55 per cent. of Fe, and lies at a height of some 1,000 feet above the base of the basalt rocks.

Using Rock Drills in the Industrial Plant

The Modern Machine Shop and Industrial Plant Find Many an Awkward Job Which Can Be Easily Accomplished by Use of Such a Tool as Described Herein.

By F. A. McLEAN.

IN the installation of conduit for electrical wiring, gas, water, steam or air pipes, in the erection and re-erection of motors, generators, machine tools, crane runways, shafting, etc., in the fitting of steel door frames, window sashes, buffers, corner plates, in the modern machine shop or factory, the electrician, the plumber, the steamfitter, the millwright, the master mechanic and the mason, often find it necessary to drill holes of various diameters and depths in stone, brick or concrete walls, ceilings, floors, columns, stanchions or foundations.

The usual method of drilling these holes with a hand steel and a hammer is by no means satisfactory for several reasons. Hand drilling, whether it be in stone, brick or concrete, is a slow and monotonous job of which men soon tire. Then it is almost impossible to strike the steel with a uniform blow and the holes vary widely in diameter, often being larger than actually needed, or are of irregular shape and require a lot of patching up with cement or mortar. This makes an unsightly job, examples of which may be seen by glancing at the chinks or dabs of mortar around pipes or bolts protruding from the walls and foundations of many manufacturing plants.

Where there are a number of holes to be drilled or a portion of the plant is forced to remain idle, pending the drilling of anchor bolt holes, the cutting or trimming of rock for a foundation or the installation of wiring or pipes to accommodate some new piece of equipment or change in the location of a motor, boring mill, lathe, drill press or pump, the cost of drilling the holes by hand is likely to be excessive and in some instances may be greater than the cost of the power drilling equipment necessary to do the work.

ANOTHER USE TO WHICH THIS STYLE OF DRILL CAN BE PUT.

Hand rock drills of the standard Jackhamer type have been successfully used in a number of plants for the heavier forms of this kind of work for several years. A notable example of their value in this respect occurred during the rebuilding of the Thomas A. Edison plant at East Orange, N.J. On this job it was found necessary to drill 9,500 holes in the concrete walls to take expansion bolts used for holding the steel window frames in place. Through the use of the Jackhamer the work was accomplished in about one-fifth of the time that it would have taken by the hand method.

With the exception, however, of such jobs as cutting large hard rocks for engine and machinery foundations, digging holes, boring frozen ground or tearing out old concrete or masonry foundations, most of the rock drilling requirements of the average factory or machine shop can be met by a somewhat smaller and less powerful drill than the regular Jackhamer, which is a little too heavy for light work and is not as easy to handle when drilling overhead as a smaller tool would be.

With this idea in mind, the Canadian Ingersoll-Rand Company has recently brought out a new drill of the Jackhamer type, known as the BAR-33, or Industrial Jackhamer, and also a simple attachment whereby the larger sizes of their "Little David" chipping hammers may be rapidly and easily converted into light hand drills or "plug drillers" as the small drills used for plug and feather work and other light drilling jobs by stone masons and monumental workers are usually called.

This Industrial Jackhamer weighs only 21½ pounds, uses ⅞-inch hollow hexagon steel with bits of up to 1⅝-inch., consumes 34 to 55 cubic feet of air per minute at pressures of 60 to 100 pounds and is adapted to all forms of drilling

THESE THREE VIEWS SHOW VARIED USES FOR THIS TYPE OF DRILL.

where the rock is not excessively hard and the depth of the holes required is not over five feet. Its light weight and small over-all dimensions relieve the operator from unnecessary fatigue and enable him to drill a far larger number of holes in a given time than can be done by the best hand driller and to reach places that he could not get at with a larger and heavier machine.

In general design this new drill resembles the company's standard BCR-430 Jackhamer, the valve mechanism being similar. All ports are short and direct, the inlet being separate and distinct from the exhaust. The rotation is simple, sturdy, automatic and positive. A rifle bar and ratchet are located in the back of the cylinder and impart a rotary motion to the piston which in turn rotates the chuck holding the drill steel, on much the same principle as that made use of in the ordinary automatic screw driver. The handle, front head, through bolts and cylinder of these drills are drop forgings and other parts are made from special alloy steel. The photographs accompanying this article illustrate a few of the ways in which these drills are made use of in industrial plants.

In the small plant where there is only an ocasional need for drilling holes in stone, concrete or brick, and only a few holes are required at any one time, the "Little David" plug drilling attachment will be found useful. When applied to a No. 3 or No. 4 "Little David" chipper, a simple plug driller is formed that will drill ¼-inch to ¾-inch holes to a depth of six or eight inches at a rate of speed that far eclipses hand work, and when the required number of holes have been drilled, the tool is quickly converted into a chipper again ready to do the work usually done by these tools. In addition it may be used for toothing out bricks, enlarging drilled holes, dressing up concrete and stone, etc.

The plug drilling attachment consists of an alloy steel bolt constructed so that a portion of the air from the exhaust of the drill is deflected and carried through a short hose to a special blowing attachment which clears the cuttings from the hole, a rotating wrench and a bit of such size and shape as will be most suitable for the work required, complete the equipment. As shown in one of the accompanying photos, the tool is held in one hand and a semi-rotary motion imparted to the rotating wrench by the

THE EASE OF HANDLING IS SELF APPARENT

free hand, thus ensuring the ultimate roundness of the finished hole.

It is perhaps needless to point out that while the largest sized bits that are recommended for use with the Industrial Jackhamer and the plug driller are respectively 1⅝-inch and ¾-inch, neither tool is limited to the production of holes of these diameters or under, since a number of holes can be drilled very close together and the intervening webs then broken out by a few sharp blows from a hammer, by chiseling or wedging or by holding the tool against them and turning on the air, allowing the vibration of the tool to break them loose. Large holes drilled or cut in this way are generally more regular in shape than those drilled with the hand steel and their size is subject to more accurate control.

In machine shops or manufacturing plants operating foundries, both the Industrial Jackhamer and the chipper used to make the "plug driller" can be adopted to knock out cores and clean the sand from all sorts of castings and will do as much work as two or three men could do by hand. When using the Jackhamer for this purpose it may sometimes be found desirable to remove the rotation pawls so that the "steel" or "bit" does not turn. The Jackhamer will handle steels up to five or six feet in length, permitting the removal of cores from engine and machine tool frames or other heavy castings, while the chipper is better suited to use on smaller and more intricate work, although in large plants where there is a considerable amount of core breaking to be done, better results are sometimes obtained by tools designed especially for this purpose.

DETAILS OF THE DRILL ITSELF.

BRITISH OIL ENGINE PIONEERS

The way in which a name, whether good, bad, or indifferent, sticks to a thing which has once received it is illustrated by the Diesel engine. In many vital respects the modern oil engine as used for propelling ships and for generating electricity is distinct from the type invented by the late Dr. Diesel, but people go on calling them "Diesels" as if the German inventor were the father of them all. There is a good deal in a name when applied to an engine in common use, because a wrong name not only gives a mistake notion of the machine but it does an injustice to the real inventor. This point came up at a recent meeting of the British Institution of Mechanical Engineers, when a paper on the progress of oil engines was read. It was there pointed out that the so-called Diesel engine was really the Ackroyd Stuart engine, as a British inventor of that name had, long before Diesel's day, worked out the principles on which large oil engines could be made to work satisfactorily. British engineers feel that it is the name of Ackroyd Stuart and not that of Diesel which should be immortalized in connection with this great branch of engineering.

GIANT FLOATING CRANE

A floating crane recently supplied from Great Britain to an Australian dockyard is one of the giant cranes of the world. It is capable of lifting a load of 150 tons and swinging it within a radius of 90 feet. In this British design the whole of the deadweight is carried on a large "roller path" fixed to the deck of the pontoon and not on the top of the steel tower which rises from the centre of the pontoon. Dangerous stresses are thus avoided, material is saved, and the life prolonged. The crane has been officially tested up to 200 tons with complete success, all the performances calculated for by the builders having been realized. No moving ballast is used in the pontoon, and at no time is the angle of tilt more than about four degrees. Two cranes of a similar type have been at work in the same dockyard for six years. A noteworthy feature of the crane is that, although designed for heavy loads, it handles light loads with ease and rapidity. All the machinery on board is electrically driven, power being obtained from a steam dynamo or from shore by means of a flexible cable.

Do You Know That Steel Melts from the Inside?

The Author, Who is the Discoverer of the Fact That Steel Melts from the Inside, is Allowed in This Article to Tell His Story in His Own Way.

By G. P. BLACKISTON.

NEW things continue to happen, new inventions continue to be found, and new discoveries are occasionally made despite the oft heard proverb "There is nothing new under the sun." Perhaps in no field more than in the steel field have greater, more far-reaching discoveries of scientific value been made in recent years. Only twenty years ago a man, whose name is found in the records of mechanical achievement, made the momentous discovery that steel containing certain alloys possesses an entirely new and distinct property, called red-hardness. It was about this time that F. W. Taylor stumbled, as it were, while engaged in a work of an entirely different nature, upon this remarkable fact, a fact of so much importance that the new steel, which became known as high-speed steel, was the impetus that was responsible for the revolutionizing of the then common manufacturing processes. For this new steel was able to remove metal, when shaped into cutting tools, at so fast a speed and feed and at a depth of cut so great, that truly the world was astonished when its properties were demonstrated.

And now comes a gentleman named G. P. Blackiston, and announces to the world that steel melts from the inside. Like Taylor's, Blackiston's discovery was an accident. We do not know what its value will be to the steel trade but will tell the story as it comes from the lips of Mr. Blackiston himself, whose desire is to give the information freely and let all who may profit from it.

Mr. Blackiston is a practical steel man, and made this discovery while at work in a crucible steel plant. As is well known in the manufacture of crucible steel, the mixture for melting consists of definite and carefully weighed amounts of certain grades of wrought iron, blister bar, alloys and scrap which are packed in pots. These pots, when filled and covered, are placed in a furnace which contains a number of holes—six pots, three deep and two abreast, being placed in each hole. The holes are then covered and the pots are subjected to a heat of about 3,000 degrees F., for a period of from two to three hours. After the mixture is melted, the pots are allowed to stand in the furnace until all the gas in the solution has boiled out and the molten steel is then ready to be cast.

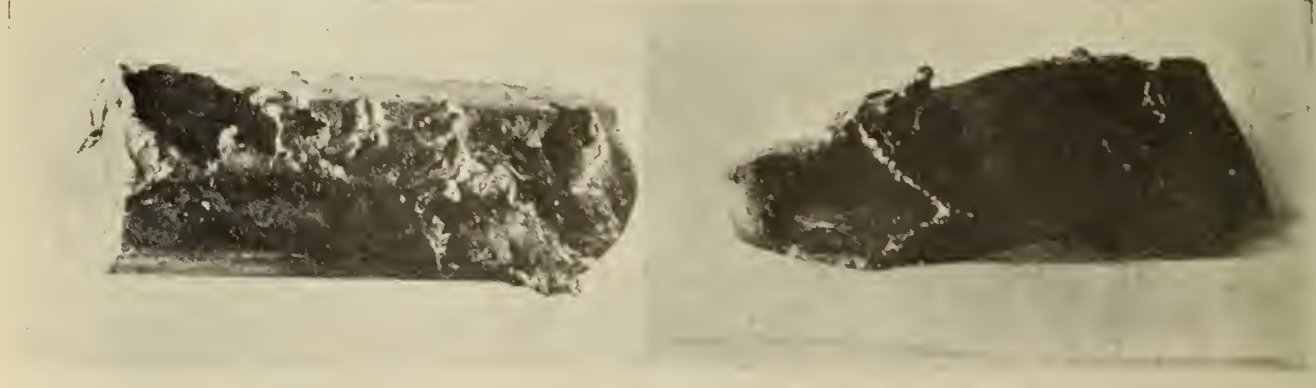
In the mixture used at the time that the discovery was made, numerous pieces of octagon bar steel such as is used for chisels, and rectangular bar steel, as used for lathe and planer tools, were found. After the pots had been packed, placed in the furnace, and the melting was well under way, one of the pots broke and was immediately removed from the furnace and set to one side.

Let us examine briefly what was revealed by an investigation into the mass of metal found in this broken crucible, which had been subjected to the high heat of 3,000 degrees F. for a short time. After the pot had cooled, it was observed that chunks of metal were present which seemed to have the original shape they possessed at the time they were inserted in the pot. By tapping them with a hammer, a hollow sound was noticeable and upon further investigation the pieces were indeed found to be hollow. They were carefully removed and are shown in the accompanying photographs, Figs. 1 and 2. It will be observed that the pieces removed from the pot are two hollow shells that have retained their original contour, except that in the process of melting the molten metal in the inside found a weak spot in the outer shell and passed out through the opening shown.

The reasons for this are not so obvious. As is well known, pure iron has a higher melting point than steel and the more carbon there is in the steel, the lower its melting temperature. The outer layer of these bars of tool steel received the heat first, but this heat was, no doubt, immediately transferred to the inner portion, as the heat continued to be added, it is believed that the carbon was burned out of the outer layer and that it became, in fact, a low-carbon steel approximating iron itself. The inner layer still retained its carbon and would, of course, melt at a lower temperature, which explains why it had entirely melted, while the outer layer was intact. This important discovery was, of course, due to the accidental breaking of the pot containing this certain mixture just at the right time; and the subsequent handling and investigation revealed this interesting phenomenon. We do not state where this discovery may lead to, but perhaps the principle may be applied to the manufacture of articles, now made in an entirely different manner, in a new and cheaper way.

MEASURING MACHINE

A microscopic measuring machine has been placed on the market by Alfred Herbert, Limited, of Coventry, England. The machine is mounted on a rigid box bed, and the table carries a pair of centers, one of which can be adjusted sidewise for accurate alignment of the work. The reading of the instrument is accomplished by the relative position of the two cross hairs that are fitted to the microscope, one of the hairs rotating with the outer tube and the other with the eye piece. The outer tube has a dial graduated in half-degrees and the eye piece has a vernier reading to one minute of arc. Accurate reading is obtained by the angular position of the two cross hairs. The machine is likewise fitted with a light projector.



HERE ARE THE PHOTOS ON WHICH THE AUTHOR BASES HIS CLAIMS.

Have You Been Reading About This Society?

By J. H. MOORE

CONSIDERABLE interest is being shown in the recent formation of the Federated American Engineering Societies in the United States, and for our readers' benefit we will tell briefly what has transpired.

On June 3 an organizing conference was held at Washington, with the result that the new society came into being. About 75 branches of the engineering profession were represented, and this alone tends to show the solidity of the movement. It has been apparent for many years that with the constant increase in number of engineering and allied technical societies, each carrying on its work independently of the others, that some form of comprehensive organization was desirable which could speak for these societies in matters of common concern. There were frequent occasions where united action by these professions was desirable, and as a result of a serious need to meet the conditions arising from the war, the Founder Societies created an engineering council—"to provide for the consideration of matters of common concern to engineers as well as those of public welfare in which the profession is interested in order that united action may be possible." This was affected through the agency of the United Engineering Society, of which Engineering Council was made a department. In February, 1919, the American Society for Testing Materials became the fifth member and the American Railway Engineering Association was admitted as the sixth member in April, 1920.

The Engineering Council held its first meeting in June, 1917. It has a chairman, two vice-chairmen, who with three other members elected by the council constitute an executive committee. Its officers and members of its 24 committees, membership on which is not limited to representatives on the council, total 125 engineers representing all parts of the United States.

The appointment by the four founder societies of committees on development was for the purpose of determining the functions and objects of these societies and of making recommendations as to the changes in their activities that were desirable both as to internal relations and as to their relations to other societies.

Joint Conference Committee

Confreres of the four societies met in August, 1919, and organized as the joint conference committee. The purpose of the latter was to determine in what manner these four societies could co-operate in non-technical or welfare work affecting the relations of the engineer to, and his service in public affairs. The committee presented a report to these societies in September, 1919, and recommended the formation of a comprehensive organization, the purpose of which should be "to further the public welfare wherever technical knowledge and training are involved, and to consider all matters of common concern to these professions."

This plan of procedure was approved by engineering council at its meeting in October, 1919; the joint meeting, held in New York in January, 1920, of the members of the governing boards of the four founder societies and of the American Society for Testing Materials, the members of Engineering Council, and the trustees of the United Engineering Society, unanimously requested the joint conference committee to call, without delay, a conference of representatives of the national, local, state and regional and engineering organizations of this country for the purpose of bringing into existence the comprehensive organization recommended by the joint conference committee.

The Organizing Conference

At the organizing conference held in Washington, June 3 and 4, 1920. in response to the call issued by the joint committee, representatives of about 75 engineering and allied technical organizations created the Federal American Engineering Societies and provided for the administration of its activities by the American Engineering Council and its executive board. The constitution and by-laws adopted were substantially those recommended by the joint conference committee. At its session of June 4, the following resolution was unaimously adopted:

Resolved: That it is the sense of this organizing conference that the joint conference committee should be entrusted with making provision for putting the conclusions of this conference of engineers into effect, and that engineering council be requested to carry on its work until the new organization has been established, and by all proper means to further the programme of the new organization. The conference further recommends to the contributing societies that they continue supplying the funds required by engineering council until its work is taken over by the new organization.

Thus the way has been opened for the American Engineering Council to succeed Engineering Council as soon as the former is ready to take over the work that the latter is now doing, which will probably be on January 1, 1921.

What of Engineering Council?

In view of this fact it will be of interest to review briefly what Engineering Council has accomplished in its three years of existence. Under the terms of the charter granted by the State of New York to the United Engineering Society, Engineering Council has defined the field of its activities as follows:

"Council may deal with any matter of general interest for which joint action of two or more of its member societies would have been appropriate, if council had not been established. Council may initiate and carry through projects of the general character defined in the by-laws, for which the necessary financial provision has been made.

"Council may take up, and in its discretion act upon, any matter of general interest referred to it by any member society or by any other society, national, state or local, or by any branch of government, or by any individual or group of individuals."

In a circular issued in December, 1919, outlining the "Aims and Work of the Council," in discussing what it has done, the following statement is made:

"Council's greatest contribution, possibly, although little known, because indirect and intangible, has been the development through its own discussions and those of the governing bodies of its member societies, of the problems involved in bringing together for united action the fragments of a profession so much broken by specialization as is the profession of engineering."

The working together of committees of representatives of the several member-societies of engineering council has unquestionably had a leavening influence for the betterment of the engineering profession, and the council has certainly accomplished a work of incalculable value in initiating the joint work of these societies.

It was not until seven months after its organization that funds were available for carrying on the work. The secretary states: "For 1918, the appropriation for council averaged 40 cents, and for 1919, 60 cents per individual member of the member-societies." With this limited support we have accomplished a great deal of work.

Field of the Federated Societies

The questions are frequently asked: "What will be the field of activity of the Federated American Enginering Societies?" and "What does the organization intend to do?" The work of this organization will be a kaleidoscopic character, with few fixed lines of activity, its major work depending on conditions as they arise from time to time; it will take over and extend the work of Engineering Council.

What it intends to do is to use its power for the service of the community, state and nation in public affairs wherever engineering experience and tech-

(Continued on page 288.)

A Talk on the Art of Practical Casehardening

The Author of This Article is Well Able to Speak of the Subject, Being a Recognized Authority—He Once More Emphasizes the Importance of the Man as Well as the Method.

By THEODORE G. SELLECK

IN concluding this series of articles on the subject of the casehardening of steel, the writer wishes to emphasize the point he has tried to make clear throughout the article,—no matter what the method of operation employed, *the Man is More than the Method.*

We may give all the instructions for the operation of the process of carburization that are known, practically or theoretically, and with the most complete details of procedure, and yet such instruction cannot be so exact that the human element is not the largest factor in the successful operation of the process.

The most complete specifications for the carbonizing of steel yet published are those of the American Society of Automotive Engineers, and a close study of them reveals just how much is left to the judgment of the casehardener. These specifications have been compiled as the result of the experiences and experiments of many expert engineers and are, undoubtedly, the best guide we have for the casehardening of automotive parts.

As an example of what is meant by the assertion that even these specifications are in nowise complete and that much is left to the judgment of the operator, let us consider one of the specifications,—that for the treatment of ".20 per cent. Carbon Steel,"—which is used in casehardened parts more than any other type of steel. The specification follows:

"1. Carbonize at a temperature between 1600 degs. F. and 1750 degs. F."

"2. Cool slowly or quench."

"3. Reheat to 1,450 degs. F. to 1,500 degs. F. and quench."

The wide range of temperatures for carbonizing, the advantage of the direct quench or slow cooling, the time the parts are to be held at the carbonizing temperature, the nature of the carburizer and every practical detail is left to the judgment of the operator. It cannot be otherwise in the operation of our present system of carburizing.

There are many variables to be considered: Variations in the chemical constitution of the steel; even the specifications demanded by the S. A. E. allow a variation of ten points in the carbon content of the steel just mentioned and thirty points variation in the manganese content. This wide range of temperatures is to provide for those variations and also to meet the varying qualities that may be desired in the "case," the depth of penetration, etc.

The specifications mention that the above treatment is sufficient for a certain class of work, "such as gears, steering-wheel pivot-pins, cam-rollers, push-rods, and many similar details of an automobile." But if we were to step out of the automobile industry and wished to use the process for something foreign to that line, the above instructions would not be particularly helpful unless the casehardener possessed sufficient knowledge and judgment to make a comparison between that line of work and the work he wished to treat. The simple treatment given above is used on a much wider range of work than the S. A. E. suggests it may be used for and, in many cases, with perfect satisfaction, but in more cases with losses and failures that should convince the operators (who fail with it) that they should change methods; but there are some who are so determined that double-treatment of case-hardened parts is not necessary, that they persist in the single-treatment when they have a constant, and sometimes heavy loss.

Double-treatment for the same steel is specified as follows:

"1. Carbonize at a temperature between 1600 degs. F. and 1750 degs. F.

2. Cool slowly in the carbonizing mixture.

3. Reheat to 1550 degs. F. to 1625 degs. F.

4. Quench.

5. Reheat to 1,400 degs. F. to 1,450 degs. F.

6. Quench.

7. Draw in hot oil at a temperature which may vary from 300 degs. F. to 400 degs. F., depending upon the degree of hardness desired."

In these operations, seven in number, we have the most complete and perfect method for the heat-treatment of casehardened parts; however, there are but three of the seven operations that are not left to the judgment of the operator, (2, 4 and 6). In the other four the operator must follow his judgment as to the proper carbonizing temperatures, quenching temperatures, and drawing temperatures; these are naturally the most important factors of the process and upon the proper choosing of them depends the success of the operation. Most operators know that the same piece, or the same quality, of steel carbonized at 1600 degs. F. for eight hours will have quite a different quality of "case" than it will possess if carbonized for the same period of time at a temperature of 1750 degs. F., and it is up to the operator to determine the exact carburizing temperature which will give him the quality and depth of case he desires. If he knows his steel and his carburizer, he may be able to determine these points without making preliminary tests, but in most cases they can be determined only by experiment.

There are other types of steel that require the same treatment as that given above; in fact, there is a sort of standard treatment that may be followed almost universally for steels of the same carbon content, the operator being the judge of the proper heat to apply within the wide range allowed. Steel castings are left out of the list of S. A. E. specifications, but the writer has followed the above single-quench method very satisfactorily on such parts. But if a casehardener is not experienced, he may have a world of trouble trying to follow the same method, because of the variations in the quality of the castings. The double-treatment will hardly ever fail, and the "drawing" may, in most operations, be omitted.

There are times when a case hardener is called upon to carbonize steel of higher and lower carbon content than that given above.

Steel carrying less than 10 per cent. carbon is not used for machined parts to any extent, or seldom for forgings; consequently, it is rarely used as a casehardening steel; there are some uses made of it, however, where it is advantageous to carbonize it. It may be carbonized at much higher temperatures without danger of injury to the "core" than steels of higher carbon content, and for that reason is sometimes used for the manufacture of agricultural steel, for such parts as cultivator-shovels, plow-shares, plow-moldboards, etc. This steel, when carbonized at a temperature between 1650 deg. F. and 1750 deg. F. will stand considerable working at high temperatures, such as forging, welding, and forming, without losing any appreciable amount of its carbon content, and at the end of the shop operations will, by the application of the double-heat treatment, develop a very tough "core" and a very hard surface. Where this steel can be used, single-heat treatment is sufficient, if the carburizing temperature has not been carried above 1650 deg. F. If the quality of the case is not of much importance, quenching direct from the pot will be the only treatment necessary. If a more refined case is desired, it will be better to let the parts cool down in the carburizer and reheat to 1450 deg. F. and quench.

It is sometimes necessary to carbonize steel with carbon content as high as .20 to .30 per cent. Such steel should never be carbonized except as an emergency, and the most painstaking care should be used in the heat-treatment,

*Fro mthe Journal of American Steel Treaters' Society.

which should always be the double-quench and draw method.

Alloy steels require only slightly different treatment than that given the plain carbon steels.

Points to be Watched

Nickel steel, containing 3½ per cent. nickel and .10 to .20 per cent. carbon, will take practically the same treatments as the S. A. E. 1020 except that the second quench should be carried out at somewhat lower temperatures. In the use of this steel the treatment depends upon the character of the parts to be carbonized. This steel is used extensively in the manufacture of gears and these should be very carefully quenched, and drawn, if the highest quality is to be established in the finished gear. The second quenching temperature should be as low as can be used and get the necessary hardness of the case. Where the hardening temperature for plain carbon steel is given as 1,400 deg. F. to 1,450 deg. F. it is given as 1300 deg., so it is wise to do a little experimenting before adopting a temperature for the refinement of the case. Parts of irregular shapes and thickness should be drawn in oil at from 250 deg. to 500 deg. F., according to the degree of hardness required.

Nickel-chromium steels of the usual analyses require the same treatment as the plain nickel steels but must be more carefully watched during the carburizing operations as they are carburized more rapidly than plain nickel.

Chromium-vanadium steels are the best casehardening steels we have so far as the process of carburizing goes, although there are steels better adapted to certain parts.

The carbonizing temperatures for these steels are the same as those recommended for the plain carbon steels. but the quenching temperature for the refinement of the core should equal the carbonizing temperature. That is, if the steel is carbonized at 1650 deg., the first quench should be at that temperature, the metal being reheated after cooling down in the carburizer. For the refinement of the case a temperature between 1475 deg. and 1550 deg. is recommended. For the most particular class of work a "draw" at 250 deg. to 550 deg. is indicated.

These specifications, compiled and issued by an organization of highly technical men, seem unnecessarily indefinite, but as a matter of fact that are as precise and definite as can be laid down for the treatment of a metal that comes so far from being regular and constant in its chemical constitution; and until steel can be manufactured to exact analyses, and present variations of carbon and its other elements are eliminated, we shall have to have flexible rules for its treatment.

In following these, or any other, instructions, for the heat-treatment of steel, the operator should have as an aid a good pyrometer, and be always sure that it is in proper working condition. The inexperienced steel-treater will find considerable difficulty in arriving at conclusions concerning the accuracy of his instrument unless he has some means at hand for checking it. Usually an extra thermo-couple is kept for that purpose and by it the regular service couples are checked at very frequent intervals, sometimes as often as every day. This is by far the best way and the simplest.

With the pyrometer, the steel-treater should equip himself with a "color chart," giving the temperature values of the various heat colors. By making comparisons between these colors and the temperatures indicated by the instrument he soon gains a knowledge of colors that will enable him to readily observe any important error in the reading of his instrument.

A color-blind steel-treater would seem to be about the last anomaly we would look for in the working of steel, but they exist altogether too commonly. Some are not entirely so and yet sufficiently to make the accurate working of steel a mere chance, while others cannot discern the difference between the primary colors, to say nothing of their various tints. This latter class rest entirely upon the pyrometer, of course, and if their instrument goes wrong their work is sure to do so. For that reason, employers of steel-treaters should insist upon an examination for such optical defects before they allow a man to function in the treatment of steel parts that require positive and careful handling at high temperatures.

For inexperienced case-hardeners who do not know the value of the more common colors and tints as expressed in temperature, the following tables are given. These should be supplemented by color charts showing the actual colors. There are several of these that may be obtained from manufacturers of pyrometers and heat-treating equipment, without cost.

Degrees Centi-grade	Fahren-heit	Color
400	752	Red heat, visible in the dark.
474	885	Red heat, visible in the twilight.
525	975	Red heat, visible in the daylight.
581	1077	Red heat, visible in the sunlight.
700	1292	Dark red.
800	1472	Dull cherry-red.
900	1652	Cherry-red.
1000	1832	Bright cherry-red.
1100	2012	Orange-red.
1200	2192	Orange-yellow.
1300	2372	Yellow-white.
1400	2552	White welding heat.
1500	2732	Brilliant white.
1600	2912	Dazzling white.

It is conceded by the best authorities that the most skilled observers may vary as much as 100 degrees Fahr. in their estimation of relatively low temperatures by color, and beyond 2,000 degrees Fahr. it is practically impossible to make estimations with any certainty. So that the use of the color chart is limited, practically, to the use it may be in giving warning of the failure of the pyrometer, and the judging of the uniformity of the temperature throughout the heating chamber of carbonizing furnaces.

In reheating, for hardening case-hardened parts, the liquid bath offers the best means of heating the parts uniformly, because the temperature required may be easily maintained and none of the parts can ever get hotter than the bath.

The materials for such baths most generally used are molten lead, mixtures of barium and potassium chloride, barium chloride, cyanide of potassium, and other metallic salts. These various baths are adapted each to a certain range of temperatures. The lead bath for instance, may be used for temperatures between its fusing point and about 1,200 deg. F., above which it is not practical because of the volatilization of the metal at that temperature; lead is chiefly used for "drawing" operations, and as a quenching medium for "high speed" steel. For temperatures between 1,400 deg. and 1,650 deg. F. a mixture of 60 per cent. barium chloride and 40 per cent. chloride of potassium may be used, or, 50 per cent. calcium chloride and 50 per cent. sodium chloride; these chloride solutions have one very bad property however, and that is the rusting of the material treated in them. This may be overcome by washing the parts in a solution of soda after quenching in clear water. A better heating solution, or bath, is a mixture of soda-ash and the common commercial cyanide-chloride mixture containing about 75 per cent. of sodium-cyanide, in proportions of 60 per cent. of the former and 40 per cent. of the latter. This gives a solution containing about 30 per cent. of cyanide.

In the use of any of these solutions, or baths, the furnaces should always be provided with ventilating hoods for carrying off the fumes and gases from the operator. Even lead yields a very poisonous gas when subjected to a volatilizing temperature.

Preheating Necessary

In the use of these heating baths the work should always be preheated to about 800 degrees before immersing in the solution, otherwise the solution will be so chilled that the operation will be greatly slowed up. Some pot furnaces, specially designed for such work, have special pre-heating chambers attached that permit of doing that part of the work by the use of waste gases from the furnace, so there is no extra expense attached to the preheating.

Parts heated in solutions should be suspended on hooks or in baskets from the top of the pots, and should not be allowed to touch the bottom or sides of the pot.

The pyrometer thermo-couple should be protected by a pure nickel protecting tube and should extend well into the pot without touching the bottom. Care should be observed in the matter of overcrowding the pot as work can be done more rapidly if the volume of solution is much larger in proportion than the volume of metal being heated.

In applying the carburizing process to any class of work it should be always borne in mind that each particular form

of parts to be carburized constitutes an individual problem in the art, and should be so considered, and its particular method of treatment should be worked out, without any reference to the methods applied to any other part. In other words the treatment best adapted to the carburization of cam-shafts is not suitable for wrist-pins, and the treatment best adapted to ball-races will not answer for very light bushings, caps, etc., and any operator of the process who knows of but one method to follow, one carburizing temperature to use, and but one quenching temperature to apply, is in line for a lot of trouble and loss.

With all the information that he can obtain from others, either by word of mouth, demonstration, or through the medium of books, the case-hardener will find himself frequently confronted with problems for which he has no answer. So it becomes the operator of the process to be always studying his art, even to making problems and finding their solution.

The writer is frequently consulted by casehardeners concerning various questions relative to the successful carburization of certain parts with which they have difficulty. Some of the questions asked are so very simple that it would seem that a man of just ordinary intelligence would not need to ask them, while others are so deep that the only answer that can be given is the suggestion that the successful treatment of certain important automobile parts depends entirely upon the development of new methods of carburizing.

The carburizing process is of so much importance in the manufacture of certain lines of the common necessities of life, as we are living it these days, that it cannot be allowed to linger in its present very incomplete stage of development. It must keep pace with the other important branches of steel-treatment.

When we consider that, as it is commonly applied, the operation of the carburizing process involves the use of more than double the fuel that should be required; that the containers used to hold the work, on the average, weigh more than the metal parts they contain, which means added labor, increased furnace capacity, and increased wear and tear; that the important, perhaps we should say the all-important, quality of uniformity, is difficult to realize under present conditions; the necessity of bringing out a new process is apparent.

At present we have no adequate system of heating carburizing boxes. The practice of placing them in the semi-muffle furnace, usually so constructed that the uniform distribution of heat is a problem greater than the average operator can solve, generally results in some of the boxes getting vastly more heat than others, frequently to the utter destruction of some of them while others are not heated above the necessary carburizing temperature. Recently the writer was "on the job" when one of a charge of four boxes in the furnace was partially melted while the other three were not at an excessive temperature, the cause in this case being the improper placing of the oil-burner from which a needle flame shot against the wall of the box. The fault, primarily, was with the manufacturer of the furnace, since the furnace was practically new and such conditions should not have been possible; secondarily the fault was with the operator, because he did not watch his equipment and know whether the furnace was operating properly or not. But the operator being "a greenhorn," and this the first casehardening job he ever had, he could hardly be expected to know that cast iron boxes can be melted in a casehardening furnace. It was a case where the employer believed, as so many of them do, that "any Dub can caseharden steel," and this man fitted the appellation to a nicety.

Metal containers for the carburization of steel, as they are now used must eventually be discarded and new methods of applying heat be developed before the process can come into its own and reach its highest point of usefulness.

We must get away from the thought that experience, intelligence and carefulness are not necessary qualifications in the selection of men to operate the process, however, before any improvements will be of the least advantage to us. We may be able to eliminate the man to some extent, but there will never be a time when the proper operation of the casehardening process, as well as all other branches of steel-treating will not depend upon the direction of an intelligent mind for successful application, and we will always be compelled to admit that "THE MAN IS MORE THAN THE METHOD."

THE FEDERATED SOCIETIES

(Continued from page 285.)

nical knowledge are involved and to consider and act upon matters of common concern to the engineering and allied technical professions. In the conduct of many public matters which are essentially of an engineering nature, it is vital to the public welfare that engineers and allied technologists should lead.

There will be an increasing number of questions arising in which the opinion of these professions will be of fundamental value to the welfare of the nation, and it behooves these professions to so support the Federated American Engineering Societies that it may so function as to supply this great public need. It is only the exceptional individual of these professions who can fail to see that in increased activities in these broader and less selfish fields the standing of the profession will be greatly improved, and this of necessity must improve the position of the individual engineer.

It is the duty of the engineer to take up public service work. It is incumbent upon him as a citizen to "do his bit," and there is the added responsibility due to his special knowledge and experience which is primarily of importance in the execution of public work.

The Federated American Engineering Societies will speak for a group of citizens who, by reason of special training and knowledge represent a high order of intelligence, and who individually and collectively would be derelict in their responsibility for the talents they possess if they did not apply them unselfishly for the common weal. In unity of action there will of necessity be strength and power. We shall look forward with interest to the progress of this new organization.

HIGH SPEED PUNCHING

Thoughts of the boxing ring are aroused by the title: "The Laws of High-Speed Punching," which belongs to a paper prepared by Captain Tresidder for the British War Office. It deals, however, with a more formidable kind of struggle, as it investigates what happens when a projectile pierces armor-plate. More than a military interest attaches to this question as Captain Tresidder has found that the laws which apply to a shell going through armor plate are the same as those concerned in the ordinary engineering process of punching holes. The extraordinary interest of this problem is suggested by the fact that a candle fired like a bullet will go right through a wooden board without changing shape. Another striking fact is that a 12 inch plate must exert 60 million horsepower in order to stop a 15 inch shell at a range of ten miles. This enormous power is exerted only for one five-hundredth of a second, but in that brief space the plate does more work than a 33-horsepower engine can do in an hour. Many results of great scientific and engineering interest have been attained by the author of this paper, who has worked out an entirely new theory of what happens when a projectile drives a hole through solid steel.

AN IMPROVED HAND VISE

It is a well known fact that the simplest things are the last to undergo improvement. People take them so much for granted that they seldom think about bringing out an improvement upon them. A typical case is the ordinary hand vise, which is used in every workshop all over the globe. It is far from being a perfect instrument, because it works on a hinge and the gripping jaws therefore do not keep parallel as the vise is opened. In spite of this drawback it is only recently that a successful effort was made to turn out a better type. A British firm is making a patent vise in which the hinge is replaced by a right and left-handed screw. When this screw is turned by means of a small wheel the lower end of the vice opens to the same extent as the jaws, which thus remain parallel to each other. With this vice it is possible to hold round articles quite firmly.

It is interesting to know that the annual timber consumption in France is not more than 100 board-feet per capita, or less than one-third that used by Americans. Of the timber required, France imports 30 to 40 per cent.

WELDING AND CUTTING

Welding of a Corroded Boiler Shell*

This Tale Describes How a Corroded Lancashire Boiler Was Repaired by Means of a Portable Electric Welding Apparatus.

By A. K. DAWSON.

HAVING recently had the opportunity of witnessing repairs to a corroded colliery Lancashire boiler by the use of a portable electric-arc welding apparatus, it is the author's intention to describe the method of using this plant, and the work done by it.

The boiler in question was one of a group supplying steam at 100 pound per square inch to Curtis turbo-alternators and other engines. It was 30 feet long by 7 feet 6 inches diameter, and hand-fired. External corrosion had so seriously damaged the shell underneath, between the sludge-pipe mounting and the front end-plate, that the shell was holed through at one point alongside the angle-iron ring, the latter also being seriously wasted away. To remedy this evil, much time and expense would have been incurred in cutting out part of the corroded shell round about the blow-off hole away from the front end-plate, with a view to repair by means of a new cover plate. To secure the latter at a moment's notice would have been by no means easy at the present-day rate of supply of such commodities. Furthermore, it was necessary to renew the lower portion of the angle-iron ring, and a new cover patch would have been to cut, shape, dress, and drill out for the rivet holes in it, as well as in the boiler shell; also, a 7 5-16 in. hole to cut for the sludge-pipe connection. After fitting this plate in position by numerous rivets, it would have to be "caulked" or "fullered," and finished off neatly to leave no roughness.

To save time, and yet make a thoroughly reliable repair, it was decided to build up the corroded shell and angle-iron by means of Messrs. Tilling-Stevens' mobile arc-welding equipment, which is embodied in a petrol-electric-driven motor lorry.

A description in outline of the plant and the method of using it is as follows: A 40 h.p. petrol engine drives the generating dynamo, the current from which supplies an electric motor in connection with the back axle to propel the vehicle when travelling on the road. For welding purposes special switchgear and resistances cut off the current from the motor and convey the electric energy by a pair of flexible cables to the electric arc at the work. On the back portion of the lorry is a twin-cylinder vertical air compressor supplying from 30 to 60 cub. ft. of free air per minute, at a pressure of 100 lb. per sq. in., and driven by a twin-cylinder petrol motor. After standing the lorry in the nearest available position to the work (in this instance about 40 yards), the compressor was used to dress off the corroded surfaces of the steel plating by means of a pneumatic chisel, air being conveyed by a small flexible armored hose; this operation ensured the clean condition of the shell surface for welding, which was then commenced.

*Abstract of paper read before the Associates' and Students' Section of the North of England Institute of Mining and Mechanical Engineers.

First Operation

The first operation was to secure a good electrical contact for the negative side of the arc with some part of the boiler, and this was attained by slightly welding the head of a small iron bolt temporarily on to the face of the manhole collar. The cable from the negative terminal of the switchboard was connected to this bolt, whilst the other cable from the positive terminal at the lorry was joined to a simple pair of steel tongs holding the electrode. These latter are made of Swedish charcoal iron, each measuring 12 inches in length, with a diameter of 5-32 inch, and are smeared with a flux before using. One striking property about them is the amount of bending and twisting they will tolerate without breaking. To commence welding, the end of one of these iron pencils is pressed into the tongs, the handle of which is electrically isolated with insulating tape: the operator places a hand-observation screen of red glass before his eyes, and makes contact with the electrode and the boiler shell. On withdrawing the pencil slightly an electric arc is produced of sufficient heat intensity to fuse the electrode end, the molten particles of which are carried over on to the negative side of the arc —i.e., the boiler shell, which is also rendered intensely hot at the point of contact. Great care is necessary to maintain the air gap between the electrode and the metal to be welded, the most suitable gap evidently being about ⅛ inch or 3-16 inch. If the pencil is allowed to touch the shell for even a second or two a complete circuit is thereby made, and as soon as the air gap ceases to exist, the arc, of course, fails, and the metals cool, with the result that the electrode becomes fixed to the boiler plate. It has then to be broken off and a fresh arc struck. Under such circumstances a heavy rush of current is caused by the absence of the air gap, consequently a steadying resistance and an electrical governor are installed in the circuit on the lorry to reduce as far as possible the current flutuations.

In doing the welding of this boiler, the switchboard at the lorry gave the following information: When no welding was being done, 50 volts, 100 amperes; when the continuous arc was being maintained during welding, 40 volts, 150/200 amperes; when the electrode was permitted to touch the boiler shell, making a closed circuit, 40 volts, 300 amperes.

When welding was done in the underneath side of the boiler shell, the electrode in fusing had the tendency to form molten globules, which were liable to fall off on to the bottom of the flue if the arc were allowed to play at the same point for any length of time. When this occurred the electrode was brought away from the shell, thus destroying the arc, and the soft globules of iron gently flattened against the plating with a hammer. Under average conditions it was possible to use 20 of these Swedish iron electrodes per hour, and for the building up of the boiler-plate in question it took, roughly, 300 of such pencils.

Time Involved

To give some idea of the time taken to complete the work, the welding apparatus arrived at the colliery about noon on one day; the cables, etc., were run out to the boiler, and the corroded steel plating was dressed with the pneumatic chisel in the afternoon, and half the welding done by 7 o'clock that night. By the following afternoon the welding was completed, and the work smoothed off with the compressed-air hammer, whilst the front lower edges of both furnace tubes were also built up where slightly damaged through frequent stoking and raking out of fires. One fitter with his assistant and a boy were with the equip-

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My Experience as a Would-be Foundry Foreman

By F. H. BELL

ANYONE who has never had experience as a foundry foreman cannot possibly have any conception of what he has missed. In fact he has missed so much that he is in no position to appreciate how really thankful he should be.

However it must be admitted that the young man who has no further ambition than to remain dormant on a journeyman's job is terribly deficient in self-esteem. My own experiences along these lines have been so extremely interesting to me that I have been forced to laugh about them myself on frequent occasions, and for that reason have thought that perhaps while not posing as humorous or funny, but on the contrary being of a very prosaic, staid disposition, I might, nevertheless, at least amuse others by relating them.

To begin with I served my apprenticeship in a little jobbing foundry which was owned and operated by my father, who I might say was a molder with no mean qualifications. From this it may be inferred that I was a privileged character, which in reality I was—coming and going as I pleased.

I made various trips to other shops throughout Canada and the United States, but always fetching up at home when there was nowhere else to go. The experience gained through these spasmodic jaunts added to the experience which I received at home doing such jobs as attending to the cupola and making cores and so on down the line, imbued me with a store of conceit which led me to believe that there was not much about a foundry with which I was not familiar.

However there came a day when my preordained programme destined that I should say goodbye to my old home town and seek a livelihood elsewhere, knowing this time that I had to make good, as I no longer had a haven to fall back on. Then came the crucial test. With all my good opinion of myself, was I capable of holding a real job? I began to fear that I was not. I had different positions offered me—some in the States and some in Canada, but being a good Canadian I decided to remain among my own, and forthwith selected as my future abode the thriving industrial city of Brantford. Brantford, at that time, boasted of a population of about eighteen thousand, and according to the usual method of accounting—six to a family—there should have been about three thousand families. But, alas! It was not so. There were about two thousand families of six and about six thousand extra or spare fellows. These poor fellows used to spend their evenings standing around in bunches on the street corners, looking at each other until about ten o'clock, when they would turn in for the night, and by half past ten a cannon might be fired down most any street without doing bodily harm to anyone, because there would be no one on the street to harm.

Next to Moscow, Brantford had probably more churches in proportion to its population than any other city in the world, and the inhabitants were of the class that when the vote was taken on local option and a majority of three-fifths was necessary to make it become law, it was carried, all but eleven measly little votes, so it will be seen that the population of Brantford was made up of an exceptionally righteous class of citizens.

As every one acquainted with Brantford knows, it is a city of foundries and practically every boy works at the foundry business. Now here was a city with a superabundance of the highest type of manhood which would have made excellent catches for the fair sex, had there been any of the fair sex to catch them.

Up the shore of the noble Grand River about seven miles was another thriving little borough, by the name of Paris. Here everything was entirely the reverse. The main industry of the town was a knitting mill, which in fact was the largest institution of its kind in Canada. I am not prepared to give exact figures as to how many hands were employed at this establishment, but if they had eight hundred, one hundred would be old and experienced men who had been in the business long enough to be holding such positions as foremen and experts of one kind or another, and would in all probability be heads of families. The other seven hundred would be girls. These girls all had to be of unblemished character, as one bad one would be like a bad peach in a basket—likely to contaminate the whole basket of peaches. Just think of it, hundreds of A1 girls and hundreds of fellows such as we have just pictured and seven miles of country road dividing them. It could not be expected that such a state of affairs could long endure. A bicycle works was started in Brantford which relieved the situation to some extent, by providing the means of lessening the seven mile difficulty and in course of time a trolley line was put into operation which improved matters to a much greater extent. Still all of this was only make-shift and as something real had to be done it was decided that a foundry would have to be started in Paris. Accordingly the proprietor of the mills hit upon the idea of instituting a stock company, consisting of his funds and a few names for fillers and launching into an enterprise known as the Paris Plow Company. A thoroughly modern plow shop was built and a plow maker of renown was imported along with a supply of operatives, and everything was in readiness to be put into full swing with one exception—they required a competent and efficient man to take charge of the foundry and with rare judgment they decided upon me.

I reported promptly at the office and had a lengthy interview with the manager, the result being that I was engaged at the handsome salary of three dollars per day with absolute authority over my department and no interference from anyone. I was shown through the foundry and learned that they had all the floors rammed up, but were afraid to take off a heat and they wanted me to come on at once.

Bright and early next morning I was on the job to put the cupola into commission and get the work poured off. The manager was there also, not in the office, but in the foundry. Of course he was not interfering with me or my work; he was just showing me how to proceed. Before putting up the bottom doors of the cupola he decided that we should try out the fan to see if it was properly speeded. It was set up in accordance with instructions from the makers, but he would take no chances. He had a pressure gauge on the wind pipe and he would have a certain stipulated pressure on that gauge or we would not attempt to run the cupola. By running the fan at the speed mentioned in the catalogue he did not seem to get any pressure on the gauge and he concluded that it was a lucky thing for him that he did not listen to my advice and make a try at it. In order to get off the heat it was decided that some of the machinery in the machine shop would have to be shut off so that we could borrow the pulleys until such time as we could have proper ones brought in. We were not able to make the alterations in time to pour off on that day, but we had a good early start for next day and I had the honor of lighting the fire for the first heat. Of course in the meantime we had put up the bottom doors and put on the coke and iron which made all the difference in the world with the pressure gauge when the blast was put on. Common sense should have dictated to the manager that it would, but common sense appeared to be the one thing which he lacked. However, we got the heat off all right. We had plenty of pressure on the gauge; in fact the gauge registered right up to the top and no telling how much further

Continued on page 62

DEVELOPMENTS IN SHOP EQUIPMENT

LUBRICATION SYSTEM

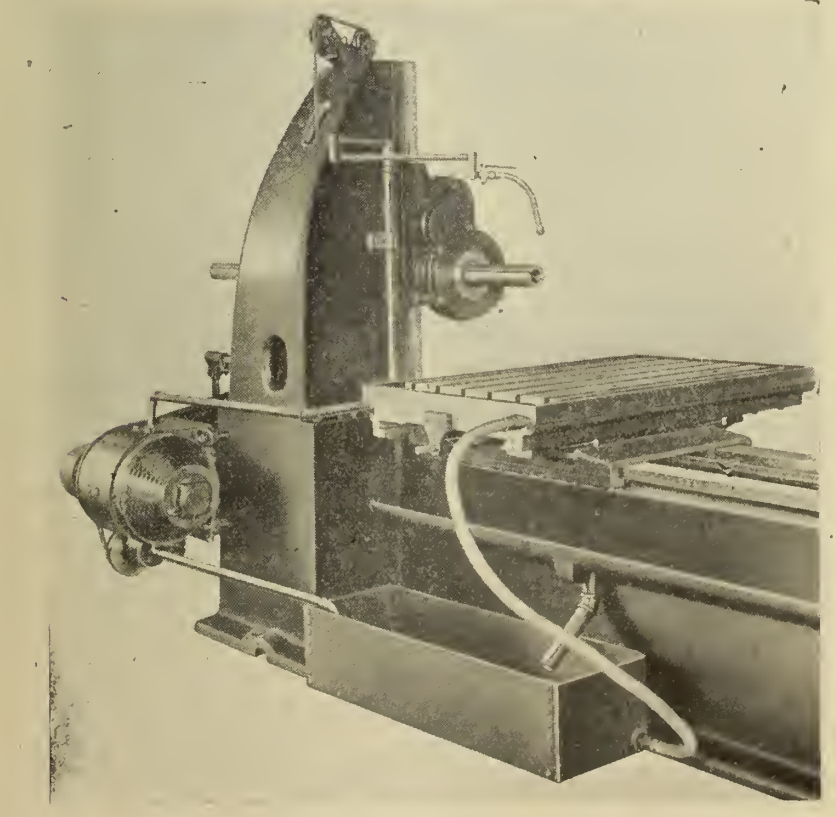
Modern experiments in cutting metal under a lubricant and coolant have led the Universal Boring Machine Co., Hudson, Mass., to provide their machines with equipment to pump and handle sufficient coolant.

As is well known the purpose of any coolant is to assist in arrying away heat from the place where the work is being done, thus keeping down the temperature of the cutting edge of the tool.

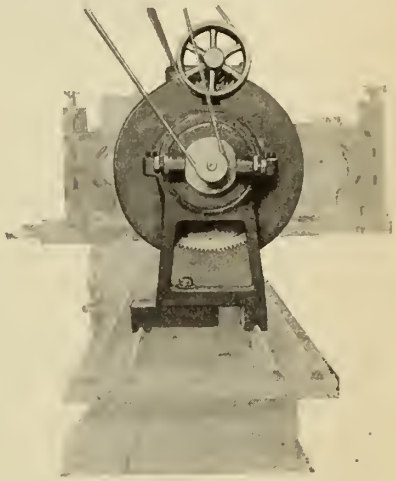
On the assumption that it is far better to use too much than too little coolant, they have equipped their machine to deliver twelve gallons a minute to the tool, if necessary. The pump used is claimed to never lose its prime. The system is said to be clog-proof, because anything that can get in can proceed through without injury to the pump, because there is no passage in the entire system smaller than the intake, which is ¾in. The impellor pumps by centrifugal force, and any chips that can enter pass right through the system, thus avoiding the necessity of strainers.

The bed of machine has oil troughs on the front and back. These slope towards the centre. The front trough is on a higher level than the rear. The lubricant is carried by a 1¾ in. pipe from the centre of the front trough, through the bed to the centre of the rear trough and from there into the tank. The troughs project 4¾ in. and are 4 in. deep.

Between the ways on the top of the bed, the surface slopes toward the centre into a rectangular trough 16 in. long. From there the lubricant is carried into the tank. The table has oil pockets on each end and grooves in the T-slots, and delivers the lubricant toward the rear. From there it is carried by a flexible tube of ample diameter into the tank in the rear. The pump is attached to the motor bracket and is driven by belt from the motor shaft. It has a capacity of twelve gallons per minute. The lubricant is carried from the pump to the tool by piping and elbows with a flexible tube nozzle to facilitate the flow in any direction. The photograph shows clearly the arrangement. We understand that the concern will equip their machines with this lubrication system on special order.



SHOWING METHOD OF ATTACHING LUBRICANT SYSTEM.



END VIEW OF THE FIXTURE.

BORING AND GRINDING MACHINE

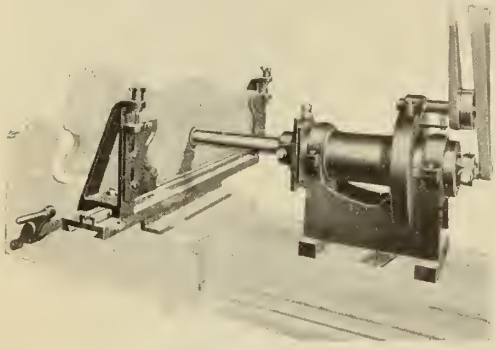
The Sunderland Machine Shops, Omaha, have placed on the market what is known as the Fox cylinder and boring machine. The two views shown give a good idea of this machine's general appearance. It will fit in any lathe, 14 in. to 24 in. swing, and can be used on either open head or closed cylinder blocks.

In use, the cylinder is mounted in the fixture as shown in illustration, and is so adjusted by the fixture screws and the cross-slide screw that the centre of the bore is in line with the centre of the boring head.

The boring head is equipped with an outer spindle to which the boring tool can be attached. This spindle revolves at a slow rate of speed and is driven through a large heavy-duty enclosed gear bolted to its outer surface. An overhead belt transmits power to the pinion shaft, which is equipped with tight and loose pulleys. The inner or grinding spindle rotates inside the outer boring spindle and is supported by three sets of S K F double-row self-aligning ball bearings which give it the required bearing support, thus assuring a true and free-running shaft that will not throw out, whip, or vibrate. It is claimed that a degree of exactness of 0.00025 inch can be readily obtained with this machine if desired.

Among some of the advantages claimed for it are its low cost, the fact that it can be used for boring or grinding

with equally good results, that it can be mounted or removed from the lathe in ten minutes, that changing the work from one cylinder bore to another requires only a few seconds, and that its use does not interfere with chucking work in the lathe. The capacities are:



GENERAL VIEW OF THE MACHINE IN ACTION.

Swing of spindle, 22 inches; boring and grinding capacities, 2½ inches and larger; and length of spindle, 15½ inches. The equipment includes one main spindle and operating standard, one countershaft, one cross-slide table, two adjustable work-holding brackets, one cutterhead, two grinding wheels, one diamond wheel tracer, one truing-up indicator, and two wrenches. The machine equipment, boxed for shipment, weighs approximately 500 pounds.

KEY-SEATING MACHINE

A horizontal key-seating machine is a new line being put on the market by the Hercules Manufacturing Company, of Portland, Ore. The work-holding face plate is secured to one end of the machine and may be tilted to accommodate pieces with tapered keyways. The machine cuts on the forward stroke and the cutting tool is relieved on the backward stroke by the action of wedge shaped blocks operating in the base of the bar rest. The machine is light and particularly well adapted for taking to heavy work, in place of bringing the work to the machine.

PLATE MILLING MACHINE

A plate milling machine for milling the edges of boiler plates has been placed on the market by the Marshalltown Manufacturing Company, of Marshalltown, Iowa. The operating mechanism is carried on a sliding head that operates the full length of the machine, a 5 h.p. motor being provided for driving the spindle. Both a friction slip and a quick return are provided in the feed mechanism. Ball bearing thrust is fitted to the spindle. Rollers are provided on each side of the cutters for holding down the work. Machines are made in four sizes, having a range of from 8 to 24 feet.

NEW THINGS IN MACHINE TOOLS

COMBINATION TOOLHOLDER

Maurice H. Derringer, of 3133 N. Eighth St., Philadelphia, Pa., has placed on the market a special toolholder for lathe use. One end of the bar is fitted with a yoke that may be swung to either side of the bar as desired. One side of the bar is adapted for the holding of square stock while the other is provided with a groove for the holding of round stock. The opposite end of the bar is fitted with a gooseneck that can be locked in position at any angle.

FALCON PIPE WRENCH

J. H. Williams and Company, of Brooklyn, N.Y., has added to its line a new Falcon wrench that has a wide range of application and is particularly adapted for piping installations. The jaw is of curved design with open ends, which makes it very suitable for operations on awkward fittings. The wrench is designed for one way operations. The jaw is symmetrical, so that when one side becomes dull it may be reversed, thus doubling its life. These wrenches are made in six sizes, with ranges from ½ inch to 12-inch pipe.

REVERSIBLE DRIVING CHUCK

The Gustin-Bacon Manufacturing Company, of Kansas City, Mo., are offering to the trade a reversible driving chuck, that will grip the stock when running in either direction, being adapted for use on such work where it is desired to reverse the direction of rotation. The jaws are of tool steel and it is claimed that the work is held centrally at all times. A large number of jaws are obtainable for different classes of work.

OIL AND WATER STRAINER

The Griscom-Russell Company of New York, are now making a strainer that is intended for use in the straining of lubricating, fuel or quenching oil, or in water supply lines. The body is of cast iron and the strainer is of perforated sheet steel, and when the strainer is used for oil it is lined with fine mesh wire. The strainer connections may be made to suit any desired purpose, and may be installed in units or in sets. When used in sets either one of the strainers may be cleaned without interrupting the service.

BENCH HORN PRESS

The Enterprise Machinery Company, of Chicago, Ill., have recently placed on the market a bench horn press known as the type "V." The press is intended for rapid assembly of small parts and for operation such as seaming and riveting on hollow work. The machine is of the single stop type with strokes of ¾, 1¼, and 1¾ inches. The ram has an adjustment of ½ inch. The press is 26 inches high and operates at 300 r.p.m.

DROP HAMMER

Long and Allstatter Company, of Hamilton, Ohio, are now manufacturing a new type of drop hammer. Frame adjustment is provided and a positive automatic arrangement is used to prevent the frames from loosening. Increased distance is provided between the V-guides, giving a wider range to the dies used. The weight of the anvil is approximately fifteen times that of the ram, and means are provided for recording the various heights at which the ram should be released for each set of dies, thus assuring duplicate work at different periods. The machine is made in eight sizes, ranging in size from 100 to 1,200 pounds falling weight.

LO-SWING LATHE

The Fitchburg Machine Company of Fitchburg, Mass., are now making a 4-inch Lo-swing lathe. It is of the constant speed type and both speeds and feeds are controlled by levers in the headstock. The two carriages, each carying three tools, operate on heavy V's so located that the carriages may be run past the tailstock. The feed gears in the carriages are driven by means of Oldham couples which eliminate the necessity for accurate alignment. Sliding gears are provided for the reverse feed. These lathes are made in three lengths, 60, 80 and 108 inches.

INSERTED CENTER POINTS

The Eastern Tube and Tool Company, of Brooklyn, N. Y., are introducing a new line of machine center points made of high speed steel for insertion in to the mild steel shank, which are hardened and ground, and furnished in all standard sizes and tapers.

HYDRAULIC TURRET LATHE

Albert Herbert, Limited, of Coventry, England, through their American offices, are placing on the market a special design of hydraulic turret lathe that was originated by an Italian, and intended for use by disabled men. The chuck turret and the cross slide are all operated by means of hydraulic cylinders conveniently situated. A minimum pressure of 75 lbs. is used for the operation of the machine.

Japan has another plant to its credit, that being a new one just completed for manufacturing thick steel plate. It is owned by the Imperial Steel Works at Yawata, Kyushu, and cost 4,000,000 yen.

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Wanted—A Superintendent

THERE was a vacancy to be filled in an organization not many miles from Toronto. It was one of the worth-while jobs that crop up only on rare occasions.

The superintendent was leaving to go into business for himself. He had been with the firm for some years, was a good man, and his departure meant finding another good man to take his place.

There was a conference right straight off, and the president and general manager, for he held the dual position, wanted to know if any of the others present had in view the name of any other man who could be brought in to take over the work.

A number of names were suggested, but one by one they were discarded, and the only result of the meeting was to make it plain that the gathering was almost back where it started, with the possible exception of having gained the knowledge that it was no small task to find the man they wanted.

The vice-president of the company, who also held the position of secretary, at the first chance the following day, started on a new line.

He called the manager to his office and proposed the name of the foreman of the machine shop.

"But he's had no experience as superintendent," objected the manager.

"Neither had he any experience as foreman of a machine shop until he was put in that position here," was the answer.

The manager admitted that he had turned out to be a good foreman.

"Well, then," came back the vice-president, "if he made a good foreman, why not a good superintendent?"

The result was that the foreman of the machine shop, one of the company's own men, was taken in and made superintendent. He is just as good a superintendent as he was foreman.

The point is here:—Is your shop a place where you are growing foremen or superintendents, or are you dwarfing them so that they stay as machine operators and clock punchers?

How do you make a good foreman? By selecting a skilled mechanic with an honest personality, one with some leadership preferred. Very well—that is just a starting point. You must put responsibility on him—give him a chance to make good, and put that most important of all things on him, the seal of approval in the shape of increasing wages.

The average man wants to develop. It is the most natural thing in the world that he should.

If you find it necessary to start a gum-shoeing trip all over the country every time a worth-while position opens up in your organization, it's high time you turned the X-rays on the organization to find out the trouble.

Some shops grow foremen and superintendents, and some shops do not.

What kind of a crop are you growing?

Mr. Findley's Statement

THE address of Mr. Thomas Findley, of the Massey-Harris Co., before the Tariff Commission at Winnipeg, has been published in many Canadian papers as paid advertising.

It may be that it is necessary to do this in order to get his views before the public. It is a fact, though, that the same papers publish every day a tremendous amount of material that is not half as interesting nor one-quarter as instructive as the facts presented by Mr. Findley.

He reviewed the position of his company; he told of all the tinkering that had been done with the tariff on agricultural machinery; mentioned the loss the farmers were inflicting upon themselves by not housing their implements; showed that the farmer in Saskatchewan was buying his binder cheaper than the farmer south of him in North Dakota or Montana.

This paper cannot recall offhand where any man has so thoroughly laid before the public the business of his company.

It is just such frankness, and such adherence to facts that will stand up after investigation that will carry conviction.

Mr. Findley has done much to spike the guns of free trade shouters—or at least he has made it increasingly necessary for them to verify their statements before parading them before the public in print.

The Why of Time Clocks

THERE are plenty of men in shops who object to "punching the clock." Every time they shove in their ticket they do so with a grudge in every move, and there is often far more ginger put into a vigorous smash on the clock lever than in any other operation that takes place in the shop hours.

Whence come clocks and the demand for them?

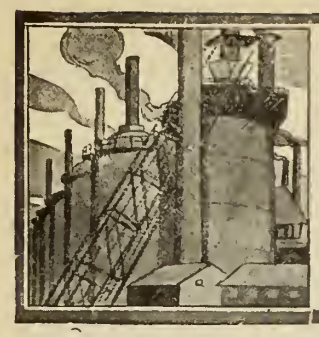
Look back a bit and the thing is very plain. Men used to work long hours and the wages were low. If a man were a few minutes late, the firm lost very little. This few minutes would amount to only a few cents, and the loss could be made up or absorbed in some other way.

It is a different proposition now.

Men are working many hours a week less than they used to, and they are getting a much greater amount for the shorter work day.

This has become so marked that a manufacturer has to reckon in minutes where he used to speak and think and plan his work in hours. A man in the shop working a short day has less time in which to speed up for any time lost in the morning.

Labor unions have insisted upon the shorter day, and in self defence it becomes necessary for the employer to see to it that he gets full measure for his work-day.



MARKET DEVELOPMENTS

Trading Quieter, But Prices Remain Firm

Many of the Machine Tool Centres Report Little Inquiry, But There is No Evidence Yet that Any of the Makers Are Thinking Seriously of a Price Reduction.

THERE is not a large volume of business moving in any of the machine tool markets. None of the Canadian centres report any great buying, and the New York market says that it is quieter there now than for months past, with very little hope of recovery. Some of the Canadian dealers are inclined to blame tight money for keeping some prospective buyers out of the money, and they claim they could dispose of a number of machines were their prospects able to finance. There is a fair number of orders as it is, but they are very much scattered. Dealers in this country do not complain of the stagnation that seems to have hit the New York market.

The supply of steel is a little more liberal, but the price that must be paid is liberal in proportion. The premium mills are making the great bulk of the deliveries that are reaching this market in the way of sheets, and they are still romping off with a high figure for their material. Warehousing interests are getting more or less nervous about going in and tackling large tonnages of this stuff, fearing that the premium market might crack, and leave them with a shipment on their hands in a skidding market.

As far as machine tool dealers can interpret the situation, they cannot see any price reduction yet. Many of the firms they represent are still booked for months to come, and the orders are all of the non-cancellation variety. It is seldom that a request comes for cancellation, a healthy sign for Canadian industry.

A further revision of prices has been made in Toronto warehouse lists bringing bar iron and steel and bar mill shapes up to $5.75 per hundred pounds, a new high mark, and one not equalled in the memory of most of the steel men in Toronto.

The scrap metal market is still waiting for something to start it off on busy days again, but that something has not appeared, although some of the dealers claim that the only thing to restore the volume of trade is a lower level of prices.

NEW RATES SEEM TO BRING A QUICKER MOVEMENT OF THE CARS

Special to Canadian Machinery

MONTREAL, Que. Sept. 23.—Apparently, one good result that the increased freight rates have brought about has been the improvement that has materialized in the delivery of goods to consumers. This condition, while not pronounced, has nevertheless given encouragement to many buyers of material. A feature that has prevented a greater betterment in United States shipments of steels and other metal lines is the tendency of the railroads in Canada to keep their equipment on their own roads so as to take care of the heavy demand now being made to move the western crops. The car situation has been a sore point during the past year, but improvement has gradually been evident, and when the grain shipments have been taken care of the movement of ordinary freight will soon reach normal.

The steel situation has developed little of interest during the past week, and operations in this district are much the same as what they have been for the past several months. In some respects the reports indicate that the activity is quieter in general and that the market is taking on a weaker tone. It was thought that the increased freight rates would be followed by a combined effort on the part of the dealers to adjust prices to the new conditions, so as to take care of the extra cost of transportation. This tendency, however, has been offset somewhat by the quieter tone of business, and although some dealers are tacking on the extra freight charges to quotations, others are allowing the old prices to stand and are absorbing the additional freight charges themselves. Consumers are in the market constantly, but buying sparingly, and trading is carried on in the hand-to-mouth style that has been more or less the order of things for the past eighteen months. Dealers report that no large developments are anticipated and this gives the impression that the fall activity will be of a conservative character. Another factor is the fact that mill production at present is above the existing demand, so that supplies are gradually assuming the position when an easier market should obtain. The lesser requirements for some commodities, notably the automobile industry, has enabled the mills to devote more time to other needed lines, so that the trade may shortly see steels listed at lower figures. One naturally looks for increased costs when freight rates are advanced, but present conditions may show that the higher charges will provide the necessary means of more rapid transportation of material, with the result that the congestion at producing points will be relieved and raw materials delivered to the producer more regularly. Shipments to this district have shown gradual improvement of late.

Light Machine Demand

As a result of the curtailment that has evidently developed in the automobile industry the activity in machine tool lines has been somewhat disjointed, due to cancellations of equipment or extended delivery. This has reacted in many ways, and foundries and other metal trades have experienced a movement to a quieter period. This trend has come at a time when users of tools were contemplating the call for higher charges on equipment haulage. The de-

mand of late, however, has been easing off, so that dealers are willing to lower the quotations slightly to counteract the extra cost that would figure in the additional freight charges. While local dealers are reporting a quiet spell, the sales are a fair average for the year. Sales of heavy tools are light, but other machines and small supplies are of sufficient volume to maintain a balance of trade.

Scrap is Listless

There is little to report on the old material situation as the quiet character of the market has nothing of interest for the trade. Operators are almost entirely confined to local trading and in this respect the buying is solely for current needs and no covering is made for future requirements. Dealers are devoid of interest and transactions are carried on more on the nature of the individual sale than on market prices or conditions. Prices locally are only to be consedered in a nominal way.

PREMIUM MILLS SUPPLY TRADE

Otherwise Some Lines Would Be Very Short in the Canadian Market

TORONTO. — The trade is becoming more or less accustomed to the new freight schedules that are now in effect on the Canadian roads, at least very little is ever heard about the matter in the markets. One matter that is quite conspicuous is the scarcity of ready money, and the difficulty with which existing lines of credit are given a little elasticity in order to meet certain situations.

Some of those who are in the machine tool business seem to be quite certain that the difficulty in getting credit and financial assistance is keeping not a few buyers out of the market, and that when matters ease off a little, and there is more ready money to be had, there will be more business in their line.

"We have had men come in here," stated the manager of one Toronto house this morning, "and tell us that they have certain extensions to their plant in mind, and asking what we can do for them in the way of extending payments. The banks apparently cannot see their way clear to give them the assistance or the time they desire, and they think they can get it from the machine tool dealers, but as a matter of fact we would soon be in for a lot of trouble were we to undertake to finance things on paper that the bank would not accept or deal in. There will come a time when this business will come into the market, as we are certain these men want to make extensions, and they are not bluffing about it either."

No Price Crack Coming

Dealers generally are confident that prices as they stand now will be the prices at which machine tools will sell for some months to come. "As far as we can see there is no chance of anything happening to the price situation, and we are very certain that there will be nothing approaching a price cutting business. If such a thing were to happen it would simply mean that we would have each other's business in a couple of months at reduced prices. Most of the bookings that are on the way through now have a non-cancellation clause attached to them, and in that way there is a very small chance of anything approaching trouble coming on the trade."

The makers will need to be a great deal more keen for business before reductions will be thought of. Some of them are showing a better delivery schedule, but in many lines there is still quite a few weeks between bookings and deliveries, and this sort of thing will have to be worn down a lot more before price reduction will be a necessity.

The dealer who complains that he is not in on any big orders in the Canadian market just now need not feel hurt, as there is no big buying being done, but there is a good showing of smaller business, and it is fairly well distributed.

Small tools remain the same in price. Some of the railroad business has not been placed yet. Most of what is being purchased now is for the eastern shops.

The Steel Market

There has been a further revision of the Toronto market upward to take care of the freight rates and other costs. It now means that the base price for steel and iron bars and bar mill shapes is 5.75 per 100 pounds. This is the highest price that has been reached in the memory of some of the oldest dealers in the warehousing business here.

There is a fair arrival of sheets, but it is all from the premium mills, and on orders that were placed only a few days ago. These premium mills are out to cater to the hand-to-mouth trade. The chances are that they never get booked up over a week or so in advance, always holding themselves in readiness to turn out a rolling in very short order for a customer who is willing to pay the price for immediate delivery.

One well-known stove maker was making the rounds this morning looking for sheets. He was almost out of certain gauges, especially anything near 22 or 24, which is the size much in demand by this class of trade. He was mightily pleased to find what he wanted, although he had to pay the high price for it. With him it was simply a case of getting the material or shutting off that corner of his shop, which is particularly busy at this season.

Just how long the warehouses will keep on going into the premium market is problematical. There is always the danger of dealers waking up some fine morning to find that there is a crack in the premium market, and it is not a happy chance to have a good sized tonnage on the way when such a thing takes place. Those who watch the market closely believe that there will be a chance, but they cannot see it right away, and apparently they are willing to take a chance of getting away with premium goods for a time yet.

Boiler tubes are coming across in fairly good numbers, but the assortment is far from complete yet. There are some of the much-wanted sizes that are not to be had, particularly in the case of 3-inch, several of the houses being short of these. There is a big market in this country now for boiler tubes, and a very large tonnage could be disposed of were it possible to secure them.

There is not the volume of delivery coming from the Canadian mills that could be hoped for, as they are still working without adequate supplies of coal.

POINTS IN WEEK'S MARKETING NOTES

Reports from Pittsburgh claim that the shop facilities have improved to such an extent that they are rapidly reducing accumulation of steel in the yards there.

—

There is very little demand in the United States steel market for structural shapes, plates, and the larger size of merchant steel bars. Prices on these are not reduced, the mills holding that such a course would not bring them any new business.

—

One report from the steel mill section is that some of the mills will be forced to curtail production in November.

—

The deliveries of sheets in the Toronto market are nearly all through the independent and premium mills.

—

Some machine tool dealers believe that the tightness of money at the present time is keeping a number of buyers out of the market.

—

Any suggestion in the reduction in the prices of machinery finds little encouragement in the markets. Some firms are still many weeks behind in their deliveries.

—

There was another change made in the price of steel and iron bars and bar mill shapes in the Toronto warehouses, the face price now being $5.75 per hundred, which is a record high price.

—

The stove markets are finding it difficult to secure enough of the proper gauge of sheets to keep their plants in operation.

MILLS ARE REDUCING THE PILES STACKED AROUND THEIR PREMISES

Special to CANADIAN MACHINERY.

PITTSBURGH, Sept. 23.—In the main, the production of steel tends to increase, being helped by constantly improving rail traffic conditions, but here and there some of the smaller mills are reducing output or planning to reduce output, on account of their orders having fallen off. The larger mills, which sold farther ahead, are well supplied with orders.

While production has been increasing somewhat, shipments have been increasing still more, as the mills are able to move more of their accumulated steel. The Carnegie Steel Company is reported to have reduced its accumulation of steel by about one-third, from the top point, leaving about a third of a million tons, a trifle over half of which is in ingots and semi-finished steel.

Delivery Demands

In more than half the finished steel lines the deliveries are such that consumers are in easy position and are not pressing the mills for heavier shipments. In tin plates, wire nails and the smaller sizes of merchant steel bars there is still urgent request on the part of many buyers for heavier shipments against contracts, though there is relatively little new buying. In sheets there is considerable pressure from some consuming lines, but the deliveries on the whole are moderately good, being helped by the fact that the automobile industry has canceled some orders entirely, while on many others it has called for reduction or suspension in shipments. An extreme case is that of an automobile factory which ordered a mill to suspend shipments instantly, and raised an issue because the mill allowed a car to go forward that was already loaded and shipped two cars with material that had already been made to the buyer's specifications. The mill was, of course, far within its rights in this matter, since it is a liberal policy that consents to hold up the filling of specifications. When the material has actually been produced the mill always expects the buyer to take it.

Prompt Market Quiet

While there is still some buying of prompt deliveries in certain lines the general aspect of the prompt delivery market is one of quietness. The situation results from better deliveries more than from decreased requirements, though in some cases, particularly in the automobile industry, the consumptive requirements are decreased. Many buyers some months ago were following the familiar course of doubling up on purchases. Having contracted for the amount of steel required, and not receiving deliveries as rapidly as the contract called for, these buyers went out into the open market and bought additional tonnages. Now both classes of steel are coming, resulting in some cases in there being more than is needed, and in nearly all cases in a cessation of the prompt buying.

Stocks on Hand

The usual question at this time is being asked without getting an answer, how much steel the buyers have in stock. After a period of stringency in deliveries the common assumption is that buyers necessarily cannot have any stocks, yet in the past it has always developed that many of them had stocks. Buyers are in various positions, and usually the case is that the trade hears of those who are short of steel while it hears nothing about those that are well stocked. At the present time buyers are content to carry their stocks, those that have any, for while the railroad situation is greatly improved the better position may not last. Usually the peak of the load on the railroads comes in October, on account of the crop movements, and after that there are the usual dangers of winter weather slowing down the railroad movement. At this time, therefore, the buyer concludes that a stock is a good thing to have. His position may, however, change radically in the course of a month or two, when he gets near to inventory time, for he may then suddenly become desirous of having his inventory as small as possible.

Items in Light Demand

Demand is practically absent for structural shapes, plates and the larger sizes of merchant steel bars. Mills are maintaining prices on these partly because there is no business and reducing prices would not create business, partly because they can put their steel into forms that are in more request, and partly because they have contracts on books at full prices, which they desire to protect. Structural shapes are not offered at less than 3.10c. so far as can be ascertained, by any of the independents, and this is $13 a ton above the Steel Corporation price of 2.45c. Plates are now commonly quoted at 3.25c. as several independent mills will make this quotation. Some mills are asking more, but their prices are simply nominal. The mills seem to have made 3.25c a sort of dead line, below which they will not go.

Duration of Business Readjustment

That business generally is in process of readjustment is admitted on all hands. The only divergence of opinion is as to the extent of the readjustment and the length of time that will be required before markets turn more active again. Some observers think there is to be merely a shortlived lull in business activity, while in other quarters the view is that it will be more than a year hence before business is really on the up grade again. There is agreement on this point, that lessened activity is needed to bring down commodity prices and the cost of labor, measuring the latter not necessarily in wage rates per hour or per day, but rather in the amount of work done for a given sum of money. Thus the question seems to resolve itself into one of how long the present momentum of business will carry things before there can be sufficient slackening to produce this readjustment. For the steel trade, the common prediction is that the industry in general, drawing inferences from the position of both producers and consumers, has enough steam up to run it not only through this year but into next year. According to this view the steel mills are going to run, with an occasional exception, at the best rate the physical conditions permit, at least, through this year and probably into early spring. In a few quarters, however, this view is considered altogether too sanguine, and the idea is expressed that it should not be surprising if the mills should be forced to curtail production sharply in November. As to steel prices, practically the unanimous opinion is that they will stay up until after the mills have had a period of relative idleness. The mills will stubbornly resist price declines and they have made so much money that they can well afford to be independent.

Pig iron is stagnant, with prices not quotably changed.

NEW YORK TOOL TRADE VERY QUIET

Various Views Taken on What is Liable to Happen There in Near Future

NEW YORK, Sept. 23.—Some in the machine tool trade describe conditions as "the quietest in years." Both inquiries and orders are few and far between, and with some machine tool manufacturers orders in the past month or so have been entirely offset by cancellations. It is surprising how quickly the machine tool trade has altered from unexampled prosperity to uncertainty. Even those machine tool plants whose order books are in the best of condition of any have scarcely more than three or four months business ahead, and unless there should be a buying movement by the first of the year, at the latest, a majority of the plants of the United States will find themselves at that time with scarcely any business ahead. Some companies are even now caught up on orders on some lines and either are making tools for stock or have curtailed their manufacturing operations.

Despite the present uncertainty as to the future of business in the near three to six months, there are some who do not view the situation pessimistically, but on the contrary look for a resumption of buying on a fairly good scale within the next 30 or 60 days; at any rate after the presidential election. Many manufacturing plants are extremely busy, but others are running on part

time and quite a number have let men go. The industrial situation is spotty, but not alarming.

Except for an inquiry from the Standard Oil Co. of New Jersey for a few machines, there is scarcely an inquiry in the market worthy of note. There are occasional orders for single machines, but even this business in the aggregate is not large.

MONTREAL NOTES

The new factory of the L. E. Waterman Company at St. Lambert was officially opened last week, when a number of notable men from England, New Zealand, United States and Canada, were guests of the company. H. L. Symonds, chairman of the London, England, Chamber of Commerce, officiated at the opening.

—

Henry Berry, vice-president and general manager of the Canadian Asbestos Company, died last week, after an illness of several months. Mr. Berry had been associated with the asbestos industry nearly all his life and his own personal efforts in this direction had done much to widen the field of usefulness of this great Canadian mineral. Mr. Berry was 55 years of age; he leaves a widow and three sons.

—

The Grand Trunk management has appointed Mrs. E. H. Gaudion as welfare superintendent of the female clerical staff at their head offices in Montreal. Mrs. Gaudion will devote her entire time and special training to the duties of this position, the desire of the management being to make the environment of office life as healthy and happy as possible. The Welfare Superintendent will have charge of the lunch room and rest rooms and will also extend her help to the homes of girls in cases of sickness.

—

Negotiations have been finally concluded for the erection of a mammoth 1,000 room hotel in Montreal. Frank A. Dudley, president of the United Hotels Company of America, and a number of prominent commercial and industrial men of the city have formed the Mount Royal Hotel Company, Limited of Montreal, with a capital of 10 million dollars. The site secured for the new hotel is the block bordered by Peel, Burnside, Metcalfe and St. Catherine streets. It is expected that an early start will be made on the construction work. The officers of the newly organized company will be: Frank A. Dudley, president; Hon. W. J. Shaughnessy, first vice-president; and W. J. Cluff, second vice-president.

Authorization has been given for the increase of the capital stock of the Atlas Construction Company, Ltd., from the sum of $100,000 to $500,000; such increase to consist of 4,000 shares of $100 each.

PIG IRON TRADE

There is not much general buying in the pig iron market, but shipments from furnaces are being readily taken up. Where automobile plants are suspending delivery, other plants are taking the iron they refuse. The reports from Philadelphia show that furnaces are well booked up, and are offering but little material. Steel works which are not very well provided for are still clamoring for delivery, particularly of basic grade. This grade is now selling at $50 furnace. There has been no change in foundry grades.

Chicago producers are well booked ahead, but the market is by no means weak though inquiry in pig iron is slack. Requests for shipment are being made by the smelters, as few have accumulated iron beyond their present needs. There is no demand for basic iron, owing to buyers waiting for orders from the railroads before buying.

New business in Cleveland is exceedingly small, owing to a continued fall in the market. Furnace shipments are continuing, however, on a higher scale and with the exception of automobile foundries, consumers are buying. Prevailing prices were $46 to $47 for next year, $47 to $48 for this year.

Boston reports that requirements for New England consumers are covered for this year. All the principal railroads are now open. Castings are in demand and foundries busy.

The market for pig iron in New York has been good. Sales for scattered lots amounted to several thousand tons for delivery this year at established prices. New inquiry has been light. Consumers are able to procure iron more easily owing to improved transportation. Eastern Pennsylvania iron has been sold at prices ranging from $50 to $51, for 1.75 to 2.25 silicon, to $53 to $54 for 2 25 to 2.75 silicon. Some southern foundry iron is selling at $42, furnace, for delivery this year and next.

Pittsburgh market for pig iron remains dull. The prices are firm owing to the orders on hand.

Buffalo. — There appears to be very little business in the market here. Enough has gone through, however, to establish $50 as the prevailing market price for No. 2 plain foundry iron. Bookings for 1921 are very small, buyers apparently hoping for something more favorable in the way of price.

Reports are made that business is almost at a standstill at St. Louis. The western and north-western sections, however, are better — prices quoted were from $42 to $45 for 1.75 to 2.25 silicon, for prompt and future delivery.

Southern markets are inactive, but the market is considered strong. No. 2 foundry is quoted on a basis of $42.

U.S. SCRAP METAL

Pittsburgh. — The market for open-hearth grades of scrap has softened, owing to the fact that deliveries are better and also to the withdrawal of one of the large steel companies. Some of the smaller dealers who had tonnages which they were unable to move because of shortage of cars are now getting permits for immediate transportation.

Boston.—The market here is strong despite the heavy advance in freight rates, and dealers are able to place fair sized tonnages for shipment to the steel mills.

New York.—There is a fair amount of inquiry for most grades. Prices of iron and steel scrap are firm, and while a firm tone still prevails no further advances have been reported. Cast scrap continues in chief demand and is scarce.

Philadelphia.—An eastern steel maker bought several thousand tons of cast iron borings during the past week. Some borings have been sold as high as $25, the highest level for this grade in 30 years. This is attributed to the increased freight rates, and the decreased production on the part of Detroit automobile builders.

Buffalo.—Steel is in greater demand than other grades. Dealers can sell almost any tonnage of turnings and borings. Most of material going forward is on old contracts. New orders placed are for prompt delivery, there being little business for future delivery.

Cleveland.—The market for iron and steel scrap is downward. Quotations have been marked down sharply during the past week.

Cincinnati. — The iron and steel scrap market in this district is firm, with large consumers buying. Higher prices are quoted for some foundry grades.

Chicago. — Prices of iron and steel scrap have continued to decline, owing to consumers having no interest in the market and the movement of scrap being negligible.

St. Louis.—The scrap market is very uncertain. The underlying trend seems to be toward lower prices. but as yet dealers' lists do not reflect this.

Much Coal Arriving.—A Hamilton report says:—Unless something very unexpected happens, the much-talked-of coal famine this winter will not be realized, according to local railwaymen. For the last two months thousands of tons of coal have been rushed into this province, and the railways are still busy moving shipments of coal from the mines and returning empties with all possible speed. On an average of 400 cars of coal a day is cleared at Niagara Falls on the G.T.R. The T. H. & B. and C. P. R. at this point also move a large number of cars each day. The record established by the G. T. R. several weeks ago, when they moved 900 cars of coal from the border has not yet been broken.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$42 40
Lake Superior, charcoal, Chicago	57 00
Standard low phos., Philadelphia	50 00
Bessemer, Pittsburgh	43 00
Basic, Valley furnace	42 90
Toronto price:—	
Silicon, 2.25% to 2.75%	52 00
No. 2 Foundry, 1.75 to 2.25%	50 00

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	$ 5 75
Steel bars, base, Toronto	5 75
Iron bars, base, Montreal	5 75
Steel bars, base, Montreal	5 75
Reinforcing bars, base	5 75
Steel hoops	7 00
Norway iron	11 00
Tire steel	5 75
Spring steel	10 00
Band steel, No. 10 gauge and 3-16 in. base	6 10
Chequered floor plate, 3-16 in.	8 50
Chequered floor plate, ¼ in.	8 10
Bessemer rails, heavy, at mill	....
Steel bars, Pittsburgh	3 00-4 00
Tank plates, Pittsburgh	4 00
Structural shapes, Pittsburgh	3 00
Steel hoops, Pittsburgh	3 50-3 75
F.O.B., Toronto Warehouse	
Small shapes	5 75
F.O.B. Chicago Warehouse	
Steel bars	3 62
Structural shapes	3 72
Plates	3 67 to 5 50
Small shapes under 3"	3 62

FREIGHT RATES

Per 100 Pounds.

Pittsburgh to Following Points

	C.L.	L.C.L.
Montreal	58½	73
St. John, N.B.	84½	106½
Halifax	86	108
Toronto	38	54
Guelph	38	54
London	38	54
Windsor	35	50½

METALS

	Gross. Montreal	Toronto
Lake copper	$25 00	$24 25
Electric copper	24 00	24 50
Castings, copper	23 50	24 00
Tin	56 00	58 00
Spelter	10 75	10 75
Lead	9 25	10 50
Antimony	9 00	12 00
Aluminum	36 00	37 00

Prices per 100 lbs.

PLATES

Plates, 3-16 in.	$ 7 25	$ 7 35
Plates, ¼ up	6 50	6 60

PIPE—WROUGHT

Standard Buttweld Pipe

Per 100 Ft.

	Steel Blk.	Steel Galv.	Gen. Wrought Iron Blk.	Gen. Wrought Iron Galv.
⅛	$ 6 50	$ 8 50	$.....	$.....
¼	5 31	7 41	5 91	8 01
⅜	5 31	7 41	5 91	8 01
½	7 10	8 63	7 95	9 48
¾	8 80	10 87	9 95	12 02
1	13 01	16 07	14 71	17 77
1¼	17 60	21 74	19 90	24 04
1½	21 04	25 99	23 79	28 74
2	28 31	34 97	32 01	38 67
2½	44 75	55 28	....	....
3	58 52	72 29	....	....
3½	74 06	90 62	....	....
4	87 75	107 37	....	....

Standard Lapweld Pipe

Per 100 Ft.

	Steel Blk.	Steel Galv.	Gen. Wrought Iron Blk.	Gen. Wrought Iron Galv.
2	$32 01	$ 38 67	$35 71	$42 37
2½	48 26	58 79	54 11	64 64
3	63 11	76 88	70 76	84 53
3½	75 90	92 46	85 10	101 66
4	89 93	107 55	100 83	120 45
4½	1 05	1 29	1 30	1 54
5	1 22	1 50	1 52	1 80
6	1 53	1 95	1 97	2 33
7	2 06	2 53	2 53	3 01
8L	2 16	2 66	2 66	3 16
8	2 49	3 07	3 07	3 64
9	2 98	3 67	3 67	4 36
10L	2 77	3 41	3 41	4 05
10	3 56	4 39	4 39	5 21

Prices—Ontario, Quebec and Maritime Provinces

WROUGHT NIPPLES

4" and under, 60%.
4½" and larger, 50%.
4" and under, running thread, 30%.
Standard couplings, 4-in. and under, 30%.
Do., 4½-in. and larger, 10%.

OLD MATERIAL

Dealers' Average Buying Prices.

	Per 100 Pounds. Montreal	Toronto
Copper, light	$15 00	$14 00
Copper, crucible	18 00	18 00
Copper, heavy	18 00	18 00
Copper wire	18 00	18 00
No. 1 machine composition	17 00	17 00
New brass cuttings	11 00	11 75
Red brass turnings	14 50	15 75
Yellow brass turninbs	9 00	9 50
Light brass	7 00	7 00
Medium brass	8 00	7 75
Scrap zinc	6 50	6 00
Heavy lead	7 50	7 75
Tea lead	4 50	5 00
Aluminum	19 00	20 00
	Per Ton	Gross
Heavy melting steel	20 00	18 00
Boiler plate	15 50	15 00
Axles (wrought iron)	30 00	20 00
Rails (scrap	23 00	18 00
Malleable scrap	26 00	25 00
No. 1 machine east iron	32 00	33 00
Pipe, wrought	12 00	12 00
Car wheel	33 00	33 00
Steel axles	25 00	20 00
Mach. shop turnings	11 00	11 00
Stove plate	26 50	25 00
Cast boring	14 00	14 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, 7-16 and up	+10
Carriage bolts, ⅜-in. and less	Net
Coach and lag screws	—15
Stove bolts	55
Wrought washers	—25
Elevator bolts	+10
Machine bolts, 7-16 and over	+10
Machine bolts, ⅜-in. and less	+10
Blank bolts	Net
Bolt ends	Net
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	+25
Machine screws, fl. and rd. hd., brass	net
Machine screws, o. and fil. hd., brass	net
Nuts, square, blank	+25 add $2 00
Nuts, square, tapped	add 2 25
Nuts, hex., blank	add 2 50
Nuts, hex., tapped	add 3 00
Copper rivets and burrs, list less	15
Burrs only, list plus	25
Iron rivets and burrs	40 and 5
Boiler rivets, base ¾" and larger	$8 50
Structural rivets, as above	8 40
Wood screws, O. & R., bright	75
Wood screws, flat, bright	77½
Wood screws, flat, brass	55
Wood screws, O. & R., brass	55½
Wood screws, flat, bronze	50
Wood screws, O. & R., bronze	47½

MILLED PRODUCTS

(Prices on unbroken packages)

	Per Cent
Set screws —20% 25 and	5
Sq. and hex. hd. cap screws	12½
Rd. and fil. hd. cap screws	plus 25
Flat but. hd. cap screws	plus 50
Fin. and semi-fin. nuts up to 1-in.	12½
Fin. and Semi-fin. nuts, over 1 in., up to 1½-in.	—5
Fin. and Semi-fin. nuts over 1½ in., up to 2-in.	+12½
Studs	+5
Taper pins	—12½
Coupling bolts	+40
Planer head bolts, without fillet, list	+45
Planer head bolts, with fillet, list plus 10 and	+55
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	+60
Collar screws	list plus 20, 30
Thumb screws	40
Thumb nuts	75
Patch bolts	add +85
Cold pressed nuts to 1½ in.	add $1 00
Cold pressed nuts over 1½ in.	add 2 00

BILLETS

	Per gross ton
Bessemer billets	$60 00
Open-hearth billets	60 00
O.H. sheet bars	76 00
Forging billets	56 00-75 00
Wire rods	52 00-70 00

Government prices.

F.O.B. Pittsburgh.

NAILS AND SPIKES

Wire nails, base	$6 10
Cut nails, base	7 00
Miscellaneous wire nails	50%

ROPE AND PACKINGS

Plumbers' oakum, per lb.	0 10¼
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 35½
British Manila rope	0 28
New Zealand hemp	0 28

POLISHED DRILL ROD

Discount off list, Montreal and Toronto	net

A Complete Line 8 in. to 50 in. Swing

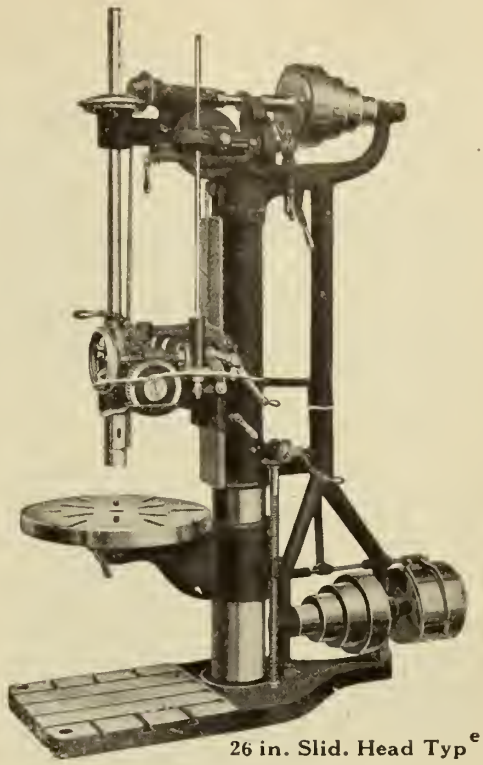
with or without tapping attachment

BARNES

Upright Drills
Horizontal Drills
Gang Drills

Accuracy—Strength
Convenience of Operation

If it's machinery write "Williams"



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THE A. R. WILLIAMS MACHINERY CO., Ltd., 64 FRONT ST. WEST TORONTO

MONTREAL ST. JOHN, N.B. WINNIPEG VANCOUVER HALIFAX BUFFALO, N.Y.

Production of Rare Quality at Lowest Labor Costs

There is unusual strength, accuracy, speed, convenience and range in

AURORA
Drilling Machines

You can use them to great advantage on any work in your shop that's suitable for a machine tool of this kind. The operating is easy and the labor cost comparatively low.

Drop a line for full particulars and specifications.
Stationary Head Sizes 20"—21"
Sliding Head Sizes 22"—44"

The Aurora Tool Works
AURORA, INDIANA, U.S.A.

If interested tear out this page and place with letters to be answered.

MISCELLANEOUS

Solder, strictly	$ 0 35
Solder, guaranteed	0 39
Soldering coppers, lb.	0 62½
White lead, pure, cwt.	20 35
Red dry lead, 100-lb. kegs, per cwt.	16 00
Gasoline, per gal., bulk	0 38
Pure turp., single bbls., gal.	3 15
Linseed oil, raw, single bbls.	2 37
Linseed oil, boiled, single bbls.	2 40
Wood alcohol, per gal.	4 00
Whiting, plain, per 100 lbs.	3 00

CARBON DRILLS AND REAMERS

S.S. drills, wire sizes	32½
Can. carbon cutters, plus	20
Standard drills, all sizes	32½
3-fluted drills, plus	10
Jobbers' and letter sizes	32½
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	50
Sleeves	50
Taper pin reamers	25 off
Drills and countersinks	net
Bridge reamers	50
Centre reamers	10
Chucking reamers	net
Hand reamers	10
High speed drills, list plus	10 to 30
Can. high speed cutters, net to plus	10
American	plus 40

COLD ROLLED STEEL

[At warehouse]

Rounds and squares	$7 base
Hexagons and flats	$7.75 base

IRON PIPE FITTINGS

	Black	Galv.
Class A	70	85
Class B	30	40
Class C	20	30

Cast iron fittings, 5%; malleable bushings, 22½%; cast bushings, 22½%; unions, 37½%; plugs, 20% off list.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$12 00	12 10
Sheets, Blue ann., No. 10	9 50	9 60
Canada plates, dull, 52 sheets	13 00	13 00
Can. plates, all bright	14 00	.....
Apollo brand, 10¾ oz. galvanized	....	....
Queen's Head, 28 B.W.G.	13 50	.....
Fleur-de-Lis, 28 B.W.G.	13 00	.....
Gorbal's Best, No. 28	....	....
Colborne Crown, No. 28.	....	....
Premier, No. 28, U.S.	11 50	12 60
Premier, 10¾-oz.	11 50	13 00
Zinc sheets	16 50	20 00

PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13.00; 5-16, $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.20; ¾ in., $9.30; ⅞ in., $9.50; 1 in., $9.10; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $13.00; 5-16 in., $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.50; ¾ in., $9.30.

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

BOILER TUBES.

Size.	Seamless	Lapwelded
1 in.	$27 00	$.....
1¼ in.	29 50	.....
1½ in.	31 50	29 50
1¾ in.	31 50	30 00
2 in.	35 00	30 00
2¼ in.	35 00	29 00
2½ in.	42 00	37 00
3 in.	50 00	48 00
3¼ in.	.. ..	48 50
3½ in.	63 00	51 50
4 in.	85 00	65 50

Prices per 100 ft., Montreal and Toronto

OILS AND COMPOUNDS.

Castor oil, per lb.	
Royalite, per gal., bulk	27½
Palacine	30½
Machine oil, per gal.	54½
Black oil, per gal.	28
Cylinder oil, Capital	82½
Petroleum fuel oil, bbls., net	18

BELTING—No 1 OAK TANNED

Extra heavy, single and double	6½
Standard	6½
Cut leather lacing, No. 1	2 00
Leather in side	2 40 3 00

TAPES

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	$4 60
Polishing wheels, bull-neck	2 00
Emery in kegs, Turkish	09
Pumice, ground	06
Emery glue	30
Tripoli composition	09
Crocus composition	12
Emery composition	11
Rouge, silver	60
Rouge, powder, nickel	45

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	.08½
Grits, 80 and finer	.6

BRASS—Warehouse Price

Brass rods, base ½ in. to 1 in. rod	0 34
Brass sheets, 24 gauge and heavier, base	$0 42
Brass tubing, seamless	0 46
Copper tubing, seamless	0 48

WASTE

XXX Extra	.24	Atlas	.20
Peerless	.22½	X Empire	.19½
Grand	.22½	Ideal	.19
Superior	.22½	X Press	.17½
X L C R	.21		

Colored

Lion	.17	Popular	.13
Standard	.15	Keen	.11
No. 1	.15		

Wool Packing

Arrow	.35	Anvil	.22
Axle	.28	Anchor	.17

Washed Wipers

Select White	.20
Dark colored	.09
Mixed colored	.10

This list subject to trade discount for quantity.

RUBBER BELTING

Standard ... 10% Best grades... 15%

ANODES

Nickel	.55 to .60
Copper	.38 to .40
Tin	.70 to .70
Zinc	.16 to .17

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	$42 50	$43 00
Copper wire, list plus 10		
Plain sheets, 14 oz., 14x60 in.	49 00	48 00
Copper sheet, tinned, 14x60, 14 oz.	52 00	48 00
Copper sheet, planished, 16 oz. base	56 00	55 00
Braziers', in sheets, 6 x 4 base	48 00	46 00

LEAD SHEETS

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$11 50	$14 50
Sheets, 3½ lbs. sq. ft.	11 25	14 00
Sheets, 4 to 6 lbs. sq. ft.	11 00	13 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS

Acid, boracic	$ .23
Acid, hydrochloric	.04
Acid, nitric	.11
Acid, sulphuric	.04
Ammonia, aqua	.15
Ammonium, carbonate	.23
Ammonium, chloride	.22
Ammonium hydrosulphuret	.75
Ammonium sulphate	.30
Arsenic, white	.14
Copper, carbonate, annhy	.41
Copper, sulphate	.15
Cobalt, sulphate	.20
Iron perchloride	.62
Lead acetate	.30
Nickel ammonium sulphate	.20
Nickel carbonate	.32
Nickel sulphate	.22
Potassium sulphide (substitute)	.42
Silver chloride (per oz.)	1.30
Silver nitrate (per oz.)	1.25
Sodium bisulphate	.14
Sodium carbonate crystals	.06
Sodium cyanide, 127-130%	.38
Sodium hyposulphite per 100 lbs	8.00
Sodium phosphate	.15
Tin chloride	.80
Zinc chloride, C.P.	.30
Zinc sulphate	.10

Prices per lb. unless otherwise stated

Make Screw Cutting the Most Satisfactory Operation in Your Shop

Others have done so by equipping with

Geometric Screw Thread Cutting Tools

Wherever Screw Machines and Turret Lathes annex a Geometric Die Head or Collapsing Tap,

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Prove for Yourself

what a Geometric installation will do for you.

Tell us the specifications of your work, and the kind of screw machine used, and we will make you a proposition.

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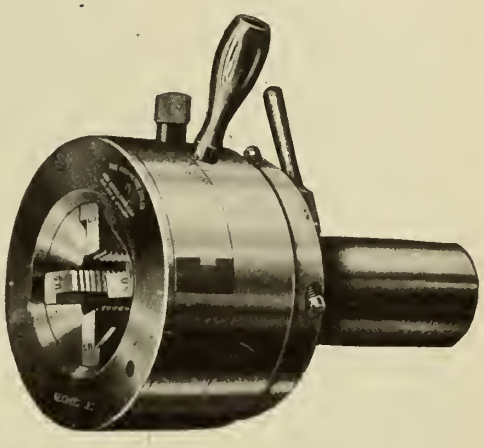
FREE TO YOU

Geometric Die Heads



Instructions for
Their Care and Use

HAVE you one of these pamphlets on the Care and Use of Geometric Die Heads?

YOU WILL WANT THIS BOOKLET SOMETIME

Are you using Geometric Die Heads?

YOU WILL WANT IT NOW

If not using Geometric Die Heads now, you will want it later, when

YOU DO USE GEOMETRIC DIE HEADS

It is a small 11-page pamphlet, 6 in. x 4½ in., which tells you how to take care of your Die Heads.

WRITE US FOR YOUR FREE COPY

A post card request will bring the booklet to you, and placed in the hands of the man who uses the Die Heads, it will help

CUT DOWN EXPENSE

If interested tear out this page and place with letters to be answered.

Inspectors and Car Foremen in Session

Large Gathering at Montreal Where Many Useful Matters Were Discussed—A Large Number of Firms Were Represented at the Gathering.

THE 20th Annual Convention of the Chief Interchange Inspectors and Car Foremen's Associations of America, which was held for three days last week at the Windsor Hotel in Montreal, was one of the most successful in the history of the organization. Over 300 delegates were present from all parts of the United States and Canada. The meeting was held in the large assembly hall of the hotel, and the rear portion was devoted to the mechanical appliances exhibit. In addition to the general business sessions several papers were presented followed by a considerable discussion. These papers included:—Lubrication of Freight and Passenger Equipment by M. J. O'Connor, special lubrication inspector of the N.Y.C.R.R.; Freight Claim Prevention, by T. A. Ward, chief clerk freight claim department of the N. Y. C. R. R.; Examination of Car Inspectors, by E. H. Hall, superintendent of car department of the Chicago Great Western R. R.; Best Means of Repairing Cars in Train Yard, by O. E. Sitterly, general car inspector of the Penn. R.R. The closing session was concluded with a considerable display of international amenities, when the majority of the members, being Americans, spoke of the freedom and hospitality they had enjoyed in Canada, and the Canadians replied with similar courtesies. The following officers were elected for the ensuing year:—President, Edward Pendleton, general car foreman, Chicago and Alton Ry., Peoria, Ill.; First Vice-President, A. Armstrong, chief joint car interchange inspector, Atlanta, Georgia; Second Vice-President, W. F. Westfall, special inspector of the New York Central Ry., Cleveland, Ohio; Secretary-Treasurer, W. R. Elliott, general car foreman, St. Louis, Mo., terminals. The following supply firms were represented:—American Brake and Shoe and Foundry Company, Chicago; Steel Foundries, Chicago; Bettendorf Company, Bettendorf, Ia.; Boss Lock Nut Company, of Canada, Limited, Montreal; Bradford Draft Gear Company, Chicago; Buckeye Steel Casting Company, Chicago; Camel Company, Chicago; Canada Grip Nut Company, Montreal; Canadian Car and Foundry Company, Montreal; Canadian Gold Car Heating Company, of New York; Canadian Johns-Manville Company, of Montreal; Canuck Supply Company, of Montreal; Chicago-Cleveland Car Roofing Company, of Chicago; Chicago Railway Equipment Company, of Chicago; Columbia Nut and Bolt Company, of Bridgeport, Conn.; Paul Dickinson Inc., of Chicago; Duff Manufacturing Company, of Pittsburg, Pa.; Galena-Signal Oil Company, of Canada, Montreal; Griffin Wheel Company, of Chicago; Holden Company, of Montreal; Independent Pneumatic Tool Company, of Montreal; Imperial Appliance Company, of Chicago; Imperial Belting Company, of Chicago; Liberty Tool Company, of Baltimore; Mahr Manufacturing Co., of Minneapolis; McCord and Company, of Chicago; W. H. Miner, of Chicago; National Malleable Castings, of Cleveland, Ohio; A. O. Norton, of Boston; Okweld Railway Service Company, of Chicago; Pyrene Manufacturing Company, of Montreal; Railway Review, of Chicago; Robinson Connector Company, of New York; Union Draft Gear Company, of Chicago; Westinghouse Air Brake Company, of Wilmerding, Pa.

The following is a list of those registered at the meeting of Chief Interchange Car Inspectors' and Car Foremen's Association:—

RAILROAD MEN

C. S. Adams, Asst. Genl. For., N.Y.C., Malt Haven, N.Y.

C. W. Broo, Gen. Car. For., N.Y.C. & St. L. Ry., Chicago; A., Berg, Gen. Car. For., N.Y.C. Lines West, Erie, Pa.; A. J. Baumbush, Gen. Car. For., N.Y.C.R.R., New York City; F. Paul Baach, For. Inspector, Buffalo Creek Ry., Buffalo, N.Y.; Valentine Baltz, Chief It. Inspector, Wheeling, West Va.; John C. Burke, Car. For., Mo. Pacific Ry., St. Louis; A. J. Boyd, Car. For., N.Y.O. & W., Norwich, N.Y.; Jas. Bannon, Genl. Car. For., C.P.R., West Toronto, Ont.; Robt. Barnaby, For. Car Inspector, D.L. & W. Ry., Buffalo, N.Y.; S. P. Blanton, Asst. Gen. Car For., S. A. L., Jackville, Fla.; W. E. Buckle, Gen. For., C.P.R., Angus Shops, Montreal; A. A. Burkhard, Gen. For., N.Y.C., West Albany, N.Y.; John A. Burns, Car Insp., D. & H., Albany, N.Y.

J. H. Campbell, Car For., G.T. Ry., Niagara Falls, N.Y.; E. R. Campbell, Gen. Car For., Minn. Transfer Co. Ry., St. Paul, Minn.; T. S. Cheadle, Chief Car Inspector, R.F. & P., Richmond, Va.; Glenn E. Chesney, Car For., G.T. Ry., Island Pond, Vt.; James Coleman, Asst. to Gen. S.M.P., G.T., Montreal, Que.; D. P. Crillman, Gen. Car For., M.C.R.R., Detroit; M. Culligan, Gen. For., N.Y.C.R.R., Dunkirk, N.Y.; R. Copland, Asst. Shop For., N.Y.C.R.R., N.Y. City; M. J. Curley, Trav. Car Inspr., N.Y.C.R.R., N.Y. City.

Carl Dierks, For. Car Insp., D. & H., Oneonta, N.Y.; C. H. Donoghue, A.D. Gen. Car For., N.Y.C., Oswego, N.Y.; F. A. Donahue, Car Inspector, C.N.O. of I., Cincinnati, O.; R. L. Donoghue, Car For. N.Y.C., Watertown, N.Y.; P. A. Dufour, Car For., M.C.R.R., Kalamazoo, Mich.; F. F. Duysters, Ry. Mech. Engr., N.Y. City; A. Ditmore, For. Car Dept., D.H.R.R., Wilkesbarre, Pa.; E. D. Donovan, Gen. Car For., N.Y.C.R.R., Clearfield, Pa.; L. M. Douglas, Car Repair Acct., B. & O. R.R., Keyser, W. Va.; E. J. Duval, Car For., N.Y.C., Lyons, N.Y.

C. F. Ehrman, Gen. Car For., Hocking Valley, Columbus, O.; W. P. Elliott, Gen. Car For., Ter. Rly. Assn., St. Louis, Mo.; Joe Ettwein, Asst. For., N.Y.C.R.R., Erie, Pa.

R. B. Freemen, Gen. Car For., Seaboard Air Line, Hamlet, N.C.; John F. Finnerty, Car For., N.Y.C., Carthage, N.Y.; F. L. Frericks, Gen. Car For., N.Y.C., Cleveland, O.; Allan Foster, Travelling M.C.B. Insp., N.Y.C., Cleveland, O.; F. J. Freeburg, Car Inspr., N.Y.C., Erie, Pa.; C. W. Frey, Gen. Car For., M.C.R.R., Detroit, Mich.; W. A. Forbes, Gen. For., G.T., Belleville, Ont.; Geo. P. Fox, Supt. Shops, N.Y.C., Albany, N.Y.; J. H. Ford, Gen. Car For., L. & N.E., Penn Argyll, Pa.; Joseph Forche, Gen. Car For., L. E. & W., Lima, O.; George Fisher, M.C.B., G.T.R., London, Ont.; L. M. Fish, G.F. Car Dept., K. & M. Ry., Middleport, O.; J. Fletcher, G.F. Car Dept., Seaboard Air Line, Portsmouth, Va.; A. H. Faerber, Shop Supt., N.Y.C.R.R., Buffalo, N.Y.; Gabriel Ferro, Chief Int. Inspr., F.E.C. Ry., Havana, Cuba.

J. B. Gilliam, Gen. Car For., Frisco R.R., St. Louis, Mo.; J. E. Gordon, Gen. Car For., N. Y. C. & St. L., Buffalo, N.Y.; J. J. Gainey, Gen. For. C.R. & Inspr., Southern Ry., Ludlow, Ky.; J. F. Griffin, Div. Gen. For., N.Y.C., Utica, N.Y.; B. F. Gordon, Car. For., F.E.C., Key West, Fla.; L. A. Gearville, Car For., G.T., Richmond, Que.; J. M. Getzen, Asst. Chief Inspr., Niag. Front. Car Insprs.' Assn., Buffalo, N.Y.; C. J. Griswold, Dist. Gen. For., N.Y.C.R.R., Chicago, Ill.

A. A. Helwig, Trav. Gen. For., C. & A. R.R., Bloomington, Ill.; M. W. Halbert, C.I.I., All Lines, St. Louis, St. Louis, Mo.; Chas. Hilderbrand, Car For., B.R. & P., Buffalo, N.Y.; W. H. Hall, Chief Car Inspr., C. of N.J., Jersey City, N.J.; Eugene Head, Chief Clerk, Car Dept., Wabash Ry., Decatur, Ill.; F. J. Heatherton, Car Inspr., L. & N., Newport, Ky.; F. L. Hendricks, Chief It. Inspr., Wilkesbarre, Pa.; A. Herbster, A.M.C.B., N.Y.C. R.R., Chicago, Ill.; W. J. Hatch, Gen. Air Brake Inspr., C.P. Ry., Montreal; W. M. Herring, Cb. C. to Asst. to V.P., Southern Ry., Washington, D.C.

Bert. Johnson, Asst. Supt. Air Brakes, N.Y.C., Ashtabula, O.; Adolf Johnson, Gen. For., North. Am. Car Co., Chicago; I. J. Justus, Spec. Inspr., N.Y.C.R.R., N.Y. City.

John C. Keene, Secretary, C.I.C.I. & C.F. Assn., Chicago, Ill.; J. H. Kinter, For. Car Inspr., Penn, Ry., Enola, Pa.; A. R. Kipp, Gen. Car Inspr., N.Y.O. & W., Middleton, N.Y.; Joseph Kranz, Car For., M.C., Toledo, O.; T. B. Koeneke, Supt. Equipment, Indiahoma Rsfg. Co., St. Louis, Mo.

A. Lachance, Genl. Contract For., C.P.R., Montreal; Geo. Landry, Car For., Rutland, Rouse's Point, N.Y.; C. E. LaMontagne, Gen. Car Insp., Rutland, Malone, N.Y.; H. A. Lightner, Gen. Car For., I.C.R.R., East St. Louis, Ill.; J. L. Latta, Car For., D. & H., Schenectady, N.Y.; S. Lindman, Gen. Car For., N.Y.C., Youngstown, O.; Geo. Lynch, Chief It. Car Inspr., Cleveland, O.; W. C. Lang, Gen. Car Inspr., P. & L.E., Corapolis, Pa.; W. H. Long, Dist. Car For., Cdn. Natl. Rlys., Toronto, Ont.; Alex. Lawson, Chief Jt. For., N.Y.C.R.R., Buffalo, N.Y.; D. C. Lawe, Car For., Virginian Ry., Norfolk, Va.

J. P. McNally, Chicago Stel Car Co., Harvey, Ill.; J. N. McWood, Gen. Car For., G.T., Ottawa, Ont.; John McCormick, Gen. Car For., L.V.R.R., Buffalo, N.Y.; D. McCarthy, Car For., N.Y.C., Buffalo, N.Y.; J. A. McLeod, Chief M.C.B. Clerk, Wabash Ry., Decatur, Ill.; W. R. McMunn, Asst. to Supt. R.S., N.Y.C.R.R., N.Y. City; E. H. McMunn, Car For., N.Y.C.R.R., Williamsport, Pa.

A. G. Marshall, Car For., G.T., Portland, Me.; Edwin Moses, Gen. Car Insp., N.Y.C., New York, N.Y.; L. W. Martin, Gen. Car For., Ter. Ry. Assn., St. Louis, Mo.; J. A. Masters, M.C.B. Billing Inspr., S.A.L., Port mouth, Va.; C. W. Maddox, Chief Car Inspr., C. & O., R.R., Richmond, Va.; Chas. F. Masters, Chief It. Inspr., D. & H. R.R., Carbondale, Pa.; E. H. Mattingley, Jt. Genl. Car For., B. & O. and B. & O.C.T., Chicago, Ill.; A. J. Mitchener, Div. Gen. Car For., M.C.R.R. St. Thomas Ont.; W. G. Milburn. Chief It. Inspr., Fostoria, O.; Eli Minick, Gen. Car For., L.V.R.R., Wilkesbarre, Pa.; A. L. Miller, Asst. Gen. Car For., Wabash Ry., Moberly, Mo.; W. R. Morris, M. of E. Acct., A.B. & A. Ry., Atlanta, Ga.; Livingston Martin, C.C.R. Acct. Bureau, B.O.R.R., Baltimore, Md.; D. C. Messerole, M.C.B., G.T. Ry., Montreal.

E. R. Norquist, Asst. H.C.I., G.T., Ry., Battl Creek, Mich.; E. H. Nettels, Ch.C.-G.S.R.S., N.Y. C.R.R., Buffalo, N.Y.

P. J O'Dea, Gen. Inspr. Mech. Dept., Erie R.R., Buffalo, N.Y.; T. J. O'Donnell, Chief Int. Inspr., Niagara Front. Car Insprs.' Assn., Buffalo, N.Y.; W. J. Owen, Chief I. Inspr., P. & P.U., Peoria, Ill.; M. J. O'Connor, Mech. Inspr., N.Y.C.R.R., Buffalo, N.Y.; J. J. O'Shea, Car For., N.Y.C., Malone, N.Y.

E. M. Pelliem, Supt. Transp. & Labour, Donner Steel Co., Inc., Buffalo, N.Y.; F. E. Park, Jt. For., D. & H. and N.Y.O. & W., Sidney, N.Y.; B. F. Patram, Gen. Car For., Southern Ry., Richmond, Va.; H. C. Payre, Div. Car For., Erie Ry., Elmira, N.Y.; C. A. Park, For. Car Inspectors, N.Y.O. & W. R.R., Norwich, N.Y.; J. W. Puckett, Gen. For. Car Repairs, Southern Ry., Alexandria, Va.; Pearl Parker, Gen. For. Car Dept., N.Y.C. R.R., Kankakee, Il.; W. H. Pirie, Gen. Car For., C.N.R., Halifax, N.S.; H. A. Palmer, Car For., G.T., Rouse's Point, N.Y.; Harry Pearce, Car For., G.T., Montreal; M. R. Perry, Ch. Car Rep. Asst., B.O., Zanesville, O.; F. T. Price, Ch. Gen. Insp., Ft. Worth, Tex.

C. F. Richards, Chief Car Inspr., L. & H.R. Ry., Phillipsburg, N.J.; C. E. Roscoe, Ch. Clerk, Supt. R.S., N.Y.C.R.R., Cleveland, O.; J. C. Roberts, Chief M.C.B., Clerk, C. & C. R.R., Richmond, Va.; H. J. Ryan Gen. Car For., N.Y.C.R.R., Oswego, N.Y.; W. A. Rogers, Chief Jt. Inspr., P. & L.E.

(Continued on page 58.)

COAST TO COAST

STEEL & IRON PRODUCTS OF EVERY DESCRIPTION

THE STEEL COMPANY OF CANADA LIMITED

HAMILTON **MONTREAL**

If interested tear out this page and place with letters to be be answered.

TRADE CAN BEST BE DEVELOPED APART FROM GOVERNMENT OFFICES

MR. LLOYD HARRIS, of Brantford, brought forward at the Congress of Chambers of Commerce of the British Empire one of the most plausible suggestions offered for the development of trade within the Empire, and the better understanding of the problems of all sections.

Mr. Harris' chief complaint is with the appointees of the various governments having to do with affairs of business, which, he claims, they do not understand, having had no practical training, and being bound around with conditions that keep them from developing.

After the signing of the armistice Mr. Harris was in London, England, for some months, as head of the Canadian Trade Mission there, and he had a splendid opportunity to see where the trouble was coming from in the development of more trade between the various parts of the British Empire. Mr. Harris cannot reconcile the idea of more trade and leaving the government trade organization as it is at present.

"The resources of the British Empire need co-ordination," stated Mr. Harris. "A government is not greater than public opinion, and there are times when it must be forced. A gathering such as this (the Chambers of Commerce) should have men with the vision and the knowledge to develop Empire trade as it should be developed."

Mr. Harris goes further. He believes that the body to take care of this work should be known as an Empire Trade Council, to be composed of three representatives from each outlying part of the Empire, the British Government also to appoint members. This should form a permanent trade council in London. The appointments to that body should not be made for political purposes. Those receiving the appointments should not be paid members. The idea of Mr. Harris is that there are enough men in the country who would tackle such a proposition with the sole idea of being able in this way to render some service to the country, and to bring the outlying parts of the Empire closer together. The appointments would be made for a term of three years, with new men coming in at intervals before all the older members dropped out, in this way carrying out the continuity of the programme.

The speaker was particularly plain in making the meaning clear, that on no account should the carrying out of such a scheme be left in the hands of any government officials.

FIRMS WANT TO ESTABLISH TRADE RELATIONS WITH CANADA

INFORMATION regarding the following lines can be obtained by communicating with this paper and mentioning key numbers.

1830. Engineers' and Shipbuilders' Supplies.—Firm in Scotland desire to receive catalogues and quotations from Canadian firms who are able to export anything of interest to the engineers', shipbuilders' and allied trades.

1831. Motor Trucks.—A firm of manufacturers' representatives of reliability desires to secure the agency for Canadian motor trucks—from three to five tons.

1832. Motor Cars.—A firm of commission merchants in Barbados would like to secure the agency for a Canadian motor car in Barbados, should be a five seater with all the latest improvements.

1852. Wire Rods. — A London firm wishes to hear from Canadian manufacturers of wire rods who can offer supplies for export.

1853. Nails. — A firm of travelling agents with branch offices in Jamaica, Demerara and Barbados desire to obtain a Canadian connection for nails and other small hardware.

1854. Steel Products. — Established trading corporation, with head office in Chicago, and branches throughout the world, ask to be placed in touch with Canadian manufacturers of iron and steel products, particularly structural iron, steel plates, pipes and pipe fittings of all kinds.

1855. Wire Rods.—Large ironworks in Scotland would be glad to receive quotations from Canadian producers who are in a position to export. The immediate requirements of this company are filled, owing to the arrival of a recent shipment from Canada, but they are regularly in the market.

1856. A Buenos Aires firm of general importers is interested in receiving quotations, c.i.f. for black, galvanized, oval high tension and barbed wire.

1857. A Buenos Aires firm of general importers is interested in receiving quotations, c.i.f. for iron and steel bars, beams, galvanized sheets and black sheets.

1858. A Buenos Aires firm of general importers is interested in receiving quotations, c.i.f. for tin plate.

1869. Brake-Shoes.—A Newfoundland commission agent, long in a position of trust with an important firm, wishes to be placed in communication with Canadian manufacturers of brake-shoes for trucks and sleds.

1588.—Machinery. A firm in Roumania desires to receive quotations and other particulars from Canadian firms in a position to export all kinds of electrical machines.

Annual Meeting.—The annual meeting of the shareholders of Canadian Locomotive Co., Ltd., was held in the general offices of the company, at Kingston, when a by-law providing for the adding of two directors was passed and the following board of directors elected: Aemilius Jarvis, Robert Hobson, Warren Y. Soper, John L. Whiting, K.C., James Carruthers, M. J. Haney, F. G. Wallace. At a subsequent meeting of the board of directors the executive officers for the coming year were appointed:—F. G. Wallace, president; Aemilius Jarvis chairman of the board; J. H. Birkett, treasurer; William Harty, Jr., and William Casey, were elected to the board and Mr. Casey appointed a vice-president and Mr. Harty secretary. The financial showing of the company for the past year is most gratifying, regardless of the fact that the works were closed during the first three months of the company's financial year owing to strikes. The company at the present time is working to full capacity with sufficient orders on hand to run it for several months.

Mr. J. H. Davey, who has been connected with the Brown & Sharpe Mfg. Co., of Providence, R.I., for about 25 years, has taken up the work of representing that firm in Canada. Mr. Davey has been in Glasgow as the Brown & Sharpe representative previous to coming here. He is now working with the Canadian Fairbanks-Morse Co., the sales representative of the Brown & Sharpe lines, and all sales will be made through this company as heretofore.

INSPECTORS AND CAR FOREMEN

(Continued from page 56.)

R.R., Youngstown, O.; G. K. Reynolds, Can. For., N.Y.C.R.R., Corning, N.Y.; E. W. Roth, Car For., N.Y.C.R.R., Buffalo, N.Y.; J. V. Rottammer, For. Car Dept., N.Y.C.R.R., N.Y. City.

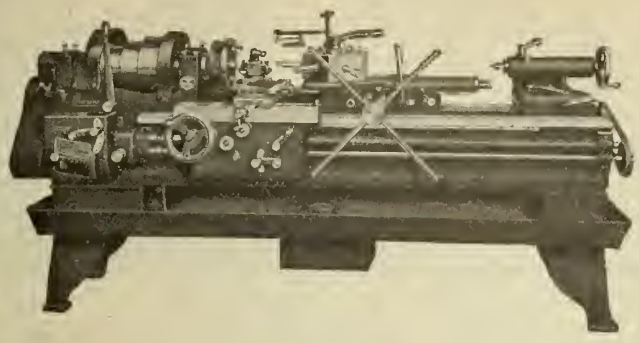
Wm. Shamp, Gen. Inspr., C. B. & Q., Chicago, Ill.; P. F. Spangler, Trav. Car Inspr., S. L. & St. F. Ry. Co., Springfield, Mo.; W. H. Sherman, Car For., G.T. Ry., Sarnia, Ont.; A. F. Schattler, Car Inspr., G.T. Ry., Port Huron Mich.; J. E. Severy, Chief Int. Inspr., D.L. & W. Ry., Binghampton, N.Y.; F. A. Starr, Gen. Car Inspr., C. & O. Ry., Covington, Ky.; E. S. Smith, M.C.B., Florida E. Coast Ry., St. Augustine, Fla.; C. C. Stone, Spec. Trav. Aud., M.C.B., Southern Ry., Richmond, Va.; W. J. Stoll, C.I.I., Toledo, O.; J. C. Stewart, For. Frt. Car Insprs., C.I. & W. Ry., Indianapolis, Ind.; C. F. Smith, Ch. C.-D.M.C.B., N.Y.C.R.R., Chicago, Ill.; R. C. Sayler, Gen. Car For., N.Y.C. R.R., Elkhart, Ind.; Fred. Schuetz, Gen. For., Live Poul. Tran. Co., R.F.D. No. 2, Forks, N.Y.; O. E. Setterly, Car For., P.R.R., Buffalo, N.Y.; W. P. Simpson, For., P.R.R., Erie, Pa.; H. J. Smith, Gen. Car Insp. D. L. & W., Scranton, Pa.; D. W. Stephens, Car For., T. & C., Fort Worth, Tex.; A. F. Sturbing, Mgr. Ed., Ry. Mech. Eng., New York, N.Y.

F. W. Trapnell, C.I.I., Kansas City, Mo.; F. A. Teed, Gen. Car For., B. & O. Ry., Washington, Ind.; W. F. Tidswell, Car For., M.C. Ry., Detroit, Mich.; Geo. Treacy, Gen. Car For., Ann Arbor R.R., Owosso, Mich.; Jas. B. Turner, Gen. Car For., Can. National, Moncton, N.B.

J. E. Vittum, Ch. It. Inspr., All Columbus Rys., Columbus, O.

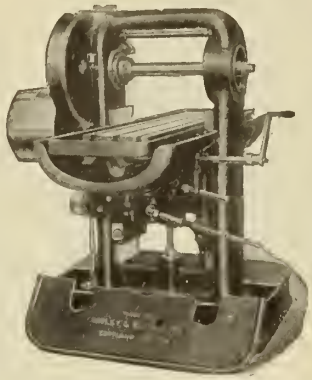
W. F. Westall, Special Inspector, N.Y.C.R.R., Cleveland, O.; C. W. Wolfe, Car Inspr., Southern Ry., Richmond, Va.; B. E. Wright, Gen. For. Car Dept., N.Y.C. & St. L. Ry., Conneaut, O.; B. M. Waldo, Chief Int. Inspr., All Lines, Dallas, Tex.; J. H. Weale, For Car Dept., N.Y.C.R.R., N.Y. City; J. W. Wilson, Chief It. Inspr., N.Y.C. and P. & R., Newberry Jct., Pa.; G. B. Williamson, Car Repair Acct., B. & O. R.R., Baltimore, Md.

A. Ziebold, Gen. Car Inspr., Hacking Valley R.R., Columbus, O.; C. A. Zielke, C.I.I., G.T. Ry., Port Huron, Mich.



Garlock-Walker Machinery Co.'s

List of
New and Used Machinery



Lathes

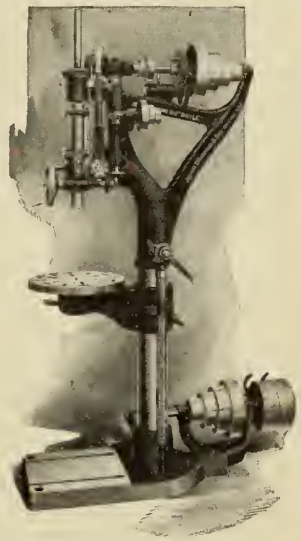
7" Cataract-Precision.
12" x 8' Le Blond Tool Room.
18 x 8 Rae, Q.C.G.
18 x 8 Milwaukee, Q.C.F.
24 x 10 Milwaukee, Q.C.F.
20 x 36 x 12' C.M.C. Gape, Q.C.G.
20 x 40 x 12' Rae Gap.
22 x 40 x 16 McDougall Gap.
38 x 12 Bertram.
5' 9" Fitchburg "Lo Swing."
30 x 12 Blaisdell (Raising Blocks).
36 x 18 Putnam.
No. 4 Millholland Turrets.
16", 18" and 24" Davis Turrets.
Wells, Prentiss, and Warner & Swazey Screw Machines.

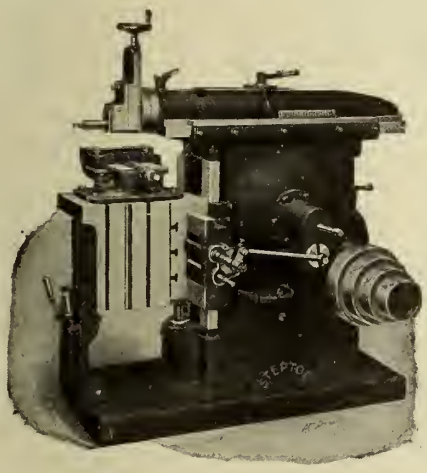
Grinders

8 x 36 Fitchburg (Cylindrical).
LeBlond Universal.
Globe Universal.
Landis No. 4 Universal.
Landis Plain.
No. 1 Steel Products Gauge Grinder.
Pedestal Emery Grinders.

Milling Machines

Type "A" and "B"
Briggs Heavy Duty Millers.
Ryerson-Conardson Plain and Universal
Whitney Hand Miller.





Boring Machines

Universal No. 2½.

Boring Mills

Niles-Bement 66", 2 heads, fixed rail.

Automatic Screw Machines

National Acme.
Cleveland.
Brown & Sharpe.

Shapers

16" Rae.
24" Steptoe.
24" McGregor-Gurley.

Air Compressors

8 x 8 Sullivan, belt driven.
12 x 12 Can. Ingersoll-Rand, belt driven.
10 x 18 Ingersoll Sargent, belt driven.
8 x 10 x 8 Bury, steam driven.

Drills

20" Buffalo.
20" Champion.
No. 1 Burke Bench.
20" Sibley.
No. 314 Baker.
D 14 Colburn.
D 8 Colburn.
4 Spindle Woodward.
National Acme Horizontal.

Planers

30 x 30 x 10' Pond.
30 x 30 x 11' London.

A few NEW Woodworking Machines

No. 200—Knife Grinder.

No. 25, American Edging and Ripping Saw.
No. 3, American Double Cut-Off Saw.
No. 30, Universal Saw Bench.
No. 9, American Universal Knife Grinders.
No. 26, American 10" Outside Moulder.
No. 4½, American 36" Cabinet Surfacer.
No. 507, C.M.C. Hollow Chisel Mortiser.
No. 438, Arm Sander.
Ballantyne 2-Spindle Shaper.
American No. 2½ Tenoner.

No. 25—Edging Saw.

If interested tear out this page and place with letters to be answered.

INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS PERSONAL AND TRADE NOTES

TRADE GOSSIP

New Catholic Union.—The National Catholic Union has established a new local in the plant of the Canadian Car & Foundry Company, Limited. According to an announcement made by Gerard Tremblay, General Secretary of the Montreal National Catholic Union, this new body is the result of the recent strike, which was followed by a shutdown of the company's plants. He stated that men, finding the company obdurate, appealed to Abbe Hebert, head of the National Union of Catholic Workers, to use his influence to bring about a termination of the trouble, with the ultimate result that the company reopened its plants. Abbe Hebert stated that the new union comprised several hundred men.

Secured Contracts.—The MacKinnon. Steel Co., Ltd., Sherbrooke, Que., have contracts for the steel for Royal Bank of Canada, Bridgewater, N.S.; general contractor, Russel & McAuley, Halifax, N.S.; steel for News Boiler House Extension, Grinder Room, Sulphite Mill Boiler House, Brompton Pulp and Paper Co., East Angus, Que.; steel superstructure for bridge, 55 feet clear space, over River Pointe du Joui L'Assomption municipality at the site known as Point Jourdain, L'Assomption, Que.; general contractor, Alex. Venne, L'Assomption, Que.; steel for Wagon Shed for Imperial Oil Co., Halifax; general contractor, McDonald Construction Co., Halifax, N.S.; steel superstructure, 65 feet clear space bridge to be erected across outlet of Brome Lake, at Fulford, Que.; general contractor, C. J. Dryden Co., Ltd., Montreal, Que.; steel work for highway bridge, 60 feet long, in two spans, with 25 feet roadway and 5 feet sidewalk for City of Granby; steel for Royal Bank Lennoxville, Que.; general contractors, Newton Dakin Construction Co., Sherbrooke, Que.; steel for post office, Yarmouth, N.S.; Russel & MacAulay, general contractors, Halifax, N.S.; steel for store for L. R. Steel Co., Wellington St., Sherbrooke, Que.; architect Mr. Gregoire, Sherbrooke, Que.; general contractors, Sherman Construction Co., Sherbrooke, Que.; steel for Canadian Bank of Commerce, Wellington St., Sherbrooke, Que.; general contractors, Anglins Norcross, Ltd., Montreal, Que., steel for Tuberculosis Hospital, Halifax, N.S., general contractors, Rhodes, Curry, Limited, Halifax, N.S.

WILLIAM CASEY JOINS THE BOARD

Vice-President and Manager of the Canadian Locomotive Plant Started There as Office Boy

William Casey was this week elected to the Board of Directors of the Canadian Locomotive Co., Kingston, and also appointed one of the vice-presidents.

WILLIAM CASEY

His promotion with this company has been a fine illustration of the possibilities of mechanical training and initiative.

He is a Kingston boy, being born there in October of 1887, so at present he is still a young man of 33. After completing his schooling he entered the employ of the Canadian Locomotive Co. as office boy. Leaving there he went to the machine shop where he served an apprenticeship, afterwards going to the drafting room. In 1907 came his first important promotion, when Mr. Casey was made machine shop foreman, remaining there until 1912 when he returned to the office to take charge of piece work and estimating. In 1914 he was made assistant to the vice-president and general manager (A. W. Wheatley) and following the latter's resignation early in 1916, Mr. Casey was appointed manager.

SIGNS OF PROGRESS

H. L. Hewson plans erection of cloth-weaving mill at cost of $50,000, at Amherst, N.S.

An extension of 126 by 85 feet, one storey high, will be made to the Kindel Bed Co., Stratford, Ont.

Buildings to the value of over one and three-quarter million dollars have been undertaken in Ottawa this year up to the end of August.

Building permits in Moose Jaw for the eight months of this year show an increase of almost a million dollars over the same period of 1919.

William Newlands and Son are architects for a first-class, modern hotel, costing $450,000 to be built at Kingston, Ont.

The Acme Sash and Door Co., Ltd., Winnipeg, have been awarded the mill work contract for a store costing $150,000 for Ramsay's, Ltd., Dauphin, Man.

Contracts have been awarded by the Technical School Commissioners, Hull, Que. The Dominion Bridge Co. secured the iron, and D. O. La Violette the stone work.

L. A. Amos, architect, 78 Crescent Street, Montreal, is preparing plans for a match factory to be erected in Quebec for Maguire, Paterson and Palmer, Ltd.

One and a half million dollars is to be expended on reconstructing the abattoir of the Pat Burns Co., Regina, Sask. The building will be of brick and concrete.

The value of building permits issued in Vancouver, B. C., the first eight months of the year is almost double the value of the permits issued during the same period of last year.

A motor truck industry, with head office in Indiana, will erect a Canadian plant at London, Ont. The incorporation of the Canadian company with a capitalization of approximately $5,000,000 is now being negotiated.

The general contract for erecting a hotel costing $1,000,000 for Benson-Hines Co., London Chambers of Commerce, has been awarded to Geo. A. Fuller Co., Ltd., 285 Beaver Hall Hill, Montreal.

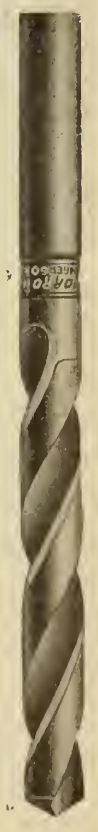
Colthurst, Trace and Nichols, architects, of Windsor, are preparing plans for the construction of a huge cold storage plant, of reinforced concrete, three storeys in height. Windsor, Detroit, London and Toronto capital is behind the scheme, and construction is expected to start in the spring.

What the Manager Said:

"You'll have to get that order out by the 15th if you work the men overtime," said the manager to the machine shop superintendent. It's promised, and this firm has built up its business by keeping its promises. If your drills are not boring holes fast enough put a rush order through for some Morrow High Speed Forged Drills."

Morrow drills will bore more holes in a given time without regrinding than any other drills. They're harder, they're tougher, they're stronger. They save time, trouble and worry.

Test them. A competitive test in your own shop will prove it.



MORROW'S

INGERSOLL - CANADA

Distributors of PXH and Imperial Files

"They cut faster and wear longer."

Upon the Health of your employees depend your profit and production

Don't be contented with half-way goodness or makeshift drinking arrangements.

Throw out the germ-laden Drinking Cup!

Give your men a clean drink

PURO SANITARY DRINKING FOUNTAIN

(MADE IN CANADA)

Allows just the proper amount of cool, clean fresh water to come through the bubbler. No spurting, overflowing, no loss. "Puro" regulates itself. "Puro" saves 35% on water bills, too. You can attach it in a few minutes. Tell us how many men, how many departments, and we'll tell you how much the cost will be.

Puro Sanitary Drinking Fountain Co.

Canadian Agents:

McKENZIE BROS.

888F St. Andre St., Montreal, P.Q.

PATENTS PROMPTLY SECURED

In all countries. Ask for our Investor's Advisers which will be sent free.

MARION & MARION 364 University St. Merchants Bank Building, corner St. Catherine St., Montreal, Phone Up. 647. and Washington, D.C., U.S.A.

H. W. Welsh, former manager in Sherbrooke, Que., for the E. and T. Fairbanks Co., Limited, and latterly manager of the scale department of the Canadian Fairbanks-Morse Co., Montreal, Que., has joined the organization of the MacKinnon Steel Co., Limited, Sherbrooke, as manager and has already assumed his duties.

WOULD BE FOREMAN

Continued from page 290

it would have gone if it had been of greater capacity. We had all the tuyere doors open and then had iron clean to the top of the stack and coming down like rain in the yard, but we got there just the same. Next day the pulleys were replaced as they were in the beginning. After we got the castings out and found that they were good, the manager came to me and explained that he was well satisfied, but that it would now be necessary to get to work and make some money out of the place, so he proceeded to start operations on this money-making plan of his. Not interfering with me or my work he pointed at one corner of the shop and said: "We will call this No. 1 floor,—Alex. you take this." Next, he says: "This will be No. 2,—Herbert you take this." And so he numbered off each floor and put a man on each of them until the men were used up. After this he turned to me and informed me that he had engaged a core-maker, who had not yet arrived, but that in the meantime I was to make what cores were required, after which I was to mold some things which he had laid out for me. On the fourth day he came to me and told me that he would be out of town for a while but that I should mold some plow shares for which he showed me the patterns and gave me to understand that they would have to be cast with the face down. I suggested that there would have to be some getting ready done first, to which suggestion he replied in a very stern voice that there would be no more getting ready, but that getting the work out would be the only consideration. He then left me and I have never seen him since.

I wended my way back to Brantford that night and wrote to him advising him that we had parted company and that on pay day I would draw on them at the bank for my money. To this I received a rather waspy reply from the manager who seemed to be put out at my not liking his methods. True to my promise I drew on them at the bank but my draft was neither paid nor returned for over a week, when I learned that the directors had held a meeting and accepted my resignation and also asked the manager for his, so that they could both be accepted at the same time. This was done and we were both paid off—two birds killed with one stone—leaving two vacancies to be filled. Thus ended my first experience as a foundry foreman.

SOME OF THE THINGS TO BE FOUND IN THE ADVERTISING PAGES OF THIS ISSUE OF CANADIAN MACHINERY

How it is that some tool rooms cannot compete with others owing to lack of full equipment.

How it is cheaper and more satisfactory to take the machine to the job rather than the job to the machine.

Where it is possible to secure expert instruction in the care and use of grinding wheels.

Some advice to purchasers in regard to anticipating their requirements some distance ahead, owing to the shortage of raw material.

Where you can get a copy of a wrench book.

Why it is that a well made file will withstand friction and chemical reaction.

How one make of tool does in a short time work that formerly took hours.

Why it is advisable to have the clutch built for a particular purpose.

How one firm has solved the problem of making uniform abrasives.

How a well known article is only now coming onto the market since the war.

The difference between a solid tap and an adjustable one.

How the automatic milling machine is always working on the cutting surface.

How a small lathe will do work for which a heavier machine is often used.

Where to get a welding engineer to make an inspection of your plant free of cost.

How it is that a certain lathe will use less power and is faster in turning out certain classes of work.

The firm who claims that its experts are always ready to work out your problems.

Where the small shop operating on electrical power can get its compressed air.

One firm claims that it wants users to drive their machines hard.

How one miller attends to the straddle milling of "Spider" arms.

How a Canadian firm has a chain of stations to insure service from coast to coast.

WELDING BOILER SHELLS

Continued from page 289

ment, and carried out everything in connection with the welding, etc.

The extent of the new metal forming the weld between the sludge-hole and the front end-plate was approximately 21 inches in length circumferentially round the shell; 3 inches in width and ½ inch in thickness (average), the hole through the plate being completely filled up. The total cost of repairing the boiler by means of electric welding was £54. Although this may appear at first sight a large amount for a small repair yet much time was saved by adopting this means of making up the original wasted plate instead of fitting a new part altogether. Further, with regard to the tensile strength of an electrically-welded joint, this may be as much as 95 per cent. of that of the original unwelded metal, the average strength being frequently from 80 to 90 per cent.

Owen Sound.—Work will be started almost immediately upon the new dock on the east side of the Owen Sound harbor. It was authorized about a year ago, and an appropriation of $89,700 has been made for it. It will be of concrete, and will be nearly 1,000 feet long. The contract has been let to a Peterborough firm, and work should start at once. When completed all the water front owned by the Government will have concrete dockage.

DOMINION CHUCKS

STEEL OR CAST-IRON BODY
BUILT FOR HEAVY DUTY

All Screws Are Reversible

SCREWS are made of the best grade steel. Both ends are broached and are heat treated after machining. They are reversible, so that either end may be used, are large enough in diameter to stand the torsional strains applied by operator when setting up his work. They are made to give the best service—and may be depended upon to stand up under the hardest usage.

DOMINION STEEL PRODUCTS CO. LIMITED
Engineers • Manufacturers
BRANTFORD, CANADA

PATENTS
ATTORNEYS

PATENTS
Fetherstonhaugh & Co.,
The old established firm. Patents everywhere. Head office, Royal Bank Bldg., Toronto. Ottawa office, 5 Elgin St. Offices throughout Canada.
Booklet Free.

DROP FORGE DIES
Send us your blueprints and specifications. Entrust your requirements to experienced workmen and up-to-date equipment. Have your dies made in Canada. First-class workmanship guaranteed.
THE KIMBER & HILLIER MFG. CO.,
Thorold Road, St. Catharines, Ont.

THE TUBE COMPANY OF CANADA LIMITED
Steel Tubing
for all purposes
Electric and Oxy-Acetylene Welded
Also
Butt Seam Tubing
Hot or cold rolled, in sizes ⅜ to 2 inches outside diameter, from 16 to 22-gauge.
We furnish any shape — Rounds, Squares, Hexagons, Ovals and Special Shapes to customers' specifications.
Expert advice given on all Steel Tubing Problems.
The Tube Company of Canada
233 Dufferin St. TORONTO, ONT

Eclipse INTERCHANGEABLE
Counterbores, Core Drills, Connecting Rod Cutters, Countersinks, Inverted Counterbores, Spot Facers, Adjustable Length Holders, And many other Special Tools
Eclipse Counterbore Co. Limited,
Walkerville, Ont.

BLACK DIAMOND OVENS
OVENS
Japanning and Varnishing Ovens heated by Gas, Electricity, Steam or Coal. Kernchen Siphonage Ventilators, Bakers' Ovens, trucks, casters, etc. Write for Booklet.
Brantford Oven & Rack Co. Ltd.
Brantford, Canada

MACHINE AND BENCH VISES
Write for Prices
Superior Machinery Co., London, Canada

HIGH CLASS Machine Tools
FOR SHIPYARDS AND CONSTRUCTIONAL WORKS
BERTRAMS LIMITED
SCIENNES EDINBURGH

Classified Opportunities

HELP WANTED

SCREW MACHINE FOREMAN WANTED FOR Cleveland and Brown & Sharpe Automatics. Give full particulars of age, experience and salary wanted. Location, small city near Toronto. Box 705, Canadian Machinery. (c13m)

WANTED—MACHINE SHOP FOREMAN FOR small shop manufacturing pumps, windmills and cylinders. Must be a man of thorough experience. Give full details first letter. Box No. 709, Canadian Machinery. (c14m)

POSITION WANTED

MECHANICAL ENGINEER WITH BROAD DE-signing and construction experience desires responsible position as assistant engineer or machine designer. First-class references available. Further particulars. Box 708, Canadian Machinery. (c14m)

RATES FOR CLASSIFIED ADVERTISING

Rates (payable in advance): Two cents per word. Count five words when box number is required. Each figure counts as one word. Minimum order $1.00. Display rates on application.

CANADIAN AGENTS WANTED

AGENTS WANTED — REPRESENTATIVE IN Eastern Canada for well-known American firm manufacturing oxy-acetylene welding apparatus, etc. Box 705F, Canadian Machinery.

FOR HIGH-GRADE AMERICAN-MADE LATHE —14 to 26. In replying state territory you can cover and cover thoroughly. Box 682, Canadian Machinery. (c22m)

AMERICAN FIRM MANUFACTURING PAT-ented process case hardening specialty wants the services of party capable of building up sales in Canada. Box 706F, Canadian Machinery.

CANADIAN REPRESENTATIVE WANTED by U.S. manufacturer of well known line of high speed and alloy steels. Correspondence invited and will be treated as confidential. Box 707F, Canadian Machinery.

CANADIAN AGENT WANTED — AMERICAN firm whose line (high grade factory specialty) is being manufactured in Canada, wishes to get in touch with live man who will act as Provincial or Dominion representative. Box 679, Canadian Machinery.

FOR SALE

14 in. Bertram Hand Feed and Perfect, Lever Feed, Sliding Head, Bench Type Drilling Machine.
No. 78 Brown-Boggs Hand Lever Punch.
60 in. x 5 ft. Back-geared, Horizontal Boring Mills.
Apply Box 704, Canadian Machinery.

PATTERNS

TORONTO PATTERN WORKS, 65 JARVIS Street, Toronto. Patterns in wood and metal for all kinds of machinery. (ctfm)

BRANTFORD PATTERN WORKS ARE PREpared to make up patterns of any kind—including marine works—to sketches, blue prints or sample castings. Prompt, efficient service. Bell 'Phone 631; Machine 'Phone 733. Brantford Pattern Works, 49 George St., Brantford, Ont. (ctfm)

MACHINE WORK WANTED

MACHINE WORK WANTED FOR LATHES, shapers, milling machine and planer, etc. Hourly or contract basis. Prompt delivery. W. H. Sumbling Machinery Co., Toronto. (ctfm)

Used Machinery Bargains

3—3 x 36 Jones & Lamson Flat Head Turret Lathes, geared feed.
2—2 x 24 Jones & Lamson Flat Head Turret Lathes, geared feed.
1—18" x 8' Cincinnati Lathe.
1—21" x 8' LeBlond Lathe.
1—24" x 10' Milwaukee Lathe.
1—26" x 10' C.M.C. Lathe.
1—38" Boring Mill.
1—Sellers Tool Grinder.

CHARLES P. ARCHIBALD & CO.
MACHINERY and SUPPLIES
285 Beaver Hall Hill Montreal

International

Railway, Marine and Industrial Supplies

Large Stocks on Hand for Prompt Shipment

Emery wheels of all sizes or for any use.
Files.
Railway Jacks and Screw Jacks.
Boiler Compound.
Flue Cleaners.
Electrical equipment to meet your requirements.
Ship's Telegraphs.
Compasses.
Rope, Manilla and Hemp.
Hose of all kinds and sizes.
Blow Torches.
Winches.
Pneumatic tools.
Brass Castings, finished and unfinished.
Warehouse Trucks.
Bearing Metals of every description, finished and unfinished.
Gaskets of all kinds and sizes.
Full line of Ship's Hardware.
Boiler Grates.
Full line of Engine-room Equipment.
Taps, Dies, Drills and Reamers.
Anti-Corrosive and Anti-Fouling Paints.
Metallic Packing of all kinds.

Wire or Write Your Requirements.

International Machinery and Supply Co., Limited
421 St. James Street, Montreal

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

Classified Opportunities

Even One Half Hour

spent reading your trade paper is time well spent. Then pass it on to your assistant, and let it help him to help you.

Machinery Wanted

New or Second Hand

We are on the market to buy the following machines:

Planer
Glue Jointer
Swing Cut-off Saws
Band Saw
Mitre Saw
Steam Engine and Boiler
Sticker
Shaper (extra large)
Power Feed Rip Saw
Belt Sander
Triple Drum Sander, 30 in.

We invite correspondence.
No business-like proposition disregarded.

Interprovincial, Ltd.
St. Pie, Bagot Co., P.Q.

AGENTS WANTED

For a high grade Piston Packing amongst mill and steamer supply houses in all the principal centres. Sold at a reasonable price, allowing for a good margin of profit to the dealer.

Write for our agent's proposition

Guildford & Sons, Limited

Office and Warehouse:
136-140 Upper Water St.
649-651 Barrington St.

Factory, June St.
HALIFAX, N.S.

FUEL OIL AT 10c GAL.

This is substantially what you pay when you use "OILGAS" furnaces and save one-half the fuel consumed in ordinary non-recuperative type furnaces.

John D.'s edicts have no terrors for users of "OILGAS" furnaces. The higher he shoves the price of oil, the greater their advantage over their competitors.

Furnaces for every heat operation.

General Combustion Company of Canada
Limited
619-623 New Birks Bldg., Montreal

LEVIATHAN AND ANACONDA
ELEVATING TRANSMITTING CONVEYING
BELTING

BELTING

That ensures a big measure of efficient and economical

SERVICE

We carry in stock Leviathan and Anaconda Belting, from 1" up, all plies, and are prepared to supply any length of belt at any time whether for conveying, elevating or transmission.

The belting comes in rolls of 500 ft., but we can supply any portion of this or one or more rolls at a moment's notice. Stocks carried at all points given in addresses below.

MAIN BELTING COMPANY
OF CANADA, LIMITED

MONTREAL
10 Peter Street
Tel. Main 7853

TORONTO
32 Front Street West
Tel. Main 1838

WINNIPEG
W. W. Hicks, 567 Banning Street
Sherbrooke 3032

EDMONTON and CALGARY
Gorman, Clancey & Grindley - Edmonton, Alberta

LA SALLE

Has an Advantage Over Other Grinders

There is some outstanding feature of all La Salle Grinding Machines that lends it exceptional productive ability.

The American Drill Grinder is especially adaptable for grinding twist, flat and three-lipped drills, because it has automatic lip rest and caliper jaw device, which assures proper clearance on all sizes of drills automatically. Send for descriptive matter covering our entire line of grinding machinery.

American Drill Grinder
For Wet or Dry Drill Grinding 1/8" to 2¼". Also 1/8" to 3½" dia.

LA SALLE TOOL CO.
La Salle, Illinois, U.S.A.

Represented in Canada by
A. R. Williams Machinery Co., Ltd.
64-66 Front Street W., Toronto
Halifax St. John, N.B. Montreal Winnipeg Vancouver

Make it Easier--

ALL-WAY

Flexible Spout Grease and Oil Guns

Make it easy to refill the most out-of-the-way gear cases or transmission as the flexible spout can be bent to any desired angle. The Cleaning Device at the end of the **"ALL-WAY"** spout reduces cleaning time and oil wastage to a minimum.

The **"ALL-WAY"** gun is especially useful and handy in filling lineshaft hanger reservoirs.

If your dealer cannot supply you, write us.

We also manufacture the well-known "ALL-WAY" Oil Can. Saves you 50% of your oil bill.

The All-Way Oiler Mfg. Co.
196 KING STREET WEST
TORONTO, ONT.

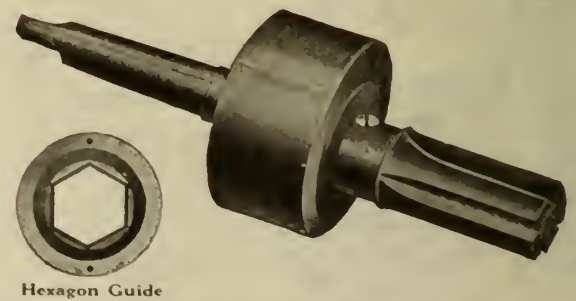
WATTS' Angular Hole Drilling Tools

A Better Job in a Fraction the Time

Watts' Angular Hole Drilling Tools have solved the problem of efficient angular hole drilling for many manufacturers. On jobs such as the making of chuck screws, socket wrenches, spring chucks, collars, feeding fingers, etc., they give entire satisfaction. Work which formerly took hours, can now be finished in a fraction of the time—and the work is cleaner and more accurate.

Full particulars upon request.

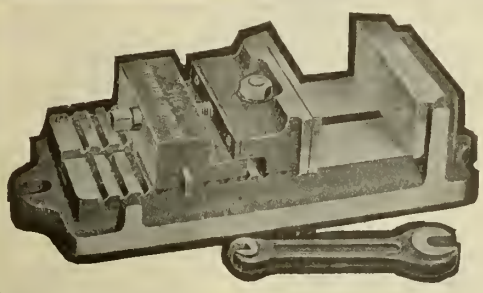
The McClean Machine & Tool Co., Ltd.
125 Mary Street Hamilton, Canada



Hexagon Guide

If interested tear out this page and place with letters to be answered.

SKINNER DRILL PRESS VISES



Designed for holding either straight or taper work this vise is portable, convenient and durable.

It is truly **THE HANDY TOOL.**

It may be bolted to a drill, planer, miller or shaper by the ears at both ends, clamped as desired by the flange or used at right angles.

THE SKINNER CHUCK COMPANY

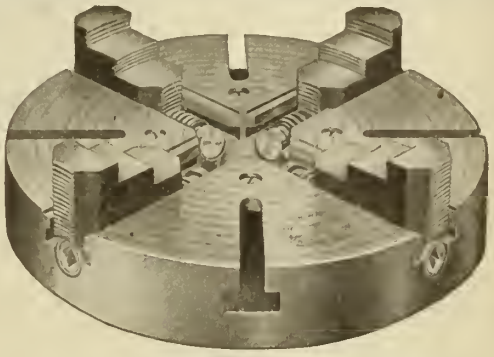
NEW BRITAIN, CONN.

New York Office: 94 Reade St.
San Francisco Office: Rialto Bldg.
London Office: 139 Queen Victoria St., London, E. C. 4.

ALL STEEL

INDEPENDENT CHUCKS

are not an experiment—they have come to stay. They are a necessity with the modern machinery and high-speed steel cutting tools.



THE UNION STEEL BODY CHUCKS

are well designed and have all the elements of strength and durability for which they are designed. We make other types in steel also, including the Geared Scroll Chucks and the Geared Scroll Combination—all designed for heavy work and hard usage.

UNION MANUFACTURING COMPANY

New Britain, Conn.

New York Office: 26 Cortlandt Street

Makers of a complete line of chucks

Can You Use Die-Castings?

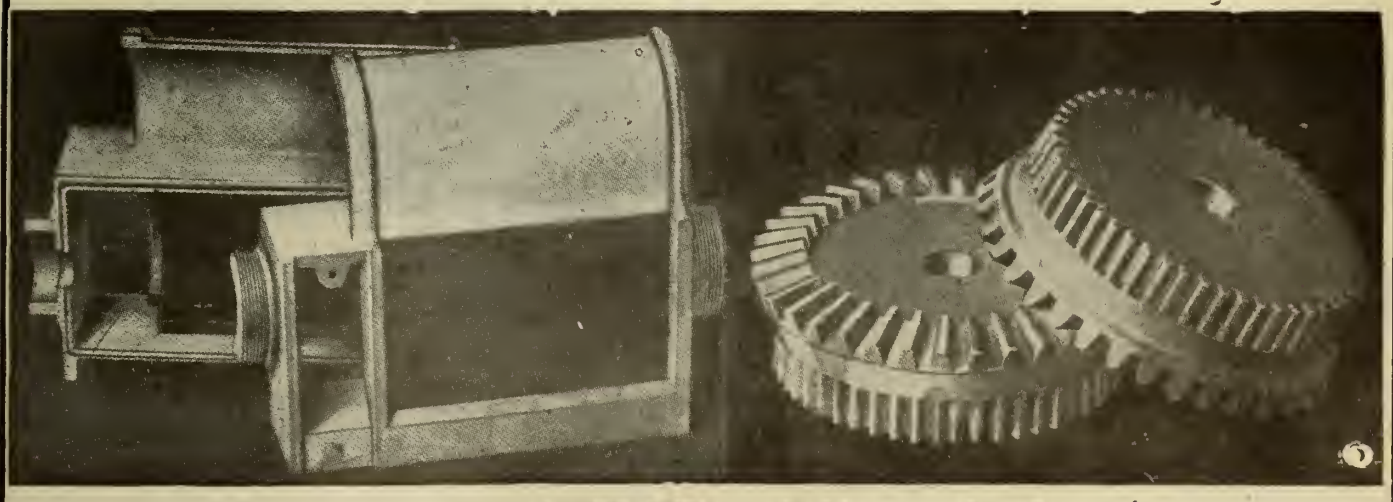
YOU can use them and save time and expense on all quantity-production work. The best way to settle this question is for you to send us blue prints or samples of your work. Do this to-day. Full information promptly!

Die-Casting Chat No. 26—The illustration below gives an idea of the parts that are possible through the die-casting method. Die-castings cover a wide field and they never fail to fill the purpose economically and efficiently for which we recommend them. They require no machinery. Don't you see where you can make a big saving?

Largest Makers of Die-Castings in Canada

THE FISHER MOTOR CO., LIMITED

ORILLIA, ONTARIO



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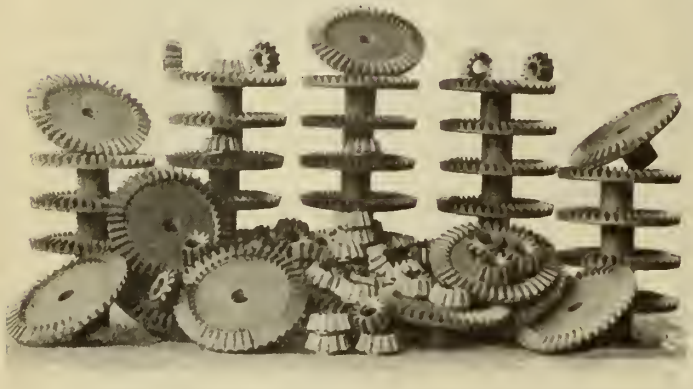
Gears in Quantities



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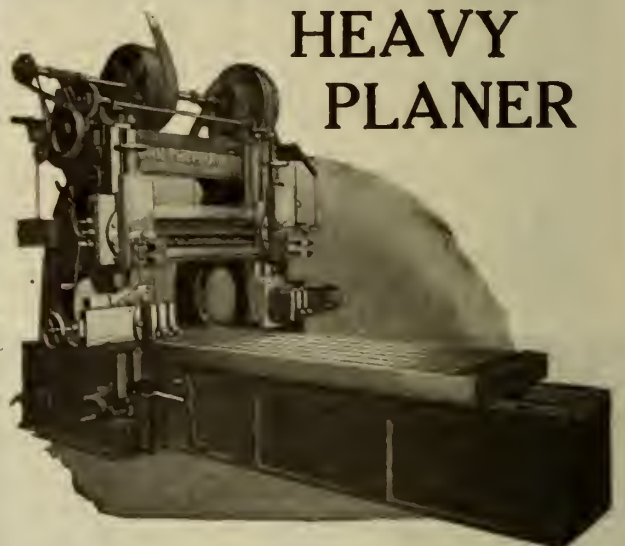

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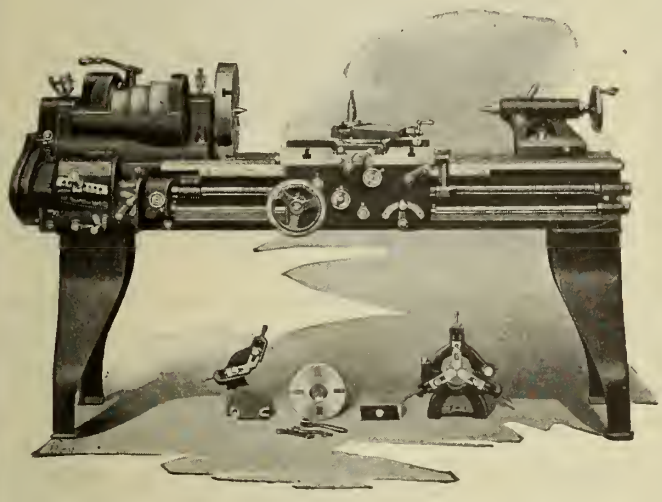

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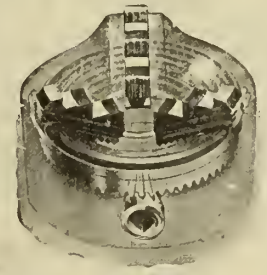

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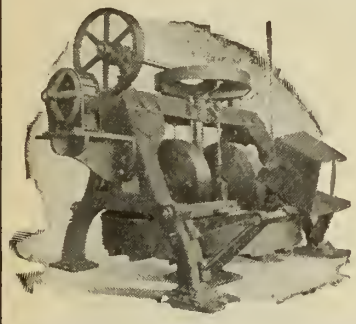

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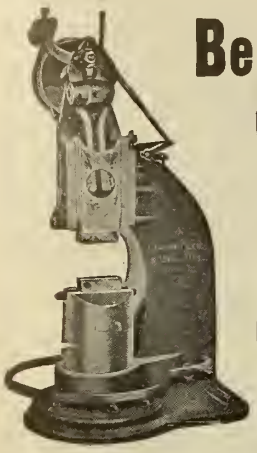

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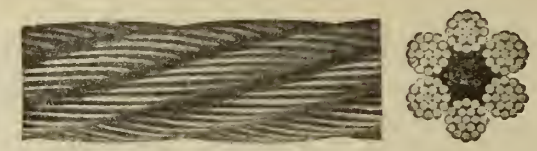

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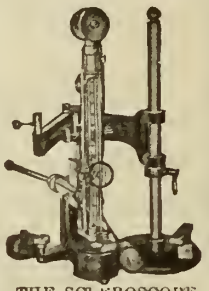

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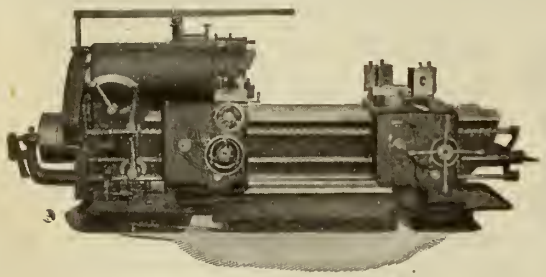

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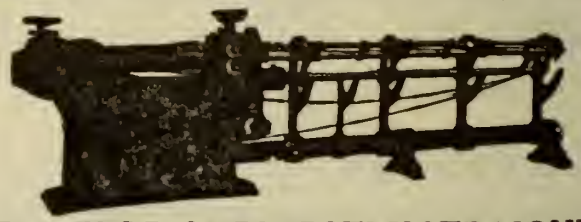

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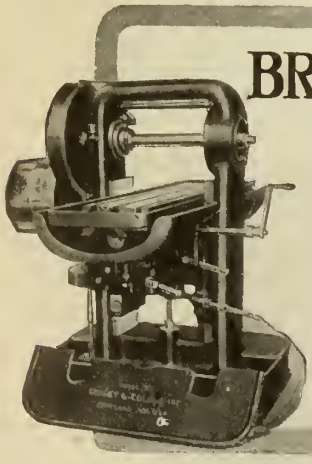

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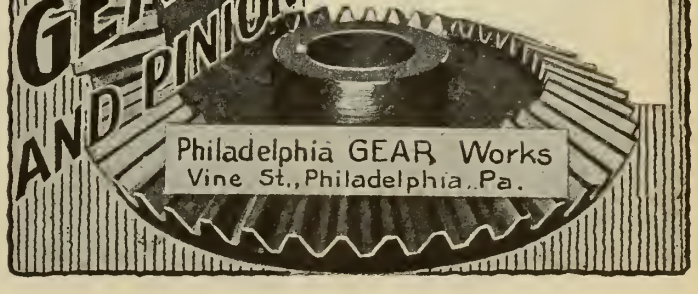

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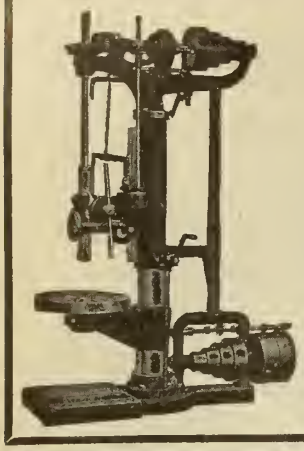

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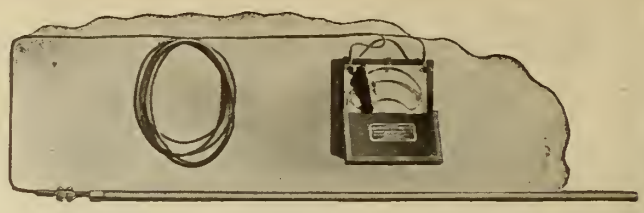

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Taylor Instrument Co., Rochester, N.Y.

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Baird Machine Co., Bridgeport, Conn.
Cleveland Wire Spring Co., Cleveland.

BARRELS, TUMBLING
Baird Machine Co., Bridgeport, Conn.
Katie Foundry, Galt, Ont.
Northern Crane Works, Walkerville, Ont.
Petrie, Ltd., H. W., Toronto.

BARS, BORING
Gisholt Machine Co., Madison, Wis.
Madison Mfg. Co., Madison, Wis.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Williams & Co., J. H., Brooklyn, N.Y.

BARS, CONCRETE REINFORCING
Algoma Steel Corp., Sault Ste. Marie.

BARS, MERCHANT
Algoma Steel Corp., Sault Ste. Marie.
Peckovers, Ltd., Toronto, Ont.
United Alloys Steel Corporation, Canton, Ohlo.

BASE FACING MACHINES
Victoria Foundry Co., Ottawa, Ont.

BATTERIES
Northern Electric Co., Ltd., Montreal, Que

BELT CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto.
Sumner & Co., New York, N.Y.
Williams Mchy Co., A. R., Toronto, Ont.

BEARINGS, GRAPHITE BRONZE
Lyman Tube & Supply Co., Montreal, Que.

BEARINGS, ROLLER
Lyman Tube & Supply Co., Montreal, Que.

BELT-LACING MACHINES, HOOKS AND PINS
Clipper Belt Lacer Co., Grand Rapids.

BELT LACING LEATHER
Aikenhead Hardware Co., Toronto, Ont.
G. F. Foss Mchy. & Sply. Co., Montreal.
Graton & Knight Mfg., Worcester, Mass.
Rice Lewis & Son, Toronto, Ont.

BELTING, BALATA
Federal Engineering Co., Toronto, Ont.

BELT HOOKS, WIRE
Clipper Belt Lacer Co., Grand Rapids.

BELTING, RUBBER
Can. Consolidated Rubber Co., Montreal.
Dunlop Tire & Ruhber Goods Co., Ltd., Toronto.
Goodyear Tire & Ruhber Co., of Canada, Ltd., Toronto.
Gutta Percha & Rubber Ltd., Toronto, Canada.

BELTING, CHAIN
Canadian Fairhanks-Morse Co., Montreal
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Petrie, Ltd., H. W., Toronto.
Renold of Canada, Ltd., Montreal.
Whitney Mfg. Co., Hartford, Conn.
Williams Mchy Co., A. R., Toronto, Ont.

BELTING, CONVEYOR
Can. Consolidated Rubber Co., Montreal.
Can. Link-Belt Co., Toronto, Ont.
Canadian Fairbanks-Morse Co., Montreal
Federal Engineering Co., Ltd., Toronto.
Gutta Percha & Ruhber, Ltd., Toronto.
Graton & Knight Mfg., Worcesteh, Mass.
International Mchy. Spls., Ltd., Montreal
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
McLaren Belting Co., J. C., Montreal.
Morse Chain Co., Ithaca, N.Y.
Petrie, Ltd., H. W., Toronto.
Quaker City Ruhher Co., Philadelphia, Pa.
Rice, Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.
Sumner & Co., New York, N.Y.
Williams Mchy Co., A. R., Toronto, Ont.

BELTING, FRICTION AND SURFACE
Can. Con. Rubber Co., Ltd., Montreal.
Gutta Percha & Ruhher, Ltd., Toronto.

BELTING, HAIR
Sumner & Co., New York, N.Y.

BELTING, LEATHER
Can. Graton & Knight Mfg. Co., Montreal
Gutta Percha & Rubher, Ltd., Toronto, Canada.

BELTING, RUBBER
International Mchy. Spls. Ltd., Montreal.
Quaker City Ruhher Co., Philadelphia, Pa.

BELTING, STITCHED COTTON DUCK
Dominion Belting Co., Hamilton, Ont.
Gutta Percha & Ruhber, Ltd., Toronto.

BELTING, WOVEN
Federal Engineering Co., Ltd., Toronto.
Sumner & Co., New York, N.Y.

BENDING MACHINERY
Bertrams, Ltd., Edinhurgh, Scotland.
Bertarm & Sons Co., John, Dundas.
Brown-Boggs Co., Ltd., Hamilton, Ont.
Can. Blower & Forge Co., Kitchener.
Dom. Steel Product Co., Ltd., Brantford.
Garlock-Walker Machinery Co., Toronto.
Petrie, Ltd., H. W., Toronto.

BLAST GATES
W. S. Rockwell Co., New York, N.Y.

BLASTING MACHINES, SAND
Garlock-Walker Machinery Co., Toronto.
Jardine, A. B., & Co., Hespeler, Ont.
National Mach. Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Strellnger, Chas. A. Co., Windsor, Ont.
Toledo Machine & Tool Co., Toledo.
Williams Mchy Co., A. R., Toronto, Ont.

BILLETS
Atkins & Co., Wm., Sheffield, Eng.
Swedish Steel & Importing Co., Ltd., Montreal.
Algoma Steel Corp., Sault Ste. Marie.
Marshall, Son & Bumney, Toronto.
United Alloy Steel Corp., Canton, Ohlo.

BILLETS, FORGING
Dominion Foundries & Steel Ltd., Hamilton, Ont.

BINS, STEEL
Dennis Wire & Iron Works, London, Ont.
Dominion Bridge Co., Montreal, Que.
MacKinnon Steel Co., Sherhrooke, Que.
Toronto Iron Works, Ltd., Toronto, Ont.
William Hamilton Co., Peterboro, Ont.

BLACKSMITH WORK
The Thos. Pink Co., Ltd., Pembroke.

BLOCKS, CHAIN
Oliver Engineering Co., Montreal.

BLOOMS AND SLABS
Algoma Steel Corp., Sault Ste. Marie.
United Alloy Steel Corp., Canton, Ohlo.

BLOWERS
Can. Blower & Forge Co., Kitchener, Ont.
Garlock-Walker Machinery Co., Toronto.
MacGovern & Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto.
Sturtevant Co., B. F., Galt, Ont.

BLOWING ENGINES
General Combustion Co., Ltd., Montreal, Que.

BLOW PIPES AND REGULATORS
Carter Welding Co., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.

BLUE PRINTING MACHINERY
Commercial Camera Co., Providence, R.I.

BLUE PRINT PAPER
Hughes, Owens Co., Ltd., Montreal, Que.

BOARTZ
Joyce, Koebel & Co., Inc., New York.

BOILER TUBES
Lyman Tube & Supply Co., Montreal, Que.

BOILER BREECHINGS
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
William Hamilton Co., Peterboro, Ont.

BOLT CUTTERS
Fellows Gear Shaper Co., Springfield, Vt.
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros., of Can., Galt, Ont.
Petrie, Ltd., H. W., Toronto.

BOILERS, RANGE
Can. John Wood Mfg. Co., Ltd., Toronto.

BOILERS
Dominion Bridge Co., Montreal, Que.
MacGovern & Co., Montreal, Que.

BOILERMAKERS' TOOLS
Holden & Co., Ltd., Montreal, Que.

BOLT CUTTERS AND NUT TAPERS
Aikenhead Hardware Co., Toronto, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Landis Machine Co., Waynesboro, Pa.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Rice Lewis & Son, Toronto, Ont.
Wells Bros. Co. of Canada, Galt, Ont.
Petrie, Ltd., H. W., Toronto.

BOLTS
Aikenhead Hardware Co., Toronto, Ont.
London Bolt & Hinge Wks., London, Ont.
Morrow Screw & Nut Co., John, Ingersoll
Rice, Lewis & Son, Toronto, Ont.
Steel Co., of Canada, Ltd., Hamilton.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

BOLTS, COUPLING
Galt Machine Screw Co., Ltd., Galt, Ont.

BOLTS, STAY
Morrow Screw & Nut Co., John, Ingersoll

BOLTS, SPRING SHAKLE
Can. Winkley Co., Ltd., Windsor, Ont.
Morrow Screw & Nut Co., John, Ingersoll

BOLTS, PATCH
Morrow Screw & Nut Co., John, Ingersoll

BOLT AND NUT MACHINERY
Bertram & Sons Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Gardner & Son, Robt., Montreal.
Landis Machine Co., Waynesboro, Pa.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ohio.
Williams Mchy Co., A. R., Toronto, Ont.

BOLT THREADING MACHINERY
Jardine & Co., Ltd., A. B., Hespeler.
Landis Machine Co., Waynesboro, Pa.
National Acme Co., Cleveland, Ohio.
Victor Tool Co., Waynesboro, Pa.

BONDING MACHINES (Electric Railway)
The Lincoln Electric Co., Toronto, Ont.

BORING MACHINES, PNEUMATIC CYLINDER
Cleveland Pneumatic Tool Co., Toronto.
Canadian Fairbanks-Morse Co., Montreal
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Garlock-Walker Machinery Co., Toronto.

BORING MACHINES, UPRIGHT AND HORIZONTAL
Bertram & Sons Co., John, Dundas.
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Gisholt Machine Co., Madison, Wis.
Herbert, Ltd., Alfred, Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Hoefer Mfg. Co., Freesport, Ill.
Landis Tool Co., Waynesboro, Pa.
Oliver Machinery Co., Grand Rapids, Mich.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto.
Rockford Drilling Mche. Co., Rockford. Ill.
Strelinger Chas. A. Co., Windsor, Out.

BORING AND TURNING MILLS
Bertram & Sons Co., John, Dundas.
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Foss Mch. & S'ply Co., Geo. F., Montreal
Herbert, Ltd., Alfred, Toronto, Ont.
Oliver Mach. Co., Grand Rapids, Mich.
Niles-Bement-Pond Co., New York.
Strelinger Chas. A. Co., Windsor, Ont.

BOXES, CAST IRON
Brown & Sharpe Mfg. Co., Providence, R.I.

BOXES, STEEL SHOP AND TOTE
Cleveland Wire Spring Co., Cleveland.

BARKES
Brown, Boggs & Co., Hamilton, Can.
Electric Steel & Metals, Ltd., Welland.

BRASS—SHEETS, ROLLS, PLATES, AND RODS
Brown's Copper and Brass Rolling Mills, New Toronto.

BRASS ALLOYS
British Smelting & Refining Co., Ltd., Montreal, Que.

BRASS AND COPPER TUBING
Lyman Tube & Supply Co., Montreal, Que.

BRASS FOUNDERS
Canada Metal Co., Toronto.
Tallman Brass & Metal Co., Hamilton.

BRASS GOODS
Crane, Ltd., Montreal, Que.

BRASS PIPE AND TUBE
Crane, Ltd., Montreal, Que.

BRASS WORKING MACHINERY
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machinery Co., Toronto.
Warner & Swasey Co., Cleveland, O.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Prest-O-Lite Co., Inc., Toronto, Ont.
Wood Turret Machine Co., Brazil, Ind.
Williams Mchy Co., A. R., Toronto, Ont.
Brown's Copper and Brass Rolling Mills, New Toronto.

BRICKS, FIRE
Elk Fire Brick Co., Can., Ltd., Hamilton, Ont.

BRIDGES, RLY. AND HIGHWAY
Dominion Bridge Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.

BROACHING MACHINES
Strelinger, Chas. A. Co., Windsor, Ont.

BRONZE—SHEETS, ROLLS, PLATES AND RODS
Brown's Copper and Brass Rolling Mills, New Toronto.

BRONZE, NAVAL
Canada Metal Co., Toronto.

BRONZE COPPER
Tallman Brass and Metal Co., Hamilton.
Canada Metal Co., Toronto.

BRUSHES, CARBON
Lyman Tube & Supply Co., Montreal, Que.

BUFFING AND POLISHING MACHINERY
Ford-Smith Mach. Co., Hamilton.
Foss Mchy. & S'ply Co, Geo. F., Montreal
Garlock-Walker Machinery Co., Toronto.
Petrie, Ltd., H. W., Toronto.

BUCKETS, DUMP
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

BUCKETS, ELEVATOR
Can. Link-Belt Co., Toronto, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

BUCKETS, CLAM SHELL, CRAB, DUMP
Brown Hoisting Machinery Co., Cleveland, Ohio.
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Ltd., Walkerville.

BULLDOZERS
Bertram & Sons Co, John, Dundas.
Canada Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford
Garlock-Walker Machinery Co., Toronto.
Lourie Mfg. Co., Springfield, Ill.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

BURNERS, OIL AND NATURAL GAS
Northern Crane Works, Ltd., Walkerville.
W. S. Rockwell Co., New York, N.Y.

BURRS, IRON AND COPPER
Parmenter & Bulloch Co., Gananoque.

BUSHING, BRONZE
Morrow Screw & Nut Co., John, Ingersoll

CALIPERS
Brown & Sharpe Mfg. Co., Providence, R.I.

CABLE, ELECTRIC
International Machinery & Supply Co., Ltd., Montreal, Que.

CABLES, TRANSMISSION AND TELEPHONES
Northern Electric Co., Ltd., Montreal.

CANNERS' MACHINERY
Bliss, E. W. Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Ont.

CANNERS' CONVEYORS
Can. Link-Belt Co., Toronto, Ont.

CARBIDE
Carter Welding Co., Ltd., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.
Union Carbide Co., of Canada, Limited, Weland, Ont.

CARBONIZING BOXES
Can. Driver-Harris Co., Ltd., Walkerville.
Katie Foundry, Galt, Ont.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.
Swedish Crucible Steel Co., Windsor.

CARRIERS, PNEUMATIC TUBE
Jones & Glasco, Montreal.

CARS, INDUSTRIAL
Can. Blower & Forge Co., Kitchener, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Elec. Steel & Metals, Welland, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

CAR MOVERS
Holden Co., Ltd., Montreal, Que.

CASES, FILING
Economy Drawing Table Co., Adrian. Mich.

CASTINGS, ALUMINUM, BRASS, BRONZE, COPPER AND GUN METAL
Algoma Steel Corp., Sault Ste. Marie.
Franklin Mfg. Co., Syracuse, N.Y.
Can. Metal Co., Toronto, Ont.

CASTINGS, DIE CAST
Can. Metal Co., Toronto, Ont.
Franklin Mfg. Co., Syracuse, N.Y.
Fisher Motor Co., Ltd., Orilla, Ont.
Tallman Brass & Metals Ltd., Hamilton, Ont.

CASTINGS, STEEL—ALL KINDS
Canada Electric Castings, Ltd., Orilla. Ont.
Dominion Foundries & Steel Ltd., Hamilton, Ont.
Electric Steel & Metals Co., Welland.
Mesta Machine Co., Pittsburgh, Pa.

CASTINGS, ELECTRIC AND ALLOY STEEL
Can. Elec. Castings Co., Ltd., Orilla, Ont.
Dominion Foundries & Steel Ltd., Hamilton, Ont.

CARRIERS COUPLING BOLTS
John Morrow Screw & Nut Co., Ingersoll.
Alexander Fleck Ltd., Ottawa.
Tallman Brass & Metal Co., Hamilton

CASTINGS, BENCH LEG
Brown & Sharpe Mfg. Co., Providence. R.I.

CASTINGS, BRASS AND IRON
Algoma Steel Corp., Sault Ste. Marie
International Machinery and Supply Co., Ltd., Montreal, Que.

CASTINGS, BUILDING
Katie Foundry, Galt, Ont.

CASTINGS, GRAY IRON
Bernard Industrial Co., A., Fortierville, Q.
Brown & Sharpe Mfg. Co., Providence, R.I.
Brown; Boggs Co., Ltd., Hamilton.
Can. Elec. Castings Co., Ltd., Orilla, Ont.
Alexander Fleck, Ltd., Ottawa.
Gardner & Son, Robt., Montreal.
Hull Iron & Steel Foundries, Ltd., Hull
Interantional Malleable Iron Co., Guelph
Kennedy & Sons, Ltd., Wm., Owen Sound.
Katie Foundry, Ltd., Galt, Ont.
Hamilton Co., Wm., Peterboro.
McFarlane Engineering Ltd., G. W., Paris, Ont.

CASTINGS, PLUMBERS'
Katie Foundry, Galt, Ont.

CASTINGS, NICHROME
Can. Driver-Harris Co., Ltd., Walkerville

CASTINGS, HARDWARE
Katie Foundry, Galt, Ont.

CASTINGS, STEEL CHROME AND MANGANESE STEEL
Thos. Davidson Mfg. Co., Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Hull Iron & Steel Foundries, Ltd., Hull.
Kennedy & Sons, Ltd., Owen Sound.

CASTINGS, MALLEABLE
International Malleable Iron Co., Guelph

CASTINGS, NICKEL STEEL
Hull Iron & Steel Foundries, Ltd., Hull.

CEMENT MACHINERY
Can. Fairbanks-Morse Co., Ltd., Montreal
Gardner, Robt., & Son, Montreal.

CEMENT HANDLING MACHINERY
Can. Link-Belt Co., Toronto, Ont.

CEMENT TOOLS
Atkins & Co., E. C., Hamilton, Ont.

CENTERING MACHINES
Victoria Foundry Co., Ottawa, Ont.

CENTRE REAMERS
Bertram & Sons Co., John, Dundas.
Butterfield & Co., Inc., Rock Island, Que.
Gardner, Robt. & Son, Montreal.
Morrow Screw & Nut Co., J., Ingersoll.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co., of Canada, Galt, Ont.

CHAIN, WELDED COIL
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

CHAIN BLOCKS
Aikenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Ford Chain Block & Mfg. Co., Phila., Pa.
Garlock-Walker Machinery Co., Toronto.
Lyman Tube & Supply Co., Montreal, Q.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Oliver Engineering Co., Montreal.
Rice Lewis & Son, Toronto, Ont.
Jones & Glassco, Montreal, Que.

CHAINS, AGRICULTURAL
Can. Link-Belt Co., Ltd., Toronto, Ont.
Morse Chain Co., Ithaca, New York.
Renold of Canada, Ltd., Montreal.

CHAINS, AUTOMOBILE ENGINE
Can. Link-Belt Co., Ltd., Toronto, Ont.
Morse Chain Co., Ithaca, N.Y.
Renold of Canada, Ltd., Montreal.

CHAINS, BICYCLE, DRIVE AND BLOCK
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold of Canada, Ltd., Montreal.

CHAINS, FOR ELEVATORS AND CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Lyman Tube & Supply Co., Montreal.
Morse Chain Co., Ithaca, N.Y.
Petrie, Ltd., H. W., Toronto.
Renold of Canada, Ltd., Montreal.
Williams Mchy. Co., A. R., Toronto, Ont.

CHAIN, MALLEABLE, DETACHABLE AND RIVETED
Can. Link-Belt Co., Toronto, Ont.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

CHAINS, POWER TRANSMISSION
Can. Link-Belt Co., Ltd., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N. Y.
Glasgow, N.S.
Renold of Canada, Ltd., Montreal.

CHAINS, SPROCKET WHEEL
Can. Link Belt Co., Ltd., Toronto, Ont.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.

CHAIN DRIVES
Can. Link-Belt Co., Ltd., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold of Canada, Ltd., Montreal.

CHASERS
National Acme Co., Cleveland, Ohio.
Taylor, J. A. M., 318 Stair Bldg., Toronto, Ont.

CHEMISTS
Toronto Testing Labatory, Ltd., Toronto.

CHUCKS, AERO, AUTOMATIC
Garvin Machine Co., New York.

CHUCKS, COLLET, AIR
Petrie, Ltd., H. W., Toronto.
Williams Mchy. Co., A. R., Toronto.

CHUCKS, DRILL, LATHE AND UNIVERSAL
Aikenhead Hardware Co., Toronto, Ont
Bertram & Sons Co., John, Dundas.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Ltd., Brantford
Foss Mchy. & Sply Co., Montreal.
Gardner, Robt. & Son, Montreal.
Garlock-Walker Machinery Co., Toronto.
Gisholt Machine Co., Madison, Wis.
Herbert, Ltd., Alfred, Toronto, Ont.
Jacobs Mfg. Co., Hartford, Conn.
Ker & Goodwin Machine Co., Ltd.
Rice Lewis & Son, Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

CHUCKS, DRILL, AUTOMATIC AND KEYLESS
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener.
McCrosky Tool Corp., Meadville, Pa., U. S. A.
Strelinger, Chas. A. Co., Windsor, Ont.

CHUCKS, FRICTION AND TAP
Victor Tool Co., Waynesboro, Pa.

CHUCKS, MAGNETIC
Heald Machine Co., Worcester, Mass.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co., Ltd., A. R., Montreal

CHUCKS, RING WHEEL
Ford-Smith Mach Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.

CHUCKING MACHINES
Brown & Sharpe Mfg. Co., Providence, R.I.
Garvin Machine Co., New York.
Gisholt Machine Co., Madison, Wis.
National Acme Co., Windsor, Vt.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Warner & Swasey Co., Cleveland, O.
Williams Mchy. Co., A. R., Toronto, Ont.

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Elk Fire Brick Co., Can., Ltd., Hamilton, Ont.

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Oakley Chemical Co., New York, N.Y.

CLEANING COMPOUND
Oakley Chemical Co., New York, N.Y.

CLOCK SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

CLOCKS, WATCHMAN, PORTABLE
Gisholt Machine Co., Madison, Wis.

CLOSETS
Crane, Ltd., Montreal, Que

CLUTCHES, CHAIN
Wright Mfg. Co., Lisbon, Ohio.

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Bernard Industrial Co. A., Fortierville Que.
Can. Link-Belt Co., Ltd., Toronto, Ont.
Carlyle Johnson Mach. Co., Manchester, Conn.
Positive Clutch & Pulley Wks., Aurora, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.

COAL CRUSHERS
Can. Link-Belt Co., Ltd., Toronto, Ont.

COAL HANDLING MACHINERY
Brown Hoisting Machinery Co., Cleveland, Ohio.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Ltd., Toronto, Ont.
Dominion Bridge Co., Montreal, Que.
MacGovern & Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Nova Scotia Steel & Coal Co., New

COLD ROLLED STRIP, ALL METAL COLLARS, SHAFTING
Can. Driver-Harris Co., Ltd., Walkerville.
Williams & Co., J. H., Brooklyn, N.Y.

COLLECTORS, PNEUMATIC
Can. Blower & Forge Co., Kitchener
Sturtevant Co., B. F., Galt, Ont.

COMPOSITION INGOT
Canada Metal Co., Toronto.

COMPOUNDS, CUTTING AND GRINDING, DRAWING STAMPING
Oakley Chemical Co., New York, N.Y.

COMPRESSORS, AIR
Atkins & Co., E. C., Hamilton, Ont.
Can. Ingersoll-Rand Co., Sherbrooke.
Cleveland Pneumatic Tool Co., Toronto.
Curtis Pneumatic Machy. Co., St. Louis
Garlock-Walker Machinery Co., Toronto.
Holden Co., Ltd., Montreal, Que.
MacGovern & Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto.
Superior Machinery Co., London, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

CONDENSERS
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
MacGovern & Co. Montreal, Que.

CONDUITS
Northern Electric Co., Ltd., Montreal, Que.

CONNECTING RODS
Canada Found's & Forgings, Ltd., Welland. Ont.

CONNECTING ROD CUTTERS INTERCHANGEABLE
Eclipse Counter bore Co., Ltd., Walkerville, Ont.

CONTRACT WORK
Brown Engineering Corp., Toronto.
Ford-Smith Machine Co., Hamilton, Ont.
Globe Engineering Co., Hamilton, Ont.
Katie Foundry, Ltd., Galt, Ont.
Victoria Foundry Co., Ottawa.

CONTROLLERS, MAGNETIC BRAKES, ELECTRIC WINCHES, MONO RAIL HOISTS
Volta Mfg. Co., Welland, Ont.

CONTROLLERS AND STARTERS
Williams Mach'y. Co., A. R., Toronto.

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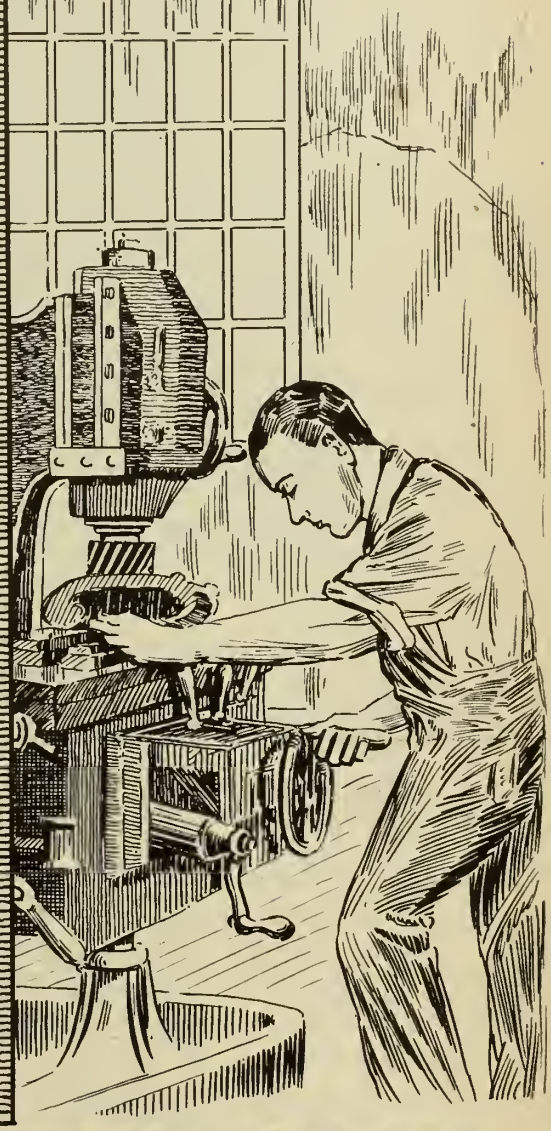

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U. S. Electrical Tool Co., Cincinnati, O
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Lyman Tube & Supply Co., Montreal, Que.
Marshall, Son & Bunney, Toronto.
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Cincinnati Electrical Tool Co., Cincinnati.
Cleveland Twist Drill Co., Cleveland.
Garlock-Walker Mchy. Co., Toronto, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Mch. Co., New Bedford Mass.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
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W. S. Rockwell Co., New York, N.Y.

DRUM CONTROLS

Volta Manufacturing Co., Welland, Ont.

DUMP CARS

Canadian Fairbanks-Morse Co., Montreal.
MacKinnon Steel Co., Sherbrooke, Que.

DUST HANDLING EQUIPMENT

Sturtevant Co., B. F., Galt, Ont.

DUST SEPARATORS

Can. Blower & Forge Co., Kitchener, Ont.
Sturtevant Co., B. F., Galt, Ont.

DYNAMOS AND ELECTRICAL SUPPLIES

Canadian Fairbanks-Morse Co., Montreal.
MacGovern & Co., Montreal Que.
Strelinger Co., Chas. A., Windsor, Ont.
A. R. Williams Machy. Co., Toronto.

ELECTRICAL SUPPLIES

Lyman Tube & Supply Co., Montreal, Que.
Northern Electric Co., Ltd., Montreal Que

ELECTRIC FURNACES

Electric Furnace Construction Co., Philadelpria, Pa.
Volta Manufacturing Co., Welland, Ont.

EECTRIC FURNACE REGULATORS, WINCHES, ROOF COOLERS AND ELECTRODE HOLDERS

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ELECTRIC HOISTS, STATIONARY AND MONO RAIL

Canadian Link-Belt Co., Ltd., Toronto,
Volta Manufacturing Co., Welland, Ont.

ELECTRIC MOTORS

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Sturtevant Co., B. F., Galt, Ont.
Volta Manufacturing Co., Welland, Ont.

ELECTRIC TRUCKS

Cowan Truck Co., Holyoke, Mass.

ELEVATOR, ENCLOSURES

Volta Mfg. Co., Welland, Ont.
Canada Wire & Iron Goods Co., Hamilton

ELEVATOR WEIGHTS

Katie Foundry, Galt, Ont.

ELEVATORS AND BUCKETS

Can. Link-Belt Co., Toronto, Ont.
Curtis Pneumatic Machy. Co., St. Louis.

ELEVATING AND CONVEYING MACHINERY

Can. Link-Belt Co., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Petrie, Ltd., H. W., Toronto.

EMBOSSING PRESSES

Dom. Steel Products Co., Ltd., Brantford.
Oliver Machinery Co., Grand Rapids, Mich

EMERY GRINDERS (PNEUMATIC)

Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Cleveland Pneumatic Tool Co., Toronto.
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.

EMERY CLOTH

Atkins & Co., E. C., Hamilton, Ont.

EMERY PAPER

Atkins & Co., E. C., Hamilton, Ont.

EMERY AND EMERY WHEELS

Atkins & Co., E. C., Hamilton, Ont.
Brantford Emery Wheel Co., Brantford, Canada.
The Foss Mchy. & Supply Co., Montreal.
Garvin Machine Co., New York.
Canadian Fairbanks-Morse Co., Montreal.
Canada Emery Wheels Co., Hamilton.
Dominion Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Mach. Co., Hamilton, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.
Wilkinson & Kompass, Hamilton, Ont.
Dominion Abrasive Wheel Co., Ltd., Mimico, Ont.

EMERY WHEEL DRESSINGS

Dominion Abrasive Co., Ltd., Mimico, Ont.
Wheel Trueing Tool Co., Windsor Ont.

ENAMELWARE

Crane, Ltd., Montreal, Que.

END MILLS

John Morrow Screw & Nut Co., Ingersoll

ENGINEERS—INDUSTRIAL CLEANING (Free Consultation)

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ENGINEERS

Samuel Osborne (Canada) Ltd., Montreal.

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Canadian Fairbanks-Morse Co., Montreal.
Holden Co., Ltd., Montreal, Que.
Johnson Mach. Co., Carlyle, Manchester, Conn.
MacGovern & Co., Montreal, Que.
Sturtevant Co., B. F., Galt, Ont.

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Hamilton Co., Ltd., Wm., Peterborough, Ont.
Johnson Mach. Co., Carlyle, Manchester, Conn.
Petrie, Ltd., H. W., Toronto.
A. R. Williams Machy. Co., Toronto.

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Holden Co., Ltd., Montreal, Que.
Ker & Goodwin Machine Co., Ltd., Brantford, Ont.

ENGINES, HEAVY OIL, DIESEL TYPE

Dom. Steel Products Co., Ltd., Brantford
Holden Co., Ltd., Montreal, Que.

ENGINES, MARINE

Can. Ingersoll-Rand Co., Sherbrooke, Que
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Holden Co., Ltd., Montreal, Que.

ESCUTCHEON PINS

Parmenter & Bulloch, Gananoque, Ont.

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Canadian Fairbanks-Morse Co., Montreal.
Sturtevant Co., B. F., Galt, Ont.

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Petrie, Ltd., H. W., Toronto.
Sturtevant Co., B. F., Galt, Ont.
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FACTORY SITES

City of St. Johns, Quebec.

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Can. Blower & Forge Co., Kitchener, Ont.
Sturtevant Co., B. F., Galt, Ont.

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Can. Wire & Iron Goods, Hamilton, Ont

FERRO-TUNGSTEN

Vanadium-Alloys Steel Co., Pittsburgh, Pa

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Diamond State Fibre Co., Bridgeport, Pa.

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Atkins & Co., Wm., Sheffield, Eng.
Ingersoll File Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Marshall, Son & Bunney, Toronto, Ont.
Nicholson File Co., Port Hope, Ont.
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Lyman Tube & Supply Co., Montreal, Que.

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Elk Fire Brick Co., Hamilton, Ont.
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Crane, Ltd., Montreal, Que.

FIXTURES

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Aikenhead Hardware Co., Toronto, Ont
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FORGINGS

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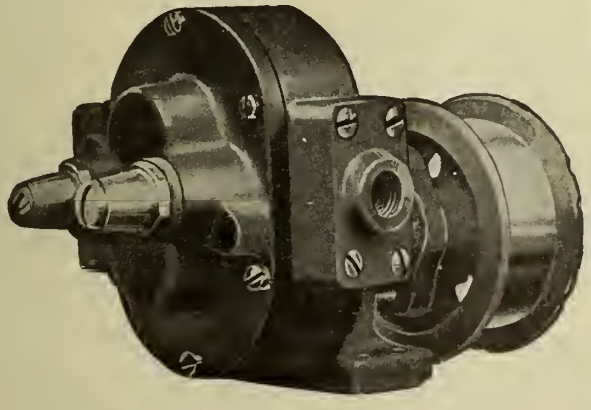

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Taylor Instrument Co., Rochester, N.Y.

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Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Hartford, Conn.
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Can. Steel Foundries, Ltd., Montreal,
Dom. Found. & Steel, Hamilton, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

GEAR BLANKS, CAST
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Dom. Foundries & Steel, Hamilton, Ont.
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Hamilton Gear & Machine Co., Toronto.
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Hamilton Co., Ltd., Wm., Peterborough.
Jones & Glassco, Montreal.
Lyman Tube & Supply Co., Montreal, Que.
Philadelphia Gear Works, Philadelphia.
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Garlock-Walker Machinery Co., Toronto

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La Salle Tool Co., La Salle, Ill.

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Superior Machinery Co., London, Ont.

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Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Haskins & Co., R. C., Chicago, Ill.
Wisconsin Electric Co., Inc., Racine, Wis
Cleveland Pneumatic Tool Co., Toronto.
Ford-Smith Mach. Co., Hamilton, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machinery Co., Toronto.
Holden Co., Ltd., Montreal, Que.
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Heald Machine Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.
Manhattan Machine & Tool Co., Grand Rapids, Mich.
Norton Co., Worcester, Mass.
Pratt & Whitney Co., Dundas, Ont.
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Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

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Landis Machine Co., Waynesboro, Pa.
National-Acme Co., Cleveland, Ohio.

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Strelinger Co., C. A., Windsor, Ont.
United States Elec. Tool Co., Cincinnati
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Garlock-Walker Machinery Co., Toronto.
Heald Machine Co., Worcester, Mass.
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Petrie, Ltd., H. W., Toronto.
Pratt & Whitney Co., Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Norton Co., Worcester, Mass.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

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Greenfield Machine Co., Greenfield, Mass.
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Norton Co., Worcester, Mass.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
Wisconsin Electric Co., Racine, Wis.
Williams Mchy Co., A. R., Toronto, Ont.
Williams Tool Corp. of Can. Ltd., Brantford, Ont.

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Norton Co., Worcester, Mass.

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Ford-Smith Machine Co., Hamilton, Ont.
Foss Mchy. & S'ply Co. G. F., Montreal
Norton Co., Worcester, Mass.

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Ford-Smith Machine Co., Hamilton, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Marshall, Son & Bunney, Toronto.
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Petrie, Ltd., H. W., Toronto.
Rice Lewis & Son, Toronto, Ont.
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Standard Machy. & Supplies, Montreal.
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Wilkinson & Kompass, Hamilton.
Williams Mchy Co., A. R., Toronto, Ont.

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Atkins & Co., E. C., Hamilton, Ont.
Can. Fairbanks-Morse Co., Montreal.
Ford-Smith Machine Co., Hamilton, Ont.
Garvin Machine Co., New York City.
Victor Saw Works, Hamilton, Ont.
Rice Lewis & Son, Toronto, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
Wilkinson & Kompass, Hamilton, Ont.

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Atkins & Co., E. C., Hamilton, Ont.
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Diamond Saw & Stamping Wks., Buffalo.
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Ford-Smith Machine Co., Hamilton.
Perfect Machine Co., Galt, Ont.
Starrett Co., L. S., Athol, Mass.
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Williams Machy. Co., A. R., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

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Hoskins & Co., R. C., Chicago, Ill.

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High Speed Hammer Co., Rochester, N.Y.
Jardine & Co., A. B., Hespeler, Ont.
Niles-Bement-Pond Co., New York, N.Y.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
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United Hammer Co., Boston, Mass.
Williams Mchy Co, Ltd., A. R., Montreal

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United Hammer Co., Boston, Mass.

HAMMERS, POWER
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HEAT GAUGES, HARDENING AND ANNEALING
Shore Instrument & Mfg. Co., New York

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See Steel.

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London Bolt & Hinge Wks., London, Ont.

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Pratt & Whitney Co., Dundas, Ont.
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Holden Co., Ltd., Montreal, Que.
Morris Crane & Hoist Co., Herbert Niagara Falls, Ont.

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Northern Crane Works, Walkerville, Ont.
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For Longer-Lived Buildings

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The inherent qualities of asphalt and asbestos protect the natural strength of the steel core, providing absolute immunity from the destructive effect of all corrosive elements. Robertson Process Metal costs less than any other permanent building material. It can be erected speedily and economically. It has all the *lightweight, structural steel* and *foundation* cost-saving features of corrugated iron. Its light weight insures a substantial reduction in freight charges. A square of R. P. M. weighs, on the average, only 200 pounds. The covering area of a ton of R. P. M. is far greater than any other building material of equal durability.

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If interested tear out this page and place with letters to be answered.

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Garvin Machine Co., New York.
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Williams Machy. Co., A. R., Toronto.

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See Saws.

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Hoefer Mfg. Co., Freeport, Ill.
Lyman Tube & Supply Co., Montreal, Que.

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Canada Metal Co., Toronto, Ont.
Deloro Smelting & Refining Co., Ltd, Toronto, Ont.
Hoyt Metal Co., Toronto, Ont.
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Standard Machy. & Supplies, Montreal.

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General Combustion Co., Ltd., Montreal, Que.

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Kearney & Trecker Co., Milwaukee Wis.
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Hendey Mach. Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Niles-Bement-Pond Co., New York.
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Strelinger, Chas. A. Co., Windsor, Ont.

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Standard Equipment & Tool Wks., Montreal, P.Q.

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Butterfield & Co., Inc., Rock Island, Que.
Cleveland Milling Machine Co., Cleveland.
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Standard Equipment & Tool Wks., Montreal, P.Q.
Strelinger, Chas. A. Co., Windsor, Ont.

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Ford-Smith Mach. Co., Hamilton, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.
Herbert, Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
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United States Mach. Tool Co., Cincinnati
Williams Machy. Co., A. R., Toronto

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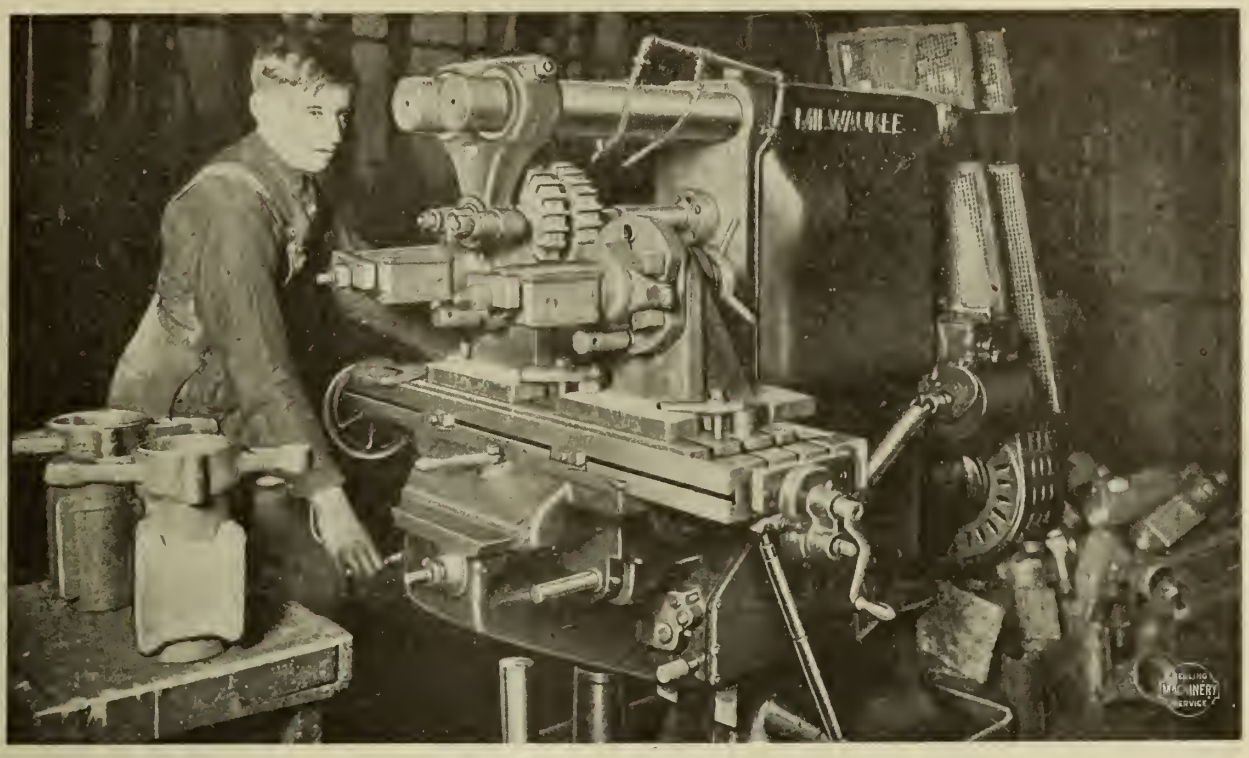
Brown & Sharpe Mfg. Co., Providence
Canada Machinery Corp., Galt, Ont.
Cleveland Milling Machine Co., Cleveland.
Cincinnati Milling Machine Co., Cincinnati
Ford-Smith Mach. Co., Hamilton, Ont.



Milwaukee Milling Machines

The straddle milling of "spider" arms is illustrated above. The work is held in indexing fixtures and the table is fed upward towards the cutters. No table travel is used. The castings are made of malleable iron and about 1/16 in. of stock is removed from the face of each arm.

The pieces are held at a considerable distance from the top of the table and the work is done efficiently, due to the double overarm and solid top knee with extended bearing.

Milwaukee Milling Machines possess many features of merit that not only contribute towards exceptional accuracy, rigidity and durability, but also minimize supervision and upkeep, and provide for ease of operation. Simplicity—stands out pre-eminently. Following are some noteworthy features: Constant speed drive; box section column; solid top, box section knee; double overarm; flanged spindle; automatic flooded lubrication of all gears and bearings in the column, feed box and pulley bracket; automatic cutter lubricating system.

Write for catalog.

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Milwaukee, Wis., U.S.A.

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Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

MILLING TOOLS

Aikenhead Hardware Co., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence.
Ford-Smith Mach. Co., Hamilton, Ont.
Geometric Tool Co., New Haven, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
Rice Lewis & Son, Toronto, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

MINE CARS

Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Dominion Bridge Co., Montreal, Que.
Elec. Steel & Metals, Welland, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
Pratt & Whitney Co., Dundas, Ont.

MINING MACHINERY

Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Elec. Steel & Metals, Welland, Ont.
Holden Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto.
Williams Machy. Co., A. R., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

MIXERS, SAND

Frost Mfg. Co., Chicago, Ill.

MORTISING CHAINS

Renold of Canada Ltd., Montreal.

MORTISING MACHINES

Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.

MOTORS, ELECTRIC

Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont. Toronto.
Lincoln Electric Co. of Canada, Ltd., Toronto, Ont.
MacGovern & Co., Montreal, Que.
Northern Elec. Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Sturtevant Co., B. F., Galt, Ont.
Volta Mfg. Co., Welland, Ont.
Williams Mach'y Co., A. R., Toronto.

MOTOR SPRINGS

The Dunbar Brothers Co., Bristol, Conn.

MOTORCYCLE FRAME AND FORK

The Dunbar Brothers Co., Bristol, Conn.

MOTORS, PNEUMATIC

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto.
Holden Co., Ltd., Montreal, Que.

MOULDS, RUBBER

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

MULTIPLE INDEX CENTRES

Garvin Machine Co., New York.
Graton & Knight Mfg. Co., Worcester, M.

MULTI-DRILLING, MULTI-BORING, MULTI-TAPPING MACHINERY,

Nat. Automatic Tool Co., Richmond, Ind.

MUNICIPALITIES

City of St. John, Quebec.

NAIL SETS

Morrow Screw & Nut Co., J., Ingersoll, Ont

NAME PLATES, BRONZE, ETCHED AND STAMPED

Turner Brass Works, Sycamore, Ill.

NICHROME CASTINGS

Can. Driver-Harris Co., Ltd., Wallaceville.

NICKEL

Pilot Steel & Tool Co., Montreal, Que.

NICKEL STEEL

See Steel.

NICKEL SILVER—SHEETS, ROLLS, PLATES and RODS

Brown's Copper and Brass Rolling Mills, New Toronto.

NIPPLE THREADING MACHINES

Landis Machine Co., Waynesboro, Pa.
Williams Tool Corp. of Can. Ltd., Brantford, Ont.

NITROGEN

Carter Welding Co., Toronto, Ont.

NUTS, STEEL, CASTELLATED AND COLD PRESSED

Galt Machine Screw Co., Ltd., Galt, Ont.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Williams & Co., J. H., Brooklyn, N.Y.

NUTS, SEMI-FINISH AND FINISHED

Galt Machine Screw Co., Galt, Ont.
National-Acme Co., Cleveland, Ohio.
Wilkinson & Kompass, Hamilton.

NUT LOCKS

Edw. W. Robinson Co., Ltd., Montreal.

NUT BURRING AND NUT MACHINES (HOT)

National Machy. Co., Tiffin, Ohio.

NUT FACING AND BOLT SHAVING MACHINES

Garvin Machine Co., New York.
National Machinery Co., Tiffin, Ohio.
Petrie, Ltd., H. W., Toronto.
Victor Tool Co., Waynesboro, Pa.

NUT TAPPERS

Bertram & Sons Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
Jardine & Co., A. B., Hespeler.
Landis Machine Co., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Tool Corp. of Can. Ltd., Brantford, Ont.

OILERS

All-Way Oiler Mfg. Co., Toronto, Ont.

OIL SEPARATORS

Can. Fairbanks-Morse Co., Montreal.

OIL STONES

Aikenhead Hardware Co., Toronto, Ont.
Carborundum Co., Niagara Falls, N.Y.
Norton Co., Worcester, Mass.
Rice Lewis & Son, Toronto, Ont.

OIL STONE GRINDERS

Oliver Machy. Co., Grand Rapids, Mich

OIL STORAGE SYSTEMS

Bowser Co., Ltd., S. F., Toronto, Ont.

OPENING DIE HEADS

Greenfield Tap & Die Corp, Greenfield
Wells Bros. of Canada, Galt, Ont.

ORE HANDLING EQUIPMENT

Brown Hoisting Machinery Co., Cleveland, Ohio.
Canadian Link-Belt Co., Ltd., Toronto, Ont.

OSCILLATING VALVE GRINDERS (PNEUMATIC)

Cleveland Pneumatic Tool Co. of Canada, Toronto.

OVENS FOR BAKING, BLUING, DRYING, ENAMELING, JAPANNING AND LACQUERING

Brantford Oven & Rack Co., Brantford

OVEN TRUCKS, STEEL

Brantford Oven & Rack Co., Brantford
MacKinnon Steel Co., Sherbrooke, Que.

OVENS FOR DRYING, TEMPER AND OXYGEN, ELECTROLYTIC CELLS UNDER TRUCKS

Brantford Oven & Rack Co., Brantford

OXY-ACETYLENE WELDING AND CUTTING AND OUTFITS

Carter Welding Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
L'Air Liquide Society, Toronto, Ont.
Prest-o-Lite Co., Inc., Toronto, Ont.
Davis-Bournonville Co., Toronto, Ont.

OXYGEN

Carter Welding Co., Ltd., Toronto, Ont.
Dominion Oxygen Co., Ltd., Toronto, Ont.
Nat. Electro Products Ltd., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.

OXYGEN PLANTS (ELECTROLYTIC)

Davis-Bournonville Co., Toronto, Ont.

PACKINGS, ASBESTOS

Cleveland Wire Spring Co., Cleveland.

PACKING, ROD AND SHEET

Dunlop Tire & Rubber Goods Co., Ltd. Toronto.
Goodyear Tire & Rubber Co., Can., Ltd. Toronto
Gutta Percha & Rubber, Ltd., Toronto.
International Mach. Spts., Ltd., Montreal
Petrie, Ltd., H. W., Toronto.
Quaker City Rubber Co., Philadelphia, Pa

PANS, WET AND DRY

Frost Mfg. Co., Chicago, Ill.

PAPER MILL CONVEYORS AND DRIVES

Bertrams, Ltd., Edinburgh, Scotland.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Gutta Percha & Rubber, Ltd., Toronto.
MacKinnon Steel Co., Sherbrooke, Que.

PARTITIONS, WIRE

See Guards

PAPER MILL MACHINERY

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Machinery Co., Toronto.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

PATTERN SHOP EQUIPMENT

Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Oliver Machy. Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.

PATTERN MAKERS' LATHES

See Lathes.

PATENT SOLICITORS

Fetherstonhaugh & Co., Ottawa.
Marion & Marion, Montreal.
Ridout & Maybee, Toronto.

PECK CARRIERS FOR POWER PLANTS

Can. Link-Belt Co., Toronto, Ont.

PENSTOCKS

William Hamilton Co., Peterboro, Ont.

PERFORATED METALS AND ORNAMENTAL IRON GOODS

Canada Wire & Iron Goods Co., Hamilton

PHOSPHOR TIN, COPPER AND BRONZE

British Smelting & Refining Co., Ltd., Montreal, Que.

PHOTOSTATS

Commercial Camera Co., Providence, R.I.

PIG IRON

Hanna & Co., M. A., Cleveland, O.
Steel Co. of Canada, Ltd., Hamilton, Ont.

PINS, TAPER

Morrow Screw & Nut Co., J., Ingersoll, Ont

PINS, BELT-LACING

Clipper Belt Lacer Co., Grand Rapids.

PIPE, BLACK & GALVANIZED

Crane, Ltd., Montreal, Que.

PIPE FITTINGS, MALLEABLE AND CAST IRON

International Malleable Iron Co., Guelph.

PIPE CUTTING AND THREADING MACHINES

Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
McDougall Co., R., Galt.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Wells Bros. Co. of Canada, Galt, Ont.
Williams Machy. Co., A. R., Toronto.
Williams Tool Corp. of Can. Ltd., Brantford, Ont.

PIPE, JOINT COMPOUNDS

Crane, Ltd., Montreal, Que.

PIPE RIVETED STEEL

Toronto Iron Works, Ltd., Toronto.
William Hamilton Co., Peterboro, Ont.

PIERCING

Oliver Machy. Co., Grand Rapids, Mich.

PIPE CUTTERS, ROLLING

Greenfield Tap & Die Corp., Greenfield
Wells Bros. Co. of Canada, Galt, Ont
Williams Tool Corp. of Can. Ltd., Brantford, Ont.

PIPE TOOLS AND DIES

Ackworthie Ltd., J., Birmingham, Eng.
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PIPE CUTTERS AND REAMERS

Greenfield Tap & Die Corp., Greenfield.
Strelinger, Chas. A. Co., Windsor, Ont.
Wells Bros. of Canada, Galt, Ont.

PIPE STOCKS AND THREADERS

Greenfield Tap & Die Corp., Greenfield.
Strelinger, Chas. A. Co., Windsor, Ont.
Wells Bros. of Canada, Galt, Ont.

PIPE TAPS AND VISES

Ackworthie Ltd., J., Birmingham, Eng.
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PIPE WRENCHES

Greenfield Tap & Die Corp., Greenfield
Wells Bros. of Canada, Galt, Ont.

PISTON AND PISTON RING MACHINES

National Acme Co., Windsor, Vt.

PLANER BOLTS

Athins & Co., E. C., Hamilton, Ont.
Morrow Screw & Nut Co., J., Ingersoll, Ont

PLANER JACKS

Armstrong Bros. Tool Co., Chicago.

PLANERS, STANDARD AND ROTARY

Betts Machine Co., Rochester, N.Y.
Bertram & Sons Co., John, Dundas.
Oliver Machy. Co., Grand Rapids, Mich.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal
Gardner & Son, Robt., Montreal.
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Herbert Ltd., Alfred, Toronto, Ont.
Morton Mfg. Co., Muskegon Heights, Mich
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
Standard Equipment & Tool Wks., Montreal.

PLANING AND SHAPING MACHINERY

Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal
Garlock-Walker Machinery Co., Toronto
Garvin Machine Co., New York.
Herbert, Ltd., Alfred, Toronto, Ont.
Niles-Bement-Pond Co., New York.
Parris, Ltd., William, Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co. Ltd., A. R., Montreal

PLANER-SHAPER, COMBINED OPEN SIDE

Petrie, Ltd., H. W., Toronto.

PLANING MILL EXHAUSTERS

Can. Blower & Forge Co., Kitchener, Ont.
MacGovern & Co., Montreal, Que.
Niles-Bement-Pond Co., New York.
Sturtevant Co., B. F., Galt, Ont.

PLATES, Q.M., SHEARED AND CHEQUERED

Pechovers, Ltd., Toronto, Ont.

PLIERS

Aikenhead Hardware Co., Toronto.
Rice Lewis & Son, Toronto, Ont.

PNEUMATIC CYLINDERS

Holden Co., Ltd., Montreal, Que.

PNEUMATIC EQUIPMENT

Strelinger Co., C. A., Windsor, Ont.

PNEUMATIC TOOLS

Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland P'matic Tool Co., Can., Toronto.
Curtis Pneumatic Machy. Co., St. Louis.
Garlock-Walker Machy. Co., Toronto.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool Co., Chicago.
Int. Mach. & Supply Co., Ltd., Montreal.
Strelinger, Chas. A. Co., Windsor, Ont.

POWER CRANES, HAND

MacKinnon Steel Co., Sherbrooke, Que.

POLISHING MACHINES

Ackworthie Ltd., J., Birmingham, Eng.
Brown & Sharpe Mfg. Co., Providence, R.I.
Ford-Smith Machine Co., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto.

POLISHING PLATES

Greenfield Tap & Die Corp., Greenfield.
Petrie, Ltd., H. W., Toronto.
Wells Bros. of Canada, Galt, Ont.

POTS AND KETTLES, CAST STEEL

Elec. Steel & Metals, Welland, Ont.

POWER HOUSE CONVEYORS

Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

PORTABLE MACHINERY

Hastings & Co., R. C., Chicago, Ill.

POWER TRANSMISSION MCHY.

Canadian Link-Belt Co., Ltd., Toronto, Hamilton Co., Ltd., Wm., Peterborough, Ont.
Petrie, Ltd., H. W., Toronto.

PRECISION MACHINES

Herbert Ltd., Alfred, Toronto, Ont.

PRESSED STEEL PARTS

Ackworthie Ltd., J., Birmingham, Eng.

PRESSERS, ARBOR

Atlas Press Co., Kalamazoo, Mich.
Metalwood Mfg. Co., Detroit, Mich.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
Lourie Manufacturing Co., Springfield, Ill.

PRESSES, BROACHING, FORGING AND FLANGING

Atlas Press Co., Kalamazoo, Mich.
Bliss Co., E. W., Brooklyn, N.Y.
Dom. Steel Products Co., Ltd., Brantford
Eastern Production Co., Detroit, Mich.
Metalwood Mfg. Co., Detroit, Mich
Petrie, Ltd., H. W., Toronto.
Toledo Machine & Tool Co., Toledo.
Stoll Co., D. H., Buffalo, N.Y.
Williams Mchy Co., Ltd., A. R., Montreal

PRESSES, CAM, TOGGLE, EYELET

Baird Machine Co., Bridgeport, Conn.
Bliss Co., E. W., Brooklyn, N.Y.
Toledo Machine & Tool Co., Toledo.
Stoll Co., D. H., Buffalo, N.Y.

PRESSES, FILTER

Parris, Ltd., William R., Toronto.

PRESSES, PNEUMATIC

Dom. Steel Products Co., Ltd., Brantford.
Eastern Production Co., Detroit, Mich.
Metalwood Mfg. Co., Detroit, Mich.
Toledo Machine & Tool Co., Toledo.

PRESSES, DROP AND FORGING

Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs Co. Ltd., Hamilton.
Can. Fairbanks-Morse Co., Montreal.
Niles-Bement-Pond Co., New York.
Parris, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co, Toledo.

PRESSES, HYDRAULIC

Bertram & Sons Co., John, Dundas.
Can. Ingersoll-Rand Co., Ltd. Sherbrooke,
Dom. Steel Products Co., Ltd., Brantford.
Eastern Production Co., Detroit, Mich.
Lourie Manufacturing Co., Springfield, Ill.
Metalwood Mfg. Co., Detroit, Mich.
Niles-Bement-Pond Co., New York.
Parris, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.
Toledo Machine & Tool Co., Toledo.
Stoll Co., Inc., D. H., Buffalo, N.Y.
Williams Machy. Co., A. R., Toronto.

PRESSES, HYDRAULIC, HORIZONTAL

Eastern Production Co., Detroit, Mich.

PRESSES, HYDRAULIC, VERTICAL

Eastern Production Co., Detroit, Mich.

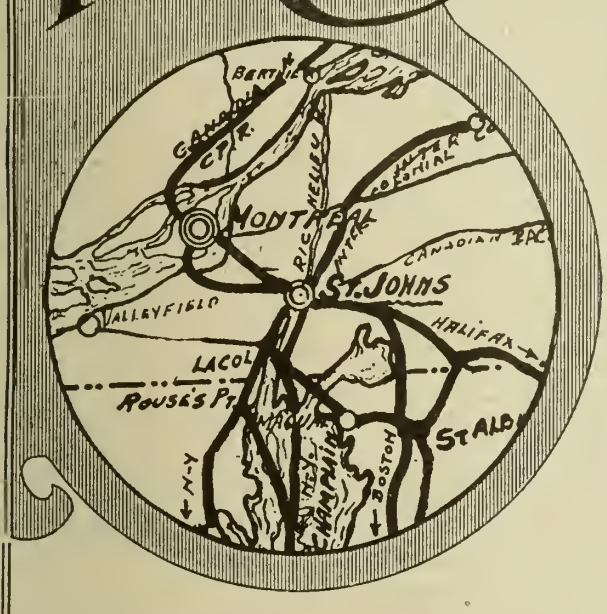
PRESSES, HYDRO-PNEUMATIC

Eastern Production Co., Detroit, Mich.

PRESSES, BALING

Parris, Ltd., William R., Toronto.

The City of ST. JOHNS, QUEBEC



Power
Labour
Transportation

?

Three Big Questions Already Solved for the Manufacturer Locating in St. Johns

POWER. Almost all the important industries carried on in St. Johns are operated by electric power, developed at Chambly Falls, 11 miles distant. St. Johns is in fact right now in a position to encourage manufacturers and offer power at prices that will compete with any city or town in Canada.

Low freight rates and excellent transportation facilities ensure an abundant supply of coal at lower rates than any other centrally-located manufacturing city in Canada.

LABOUR. St. Johns has long been recognized as the cheapest labour market in Canada. Skilled and semi-skilled labour, both male and female, is plentiful. The workmen are the intelligent, happy and contented kind and labour troubles are practically unknown. St. Johns has this great advantage over larger manufacturing centres because the workingman's cost of living is low—as are also his taxes and house rents.

TRANSPORTATION. St. Johns' transportation facilities are unexcelled by any city of its size in Canada. Seven railroads, including Canada's two great transcontinental lines, run through the city and are interconnected in the St. Johns yards by a terminal switching company at very low rates. St. Johns also enjoys the advantages of water transportation through the Richelieu River, which is a link in the chain of canals from New York to the St. Lawrence, furnishing the city with a direct water route to the eastern seaboard of the U. S. and the Great Lakes.

In addition to these advantages the city offers her assistance by granting many generous concessions such as, exemption from taxes, all public improvements required, and a cash bonus on your payroll. You risk a serious mistake if you do not include St. Johns in your investigations.

For More Specific Information Write to

The Secretary of the City Council

St. Johns, Quebec, Canada

If interested tear out this page and place with letters to be answered.

PRESSES, POWER
Baird Machine Co., Bridgeport, Conn.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machinery Co., Toronto.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo.
Strellnger, Chas. A. Co., Windsor, Ont.
Williams Machy. Co., A. R., Toronto.

PRESSES, SPRING FOOT
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Ont.
Toledo Machine & Tool Co., Toledo.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., Ltd., A. R., Montreal

PRESSES, SCREW
Bliss Co., E. W., Brooklyn, N.Y.
Manhattan Machine & Tool Co., Grand Rapids, Mich.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.

PRESSES, TIRE
Can. Ingersoll-Rand Co., Ltd., Sherbrooke.

PRESSES, TRIMMING
Bliss Co., E. W., Brooklyn, N.Y.
Canada Machinery Corp., Galt, Ont.
Petrie, Ltd., H. W., Toronto.
Stoll Co., D. H., Buffalo, N.Y.

PROFILING MACHINES
Herbert Ltd., Alfred, Toronto, Ont.

PROJECTORS, FLOOD LIGHTING
Holden Co., Ltd., Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que

PROPELLERS
Kennedy & Sons, Wm., Owen Sound.

PROTECTIVE COATINGS
H. H. Robertson, Ltd., Sarnia, Ont.

PSYCROMETERS, SLING
Taylor Instrument Co., Rochester, N.Y.

PULLEYS
Algoma Steel Corp., Sault Ste. Marie, Ont
American Pulley Co., Philadelphia.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., Fortierville, Que.
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Diamond State Fibre Co., Bridgeport, Pa.
Ford-Smith Machine Co., Hamilton, Ont.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Kennedy & Sons, Ltd., W., Owen Sound.
Positive Clutch & Pulley Works Ltd., Toronto.
Petrie, Ltd., H. W., Toronto.

PULLEYS, STEEL SASH, STEEL BELT
American Pulley Co., Philadelphia, Pa.

PULLEYS, FRICTION, CLUTCH
American Pulley Co., Philadelphia, Pa.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., A., Fortierville, Q.
Can. Link-Belt Co., Toronto, Ont.
Carlyle Johnson Mch. Co., Manchester, Ct.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Jones & Glasco, Montreal.
Positive Clutch & Pulley Works, Toronto.
Petrie, Ltd., H. W., Toronto.

PULP MILL MACHINERY
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Hamilton Co., Ltd., Wm., Peterborough, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

PUMPS, AIR LIFT
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Holden Co., Ltd., Montreal, Que.

PUMPS, BOILER FEED
Can. Ingersoll-Rand Co., Ltd. Sherbrooke,

PUMPS, CENTRIFUGAL
Bowser Co., Ltd., S. F., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Ingersoll-Rand Co., Montreal, Que.
Darling Bros., Ltd., Montreal, Que.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

PUMPS, FUEL OIL
Bowser Co., Ltd., S. F., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Darling Bros., Ltd., Montreal, Que.
Trahern Pump Co., Rockford, Ill.

PUMPS, GEARED
Darling Bros., Ltd., Montreal, Que.
Globe Engineering Co., Hamilton, Ont.

PUMPS, HIGH PRESSURE
Perrin, Ltd., William R., Toronto.

PUMPS, HYDRAULIC
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Clarke & Co., Furniss, Montreal, Que.
Garlock-Walker Machinery Co., Toronto.
Darling Bros., Ltd., Montreal, Que.
Elec. Steel & Metals, Welland, Ont.
Metalwood Mfg. Co., Detroit, Mich.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

PUMPS, LUBRICATING, OIL STORAGE
Bowser Co., Ltd., S. F., Toronto, Ont.

PUMPS, RETURN AIR
Can. Ingersoll-Rand Co. Ltd., Sherbrooke.

PUMPS, SPECIAL
Elec. Steel & Metals, Welland, Ont.

PUMPS, RUBBER CEMENT
Bowser Co., Ltd., S. F., Toronto, Ont.

PUMPS, KEROSENE, OIL, SELF-MEASURING
Bowser Co., Ltd., S. F., Toronto, Ont.

PUMPS, LUBRICANT, OIL, WATER
Darling Bros., Ltd., Montreal, Que.
Trahern Pump Co., Rockford, Ill.

PUMPS — ROTARY
General Combustion Co., Ltd., Montreal, Que.

PUMP LEATHERS
Gruton & Knight Mfg. Co., Worcester.

PUNCHES AND DIES
Atkins & Co., Ltd., Wm., Sheffield, Eng.
E. W. Bliss Co, Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Can.
Can. Blower & Forge Co., Kitchener, Ont.
Crescent Mach. Co., Ltd., Montreal, P.Q.
Can. Fairbanks-Morse Co., Montreal.
Gardner & Son, Robert, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Marshall, Son & Blunney, Toronto.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, O.
Williams Mchy Co., A. R., Toronto, Ont.

PUNCHES, POWER
John Bertram & Sons Co., Dundas, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd, Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machinery Co., Toronto.
A. B. Jardine & Co., Hespeler, Ont.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
D. H. Stoll Co., Buffalo, N.Y.
Williams Mchy Co., A. R., Toronto, Ont.

PUNCHING MACHINES, HORIZONTAL
Bertrams, Ltd., Edinburgh, Scotland.
Bertrams & Sons, John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co, Ltd., Hamilton, Ont.
Garlock-Walker Mach'y. Co., Toronto.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

PUNCHES, HAND
Niles-Bement-Pond Co., New York.

PYROMETERS
Bristol Co., Waterbury, Conn.
Shore Instrument & Mfg. Co., New York.
Taylor Instrument Co., Rochester, N.Y.

QUARTERING MACHINES
Bertram & Sons, John, Dundas, Ont.
Niles-Bement-Pond Co., New York.

RAIL BENDERS
Algoma Steel Corp., Sault Ste. Marie, Ont.

RAILROAD TOOLS
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machinery Co., Toronto.
Holden Co., Ltd., Montreal, Que.
Niles-Bement-Pond Co., New York.
Petrie Ltd., H. W., Toronto.
Strellnger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

RASPS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall, Son & Bunney, Toronto.

RAWHIDE PINIONS (See Gears)

REAMERS
Butterfield & Co., Inc., Rock Island, Que.

REAMERS, ADJUSTABLE
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland,
Greenfield Tap & Die Corp., Greenfield.
Ingersoll Machy. Co., Ingersoll, Ont.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
McCrosky Tool Corp., Meadville, Pa., U. S. A.
Pratt & Whitney Co., Dundas, Ont.
J. A. M. Taylor, 318 Stair Bldg., Toronto
Wells Bros. of Can., Galt, Ont

REAMERS, BRIDGE, EXPANDING AND HIGH SPEED
Atkins & Co., Ltd., Wm., Sheffield, Eng
Aikenhead Hardware Co., Toronto.
Butterfield & Co., Rock Island, Que
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Gisholt Machine Co., Madison, Wis.
Lyman Tube & Supply Co., Montreal, Que
Marshall, Son & Bunney, Toronto
Morrow Screw & Nut Co., J., Ingersoll, Ont
Morse Twist Drill & Mch. Co., New Bedford Mass.
McCrosky Tool Corp., Meadville, Pa., U. S. A.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont
Samuel Osborne, Ltd., Montreal, P Q
Strellnger, Chas. A. Co., Windsor, Ont.
Wilt Twist Drill Co., Walkerville, Ont

REAMERS, STEEL TAPER AND SELF-FEEDING
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

REAMERS, CHUCKING
Ackworthie Ltd., J., Birmingham, Eng.
Atkins & Co., Ltd., Wm., Sheffield, Eng
Butterfield & Co., Inc., Rock Island, Que
Greenfield Tap & Die Corp., Greenfield.
Ingersoll Machy. Co., Ingersoll, Ont.
Marshall, Son & Bunney, Toronto.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Strellnger, Chas. A. Co., Windsor, Ont.
Wells Bros. of Canada, Galt, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

REAMERS, HAND
Ackworthie Ltd., J., Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que
Greenfield Tap & Die Corp., Greenfield.
J. Morrow Screw & Nut Co., Ingersoll, Ont
Wells Bros. of Can., Galt, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

REAMERS, PIN
Ackworthie Ltd., J., Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que
Greenfield Tap & Die Corp., Greenfield.
Morrow Screw & Nut Co., John, Ingersoll
Wells Bros. of Can., Galt, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

REAMER FLUTING MACHINES
Garvin Machine Co., New York.

REAMING MACHINES, PNEUMATIC
Cleveland Pneumatic Co. of Can., Toronto
Garlock-Walker Machinery Co., Toronto.
Holden Co., Ltd., Montreal, Que.

RECORDING INTRUMENTS
Bristol Co., Waterbury, Conn.
Gisholt Machine Co., Madison, Wis.
Taylor Instrument Co., Rochester, N.Y.

REELS, WIRE AND TEXTILE MFG
American Pulley Co., Philadelphia, Pa.

REGULATORS, AUTOMATIC
Electric Steels & Metals, Ltd., Welland

REGULATORS, PRESSURE, TEMPERATURE
Can. Fairbanks-Morse Co., Montreal.
Taylor Instrument Co., Rochester, N.Y.

REPAIR WORK — SAWS
Atkins & Co., E. C., Hamilton, Ont.

REPAIR WORK, ALL KINDS
Elec. Steel & Metals, Welland, Ont.

RIVETS.
Aikenhead Hardware Co., Toronto, Ont.
Parmenter & Bulloch Co., Gananoque.
Rice, Lewis & Son, Toronto.
Steel Co. of Canada, Ltd., Hamilton.

RIVETERS, PNEUMATIC, HYDRAULIC, HAMMER, COMPRESSION
Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Montreal.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.

RIVETING MACHINES, ELASTIC, ROTARY BLOW
High-Speed Hammer Co., Rochester.
Petrie, Ltd., H. W., Toronto.
F. B. Shuster Co., New Haven, Conn.
Strellnger Co., C. A., Windsor, Ont.

ROAD BUILDING EQUIPMENT
Can. Ingersoll-Rand Co., Ltd., Sherbrooke
Holden Co., Ltd. Montreal, Que.

ROAD-MAKING MACHINERY
G. F. Foss Mchy & Sply. Co., Montreal

RODS, PURE NICKEL, MONEL METAL, NICHROME
Can. Driver-Harris Co., Ltd., Walkerville.

ROLLER CHAINS
Can. Link-Belt Co., Toronto.
Jones & Glasco, Montreal.
Lyman Tube & Supply Co., Montreal, Que
Renold of Canada Ltd., Montreal.

ROLLS, BENDING, STRAIGHTENING
John Bertram & Sons Co., Dundas.
Brown, Boggs Co., Ltd., Hamilton.
Can. Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford
Garlock-Walker Machinery Co., Toronto
Niles-Bement-Pond Co., New York.
Petrie Ltd., H. W., Toronto.
Toledo Machine & Tool Co., Toledo, O.

ROLLS CRUSHING
Can. Ingersoll-Rand Co., Ltd., Sherbrooke. Que.

ROLLS AND TABLES
Dominion Foundries & Steel Ltd., Hamilton, Ont.
Elec. Steel & Metals, Welland, Ont.

ROOFING
H. H. Robertson, Ltd., Sarnia, Ont

ROPE, GALX, MONEL METAL, BRONZE, TILLER AND SASH CORD
Can. Driver-Harris Co., Ltd., Walkerville

ROLLING MACHINES, SHEET METAL
Manhattan Machine & Tool Co., Grand Rapids, Mich.

ROLLING MILL MACHINERY
Dom. Steel Products Co., Ltd., Brantford
Mesta Machine Co., Pittsburgh, Pa.

ROLL LATHES
Mesta Machine Co., Pittsburgh, Pa.

ROLLS, BENDING, STRAIGHTENING
Manhattan Machine & Tool Co., Grand Rapids, Mich.

ROLLS, CRUSHING
Can. Link-Belt Co., Toronto.

ROOF COOLERS
Electric Steels & Metals, Ltd., Welland

RUBBER MILL DRIVES
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Dom. Steel Products Co., Ltd., Brantford.
Can. Link-Belt Co., Toronto.

RUBBER MILL MACHINERY
Bertrams Ltd., Edinburgh, Scotland.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Dom. Steel Products Co., Ltd., Brantford.

RUBBER MOULDS & CORES
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

RUBBER PRODUCTS, MECHANICAL
Dunlop Tire & Rubber Goods Co., Ltd., Montreal.

RUBBING BRICKS
Dominion Abrasive Co., Mimico, Ont.

RULES
Brown & Sharpe Mfg. Co., Providence.
James Chesterman & Co., Ltd., Sheffield.
Rice, Lewis & Son, Toronto.
L. S. Starrett Co., Athol, Mass.

RUST PREVENTATIVES
Oakley Chemical Co., New York, N.Y.

SAW MILL CONVEYORS
Can. Link-Belt Co., Toronto.
Petrie, Ltd., H. W., Toronto.

SAND MILLS
Frost Mfg. Co., Chicago, Ill.

SAND MIXING MACHINERY
Frost Mfg. Co., Chicago, Ill.

SANITARY DRINKING FOUNTAINS
Puro Sanitary Drinking Fountain Co., Haydenville.

SANDING MACHINES
Canada Machinery Corp., Galt.

SAW MILL MACHINERY
Can. Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt.
Bissett Gardner & Son, Montreal.
Curtis Pneumatic Machy Co., St. Louis
Hamilton Co., Ltd., Wm., Peterborough, Ont.
A. R. Williams Machy. Co., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

SASH SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

SAWS FOR EVERY USE
Atkins & Co., E. C., Hamilton, Ont.

SAWS, CIRCULAR METAL
Atkins & Co., E. C., Hamilton, Ont.
Cochrane-Bly Co., Rochester, N.Y., U.S.A.
Wm. Atkins & Co., Ltd., Sheffield, Eng.
Marshal, Son & Bunney, Toronto.
Simonds Mfg. Co., Fitchburg, Mass.
Tabor Mfg. Co., Philadelphia, Pa.

SAWS, HACK (See Hack Saws)

SAW GUARDS
Ackworthie Ltd., J., Birmingham, Eng.
Atkins & Co., E. C., Hamilton, Ont.

SAWING MACHINES, METAL
Herbert, Ltd., Alfred, Toronto, Ont.

SAWING MACHINES, CIRCULAR, FOR COLD METAL
Cochrane-Bly Co., Rochester, N.Y., U.S.A.

SAWS, METAL, HACK AND BAND
Atkins & Co., E. C., Hamilton, Ont.

SAWS, SILVER STEEL
E. C. Atkins & Co., Inc., Indianapolis

SAW SHARPENERS
Cochrane-Bly Co., Rochester, N.Y., U.S.A.
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Can., Galt, Ont.

SAWS, SLITTING
J. A. M. Taylor, Stair Bldg., Toronto
Atkins & Co., E. C., Hamilton, Ont.

SAWS — HIGH-SPEED FRICTION
Atkins & Co., E. C., Hamilton, Ont.

SAWS — PATTERN SHOP
Atkins & Co., E. C., Hamilton, Ont.

SAWS — SWING
Atkins & Co., E. C., Hamilton, Ont.

SCLEROSCOPES
Shore Instrument & Mfg. Co., New York.

SCREENING MACHINERY
Can. Link-Belt Co., Toronto.

SCREW EXTRACTORS
Cleveland Twist Drill Co., Cleveland.

SCREW MACHINES, HAND, AUTOMATIC
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Ltd., Toronto
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield.
Herbert, Ltd., Alfred, Toronto, Ont.
A. B. Jardine & Co., Hespeler
National Acme Co, Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto.
Pratt & Whitney Co., Dundas, Ont
Strellnger, Chas. A. Co., Windsor, Ont.
Warner & Swasey Co., Cleveland, O.
Wells Bros. of Can., Galt, Ont.

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Weekly—
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Canadian Grocer
Financial Post
Druggists' Weekly
Canadian Machinery

Semi-Monthly—
Maclean's Magazine
Farmers' Magazine
Power House
Sanitary Engineer

Monthly—
Dry Goods Review
Men's Wear Review
Bookseller and Stationer
Canadian Foundryman
Marine Engineering
Printer and Publisher
Canadian Motor, Tractor and Implement Trade Journal

The MacLean Publishing Company, Limited

oronto Montreal Winnipeg Vancouver London (Eng.)

SCREWS, MACHINE, SET, CAP AND SPECIAL
Galt Machine Screw Co., Galt.
John Morrow Screw & Nut Co., Ingersoll.
National Acme Co., Montreal.
Rice Lewis & Son, Toronto.
Steel Co. of Canada, Ltd., Hamilton.
Wilkinson & Kompass, Hamilton.

SCREW COLLARS
Galt Machine Screw Co., Ltd., Galt, Ont.
John Morrow Screw & Nut Co., Ingersoll.

SCREW MACHINES, PLAIN
Brown & Sharpe Mfg. Co., Providence, R.I.
Herbert, Ltd., Alfred, Toronto, Ont.

SCREW PLATES
Ackworthie Ltd., J., Birmingham, Eng.
Butterfield & Co., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield.
A. B. Jardine & Co., Hespeler.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto.
J. A. M. Taylor, Stair Bldg., Toronto.
Wells Bros. of Can., Galt.
Wilkinson & Kompass, Hamilton.

SCREWS, SAFETY SET
Galt Machine Screw Co., Ltd., Galt, Ont.

SCREW SLOTTERS
Butterfield & Co., Inc., Rock Island, Que.
Garvin Machine Co., New York.
National Acme Co., Cleveland, O.
Pratt & Whitney Co., Dundas, Ont.

SELF-OPENING DIES
See Dies.

SET SCREWS, SAFETY
Aikenhead Hardware Co., Toronto.
Bristol Co., Waterbury, Conn.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wilkinson & Kompass, Hamilton.

SHANKS, STRAIGHT AND TAPER
Jacobs Mfg. Co., Hartford, Conn.

SHAPERS
John Bertram & Sons Co., Dundas.
Can. Fairbanks-Morse Co., Montreal.
Canadian Machinery Corp., Galt.
Cochrane-Bly Co., Rochester, N.Y., U.S.A.
Geo. F. Foss Mchy. & Sply. Co., Montreal
Robt. Gardner & Son, Montreal.
Garlock-Walker Mach'y. Co., Toronto.
Herbert, Ltd., Alfred, Toronto, Ont.
Handey Machine Co., Torrington, Conn.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
Standard Equipment & Tool Wks., Montreal.
Walcott Lathe Co., Jackson, Mich.
Williams Mchy Co., A. R., Toronto, Ont.

SHAPERS, GEAR
Fellows Gear & Shaper Co., Springfield, V.

SHAFTING
Algoma Steel Corp., Sault Ste. Marie, O.
Can. Fairbanks-Morse Co., Montreal.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machy. Co., Ltd., Toronto
Jones & Glasseo, Montreal.
Niles-Bement-Pond Co., New York.
Can. Drawn Steel Co., Hamilton.
Peckovers, Ltd., Toronto, Ont.
Petrie, Ltd., H. W., Toronto.
Pratt & Whitney Co., Dundas.
Rice, Lewis & Son, Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
A. R. Williams Machy. Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

SHARPENING STONES
Norton Co, Worcester, Mass.
Rice, Lewis & Son, Toronto.

SHEARING MACHINES, ANGLE IRON, BAR AND GATE
John Bertram & Sons Co., Dundas.
Bertrams Ltd., Edinburgh, Scotland.
Canada Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machy. Co., Ltd., Toronto
A. B. Jardine & Co., Hespeler, Ont.
Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co., Toledo, O.

SHEARS, POWER
John Bertram & Sons Co., Dundas.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co, Ltd., Hamilton.
Can Blower & Forge Co, Kitchener.
Canada Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machy. Co., Ltd., Toronto
A. B. Jardine & Co., Hespeler, Ont.
National Machy. Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
H. D. Stoll Co., Inc., Buffalo, N.Y.
Strelinger, Chas. A. Co., Windsor, Ont.
Toledo Machine & Tool Co., Toledo, O.
Williams, White & Co., Moline, Ill.
Williams Mchy Co., A. R., Toronto, Ont.

SHEARS, PNEUMATIC
Toledo Machine & Tool Co., Toledo, Ohio

SHEARS, PLATE CUTTING, SLITTING
Dom. Steel Products Co., Ltd., Brantford.

SHEARS, SPLITTING
Dom. Steel Products Co., Ltd., Brantford.

SHEARS, IRREGULAR AND CIRCLE CUTTING
D. H. Stoll Co., Inc., Buffalo, N.Y

SHEARS, SQUARING
Brown, Boggs & Co., Hamilton, Ont.
D. H. Stoll Co., Inc., Buffalo, N.Y.

SHEET METAL WORKING MACHINERY
Herbert, Ltd., Alfred, Toronto, Ont.
D. H. Stoll Co., Inc., Buffalo, N.Y.

SHEET METAL WORKING TOOLS
Baird Machine Co., Bridgeport, Conn.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton.
Petrie, Ltd., H. W., Toronto.
D. H. Stoll Co., Inc., Buffalo, N.Y.
Strelinger, Chas. A. Co., Windsor, Ont.

SHEETS, CRUCIBLE, CAST
British Smelting & Refining Co., Ltd., Montreal, Que.

SHEETS, BLACK AUTO AND GALVANIZED
Peckovers, Ltd., Toronto, Ont.

SHEETS, NICKEL, RESIST, ALLOY
Can. Driver-Harris Co., Ltd., Walkerville.

SHELVING, STEEL
Dennis Wire & Iron Works, London.

SHIPYARD MACHINERY, SHOP FURNITURE
Dennis Wire & Iron Works, London.

SIDE TOOLS
Armstrong Bros. Tool Co., Chicago.
J. H. Williams & Co., Brooklyn, N.Y.

SILENT CHAINS
Can. Link-Belt Co., Toronto, Ont.
Jones & Glasseo, Montreal.
Renold of Canada Ltd., Montreal.

SLEDGES
Aikenhead Hardware Co., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.
Wilkinson & Kompass, Hamilton, Ont

SLINGS, CHAINS
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

SLOTTERS
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
Herbert, Ltd., Alfred, Toronto, Ont.
National-Acme Co., Cleveland, Ohio.
Niles-Bement-Pond Co., New York.

SMOKESTACKS
William Hamilton Co., Peterboro, Ont.
MacKinnon Steel Co., Sherbrooke, Que

SNIPS, TINNERS AND SHEET METAL WORKERS
Kearney & Trecker Co., Milwaukee, Wis
J. Morrow Screw & Nut Co., Ingersoll, Ont

SOCKETS
Brown & Sharpe Mfg. Co., Providence.
Butterfield & Co., Inc., Rock Island, Que
Cleveland Twist Drill Co., Cleveland
J. Morrow Screw & Nut Co., Ingersoll, Ont
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.

SOIL PIPE FITTINGS, CAST IRON
Katie Foundry, Galt, Ont.

SOLDERING IRONS
Aikenhead Hardware Co., Toronto, Ont.
Brown, Boggs & Co., Hamilton, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.

SOLDER
British Smelting & Refining Co., Ltd. Montreal, Que.
Aikenhead Hardware Co., Toronto, Ont.
Canada Metal Co. Ltd., Toronto, Ont.
Hoyt Metal Co., Toronto, Ont.
Rice Lewis & Son Toronto, Ont.
Tallman Brass & Metal Co., Hamilton.

SPELTER
British Smelting & Refining Co., Ltd. Montreal, Que.

SPEED REDUCING GEARS
Can. Link-Belt Co., Toronto, Ont.
Jones & Glasseo, Montreal.

SPRINGS, MACHINERY
Barnes, Wallace Co., Bristol, Conn.
Can. Steel Foundries, Ltd., Montreal.
Cleveland Wire Spring Co., Cleveland.
Dunbar Bros. Co., Bristol, Conn.
Garlock-Walker Machinery Co., Toronto

SPECIAL MACHINERY
Baird Machine Co., Bridgeport, Conn.
Bertram, John, & Sons Co., Dundas.
Bliss, E. W. Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada
Brown Engineering Corp., Toronto, Ont
Dom. Steel Products Co., Ltd., Brantford
Ford-Smith Machine Co., Hamilton, Ont
Garlock-Walker Machinery Co., Toronto
Garvin Machine Co., New York.
Globe Engineering Co., Ltd., Hamilton
Hamilton Co., Ltd., Wm., Peterborough
A. B. Jardine & Co., Hespeler, Ont.
Katie Foundry, Galt, Ont.
Ker & Goodwin Machine Co., Ltd. Brantford, Ont.
McCrosky Tool Corp., Meadville, Pa., U. S. A.
National-Acme Co., Cleveland, Ohio.
Nesta Machine Co., Pittsburgh, Pa
Stoll Co., D. H., Buffalo, N.Y.
Victoria Foundry Co., Ottawa, Ont.
William R. Perrin, Ltd., Toronto.
Williams Tool Corp. of Can. Ltd., Brantford, Ont.

SPECIAL TOOLS, MACHINERY
Crescent Machine Co., Ltd., Montreal, Que.
McClean Machine & Tool Co., Ltd., Hamilton, Ont.

SPOT FACERS, INTERCHANGEABLE
Eclipse Counterbore Co., Ltd., Walkerville, Ont.

SPRING COILING AND WINDING MACHINERY
Baird Machine Co., Bridgeport, Conn.
Garvin Machine Co., New York.

SPRING MAKING MACHINERY (AUTOMATIC)
Baird Machine Co., Bridgeport, Conn.

SPRINGS, SPIRAL, TOOL
The Dunbar Bros. Co., Bristol, Conn.

SPRINGS STEEL
Barnes Co., Wallace, Bristol, Conn.

SPROCKETS, COMPENSATING
Morse Chain Co., Ithaca, New York.

SPROCKETS, SPRING
Morse Chain Co., Ithaca, New York.

SPROCKETS, CHAIN
Can Link-Belt Co., Toronto, Ont.
Jones & Glasseo, Montreal.
Lyman Tube & Supply Co., Montreal, Que
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia
Renold of Canada Ltd., Montreal.

SPRINGS FOR TOYS AND ELECTRIC DEVICES
The Dunbar Bros. Co., Bristol, Conn.

SPROCKET WHEELS, CAST
Can. Link Belt Co., Toronto, Ont.
Lyman Tube & Supply Co., Ltd., Montreal

SAFETY CYLINDERS
Oliver Mach. Co., Grand Rapids, Mich.

SANDERS
Oliver Mach. Co., Grand Rapids, Mich.

SAW BENCHES
Oliver Mach. Co., Grand Rapids, Mich.

SAW GUARDS
Oliver Mach. Co., Grand Rapids, Mich.

SAWING MACHINES
Herbert Ltd., Alfred, Toronto, Ont.

SAWS SWING
Oliver Mach. Co., Grand Rapids, Mich

SMALL TOOLS
Herbert Ltd., Alfred, Toronto, Ont.

STAYBOLT TOPS
Butterfield & Co., Inc., Rock Island, Que
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

STAIRS, IRON
Canada Wire & Iron Goods Co., Hamilton, Ont.

STAMPINGS, SHEET BRASS, COPPER, ALUMINUM AND STEEL
Dom. Forge & Stamping Co., Walkerville
Globe Engineering Co., Hamilton, Ont.

STAMPING MACHINERY
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs, & Co., Hamilton, Can.
Canada Machinery Corp., Galt, Ont.

SAFETY CYLINDERS
Oliver Mach. Co., Grand Rapids, Mich

STEAM APPLIANCES
Darling Bros., Ltd., Montreal, Quebec.

STEAM SEPARATORS AND TRAPS
Can. Fairbanks-Morse Co., Montreal.

STEAM TURBINES
General Combustion Co., Ltd., Montreal, Que.
Sturtevant Co., B. F., Galt, Ont.

STEEL BALLS
See Balls Steel.

STEEL, CRUCIBLE TOOL
Atkins & Co., Ltd., Wm. Sheffield, Eng
Illingworth Steel Co., John, New York
Marshall, Son & Bunney, Toronto.

STEEL, CARBON, FERRO-TUNGSTEN
Armstrong, Whitworth of Can., Montreal.
Atkins & Co., Ltd., Wm., Sheffield, Eng
Firth & Sons, Thos., Montreal, Que
Latrobe Electric Steel Co., Latrobe, Pa
Lincoln Electric Co. of Canada, Ltd Toronto, Ont.
Marshall, Son & Bunney, Toronto.
Peckovers, Ltd., Toronto, Ont.
Samuel Osborne (Can.), Ltd., Montreal
Vanadium-Alloys Steel Co., Pittsburgh

STEEL, CHROME MOLYBDENUM
United Alloy Steel Corp., Canton, Ohio.

STEEL CHROME VANADIUM
Norton, Ralph R., Agent, Montreal.
Atkins & Co., Ltd., Wm. Sheffield, Eng
Marshall, Son & Bunney, Toronto
United Alloy Steel Corp., Canton, Ohio.

STEEL CHROME NICKEL
Firth & Sons, Ltd., Thos., Montreal,
Lyman Tube & Supply Co., Ltd., Montreal
Norton, Ralph R., Agent, Montreal.
Atkins & Co., Ltd., Wm., Sheffield, Eng
Marshall, Son & Bunney, Toronto
United Alloy Steel Corp., Canton, Ohio.

STEEL CASTINGS
Can. Elec. Steel Casting Co., Aurora, Ont
Davidson Mfg. Co., Ltd., Montreal, Que
Dominion Foundries & Steel Ltd., Hamilton, Ont.
Dom. Iron & Steel, Sydney, N.S.
Kennedy & Sons, Wm., Owen Sound
Electric Steel & Metals Co., Welland.
Nova Scotia Steel & Coal Co., Windsor
Swedish Crucible Steel Co., Windsor

STEEL, COLD DRAWN
United Alloy Steel Corp., Canton, Ohio.

STEEL, COLD ROLLED
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Can. Drawn Steel Co., Hamilton, Ont.
Rice Lewis & Son, Toronto, Ont.
Swedish Steel & Importing Co. Ltd., Montreal.
Union Drawn Steel Co., Hamilton, Ont.

STEEL, ELECTRIC FURNACE
United Alloy Steel Corp., Canton, Ohio.

STEEL FJAB
Lincoln Electric Co., of Canada, Ltd., Toronto, Ont.

STEEL, NICKEL
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall, Son & Bunney, Toronto.
United Alloy Steel Corp., Canton, Ohio.

STEEL, HIGH SPEED
Armstrong-Whitworth of Can., Montreal
Wm. Atkins & Co., Sheffield, Eng.
Can. Fairbanks-Morse Co., Montreal
Deloro Smelting & Refining Co., Ltd. Toronto, Ont.
H. A. Drury Co., Ltd., Montreal.
Firth & Sons, Thos., Montreal, Que.
Illingworth Steel Co., J., New York.
Latrobe Electric Steel Co., Latrobe, Pa.
Marshall, Son & Bunney, Toronto, Ont.
Osborne, Samuel, Montreal, P.Q.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Toronto, Ont.
Swedish Steel & Importing Co., Ltd., Montreal.
Vanadium-Alloys Steel Co., Pittsburgh.

STEEL, OPEN HEARTH
Illingworth Steel Co., John, New York.
United Alloy Steel Corp., Canton, Ohio.

STEEL PLATES
Dominion Foundries & Steel Ltd., Hamilton, Ont.

STEEL PRODUCTS AND MACHINERY
Dom. Steel Products Co., Ltd., Brantford

STEEL, ROCK DRILL
Armstrong, Whitworth of Canada, Montreal, Que.
Lincoln Electric Co. of Canada, Ltd., Toronto, Ont.

STEEL, SPECIAL ANALYSIS
United Alloy Steel Corp., Canton, Ohio.

STEEL, SPRING AND REINFORCING
Peckovers, Ltd., Toronto, Ont.
United Alloy Steel Corp., Canton, Ohio.

STEEL, STRUCTURAL
Algoma Steel Corp., Sault Ste. Marie
MacKinnon Steel Co., Sherbrooke, Que.
Peckovers, Ltd., Toronto, Ont.

STEEL, TOOL
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Atkins & Co., Wm., Sheffield, Eng.
Can. Fairbanks-Morse Co., Montreal
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Drury Co., H. A., Montreal, Que.
Deloro Smelting & Refining Co., Ltd. Toronto, Ont.
Firth & Sons, Thos., Montreal, Que.
Lincoln Electric Co. of Canada, Ltd., Toronto, Ont.
Lyman Tube & Supply Co., Ltd., Montreal
Marshall, Son & Bunney, Toronto, Ont.
Latrobe Electric Steel Co., Latrobe, Pa.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son Toronto, Ont.
Vanadium-Alloys Steel Co., Pittsburgh.

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Drury, H. A., Co., Montreal, Que.
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Vanadium-Alloys Steel Co., Pittsburgh.
Wells Bros. of Can., Galt, Ont.

"STELLITE"
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Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

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Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

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Rice Lewis & Son, Toronto, Ont.
Wells Bros. Co., of Canada, Galt, Ont.

STONES, COMMUTATORS
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Bertrams, Ltd., Edinburgh, Scotland.

STRAND
Dom. Steel Products Co., Ltd., Brantford.
Page Steel & Wire Co., Adrian, Mich.

SURFACE PLATES
Brown & Sharpe Mfg. Co., Providence, R.I.

STRUCTURAL STEEL WORKS
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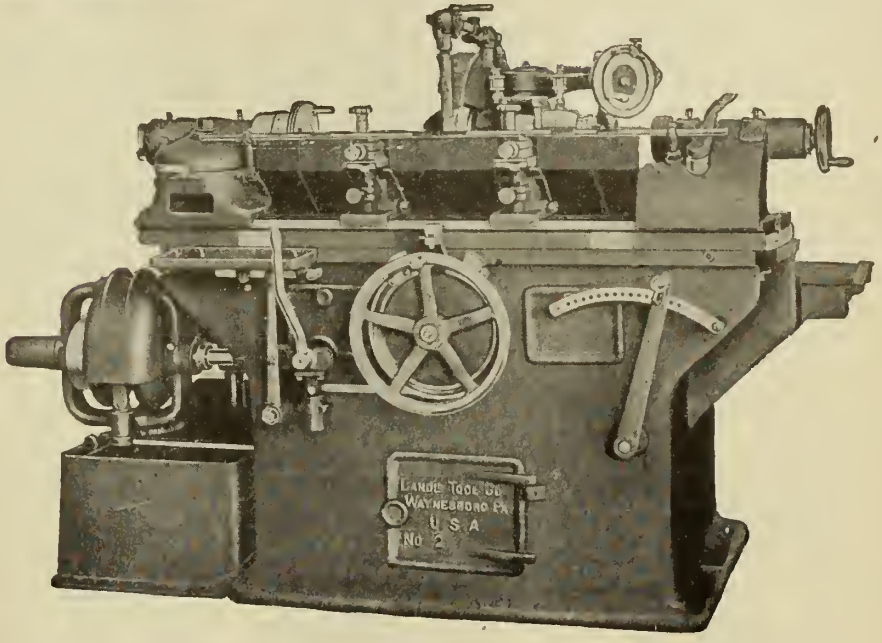
SWITCHBOARDS
Can. Steel Foundries, Ltd., Montreal.

SWITCHES, RAILWAY
Northern Electric Co., Ltd., Montreal Que

LANDIS

The Productive Landis Universal



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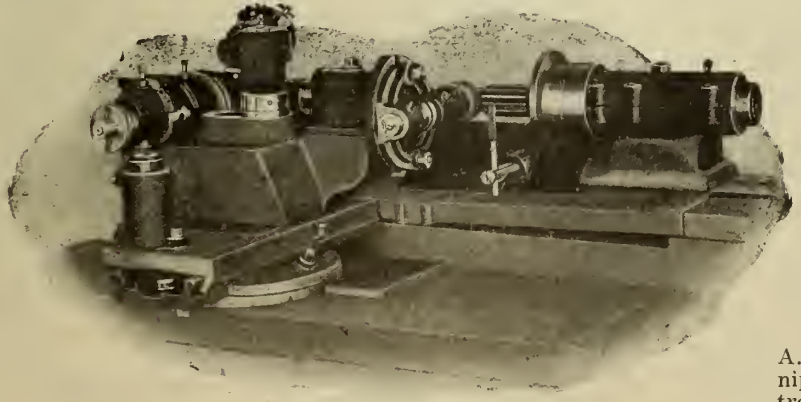

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WAYNESBORO, PA.

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CANADIAN AGENTS:

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Can. John Wood Mfg. Co., Ltd., Toronto
Dominion Bridge Co., Montreal, Que.
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MacKinnon Steel Co., Sherbrooke, Que.
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Elec. Steel & Metals, Welland, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
Williams Hamilton Co., Peterboro, Ont.

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Rice Lewis & Son, Toronto, Ont.

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A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
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Pilot Steel & Tool Co., Montreal, Que.
Victor Tool Co., Waynesboro, Pa.

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Greenfield Tap & Die Corp., Greenfield, Mass.
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Greenfield Tap & Die Corp., Greenfield, Mass.
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Marshall, Son & Bunney, Toronto.
Wells Bros. of Can., Galt, Ont.

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Greenfield Tap & Die Corp., Greenfield.
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Foss Mchy. & Sply. Co., G. F., Montreal.
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Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Waynesboro Pa
Morse Twist Drill & Mchy. Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Rice Lewis & Son, Toronto, Ont.
Starrett Co., L. S., Athol, Mass.
Strellnger, Chas. A. Co., Windsor, Ont.
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Shore Instrument & Mfg. Co., New York.

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Oliver Machy. Co., Grand Rapids, Mich

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Toronto Testing Laboratory, Toronto.

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Jardine & Co., Ltd., A. B., Hespeler.
Landis Machine Co., Waynesboro, Pa.
National-Acme Co., Cleveland, Ohio.
National Machy. Co., Tiffin, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
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Pratt & Whitney Co., Dundas, Ont.
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Wells Bros. of Canada, Galt, Ont.
Williams & Co., J. H., Brooklyn, N.Y

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Hoyt Metal Co., Toronto, Ont.

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Perrin, Ltd., William R., Toronto.

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Gisholt Machine Co., Madison, Wis.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Strellnger, Chas. A. Co., Windsor, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

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TOOL ROOM PARTITIONS
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Independent Pneumatic Tool Co., Chicago.
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Williams Machy Co., A. R., Toronto.
U. S. Electrical Tool Co., Cincinnati, O

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Northern Crane Works, Walkerville.

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Can. Fairbanks-Morse Co., Montreal.
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Hamilton Gear & Machine Co., Toronto.
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Morse Chain Co., Ithaca, N.Y.
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Strellnger, Chas. A. Co., Windsor, Ont.
Williams Machinery Co., A. R., Toronto.

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MacKinnon Steel Co., Ltd., Sherbrooke.

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Dominion Bridge Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que
Northern Crane Works, Walkerville.
Tallman Brass & Metal Co., Hamilton

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Lyman Tube & Supply Co., Ltd., Montreal
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Chapman Double Ball Bearing, Toronto
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Cowan Truck Co., Holyoke, Mass.

TRUCKS, FLOOR
Cowan Truck Co., Holyoke, Mass.

TRUCKS, HAND
Cowan Truck Co., Holyoke, Mass.

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Swedish Steel & Importing Co., Montreal
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Cowan Truck Co., Holyoke, Mass.

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Tallman Brass & Metal Co., Hamilton

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Lyman Tube & Supply Co., Montreal, Que

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Tube Co. of Can., Ltd., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que

TUBING, WELDED STEEL
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Garlock-Walker Machinery Co., Toronto
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Strnble Turret Mach. Co. Madison, Wis
Strellnger, Chas. A. Co., Windsor, Ont.
Warner & Swasey Co., The, Cleveland, O

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Garvin Machine Co., New York
Holden Co., Ltd., Montreal, Que.
MacGovern & Co., Montreal, Que.
Warner & Swasey, Cleveland, O.

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Petrie, Ltd., H. W., Toronto.
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Superior Machinery Co., London, Ont.

VISES, DRILL
Superior Machinery Co., London, Ont.

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Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Rock Island, Que.
Marshall, Son & Bunney, Toronto.
Petrie, Ltd., H. W., Toronto.
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Superior Machinery Co., London, Ont.

VISES, PLANER AND SHAPER
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Oakley Chemical Co., New York, N.Y.

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Toronto Iron Works, Ltd., Toronto.

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Lincoln Electric Co. of Canada, Ltd., Toronto, Ont

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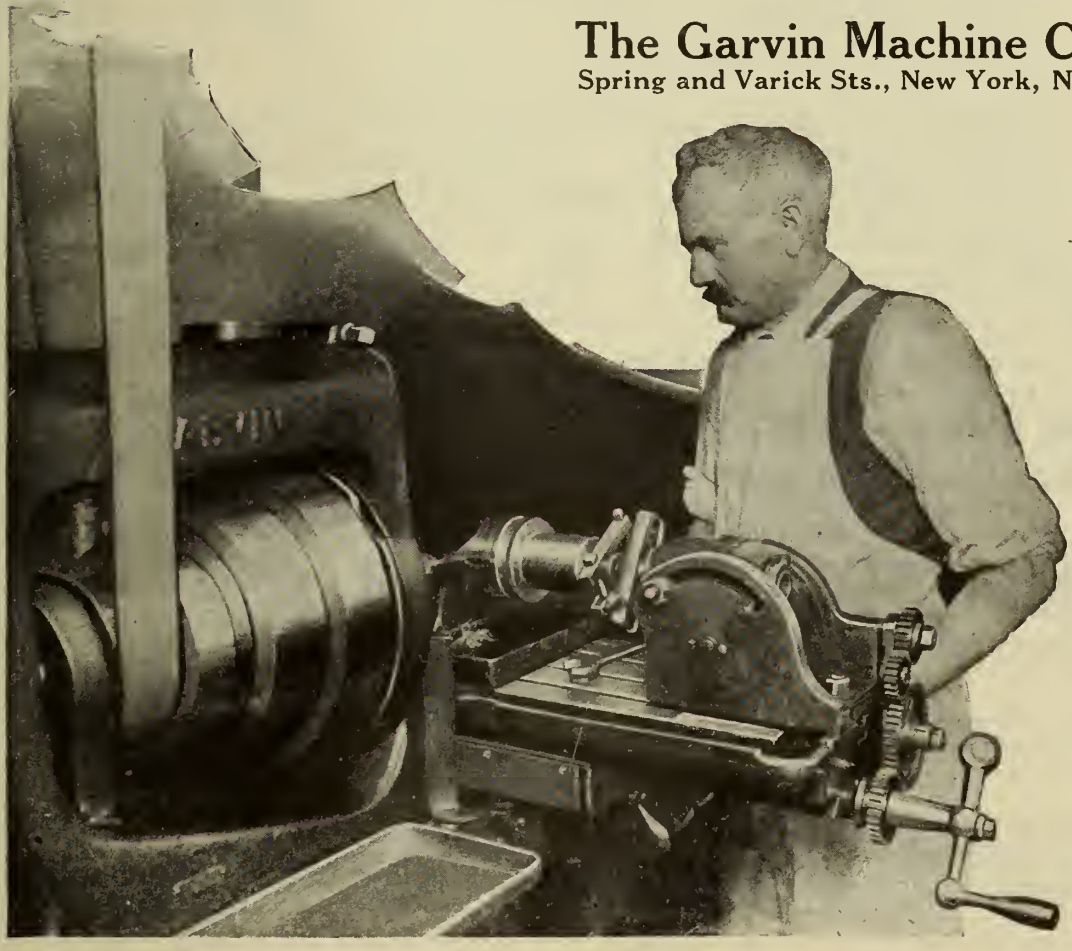
Spring and Varick Sts., New York, N. Y., U. S. A.



GARVIN

BUILDER OF BETTER MACHINE TOOLS

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L'Air Liquide Society, Toronto, Ont.
Lincoln Electric Co. of Canada, Ltd., Toronto, Ont.

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Nat. Electro Products Ltd., Toronto, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
Union Carbide Co. of Can. Ltd., Welland, Ont.

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Lyman Tube & Supply Co., Montreal, Que

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Elec. Steel & Metals, Welland, Ont.

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Petrie, Ltd., H. W., Toronto.

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Elec. Steel & Metals, Welland, Ont.

WHEELS, PRESSED STEEL
American Pulley Co., Philadelphia, Pa.

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Wheel Trueing Tool Co., Windsor, Ont.

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Hamilton Co., Ltd., Wm., Peterborough, Ont.
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Northern Crane Works, Walkerville.
Williams Tool Corp. of Can. Ltd., Brantford, Ont.

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Hamilton Co., Ltd., Wm., Peterborough, Ont.

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Brown, Boggs Co., Ltd., Hamilton, Can.

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Steel Co. of Canada, Ltd., Hamilton, Ont.

WIRE ROPE
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Can. Wire & Iron Goods Co., Hamilton, Ont.
Samuel Osborne, Ltd., Montreal, P.Q.

WIRE NAIL MACHINERY
National Machy. Co., Tiffin, Ohio.

WIRE, SPARK PLUG, MANGANESE NICKEL, COPPER NICKEL, MONEL METAL
Can. Driver-Harris Co., Ltd., Walkerville

WIRE STEEL, BRASS, COPPER
Steel Co. of Canada, Ltd., Hamilton, On

WIRE, WEAVING, MONEL METAL, BRASS, COPPER, GOLDEN BRONZE, HIGH BRASS, LOW BRASS, NICKEL
Can. Driver-Harris Co., Ltd., Walkerville

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Canada Machinery Corp., Galt, Ont.
Cowan Truck Co., of Galt, Galt, Ont.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., Ltd., A. R., Montreal

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Baird Machine Co., Bridgeport, Conn.
Brown, Boggs Co., Ltd., Hamilton, Can
Strelinger Co., C. A., Windsor, Ont.
Shuster Co., F. B., New Haven, Conn.

WOOD BORING MACHINES
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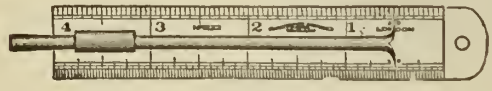

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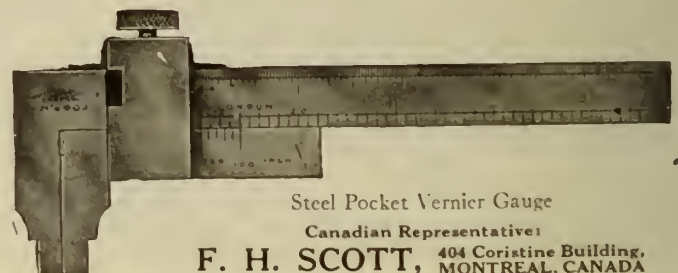
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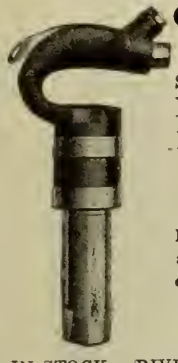

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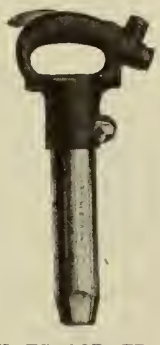

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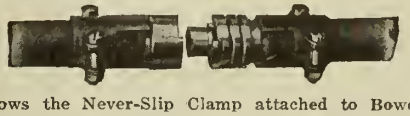

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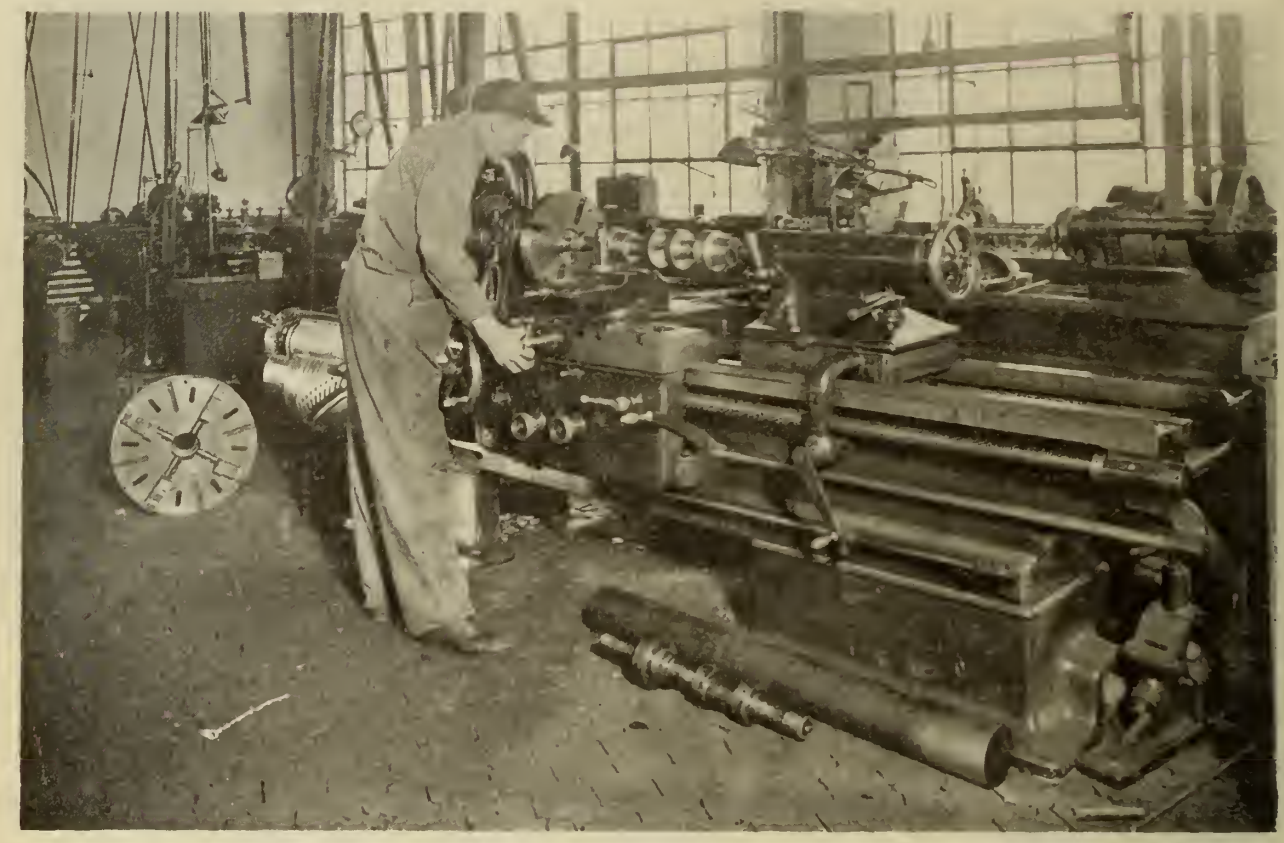

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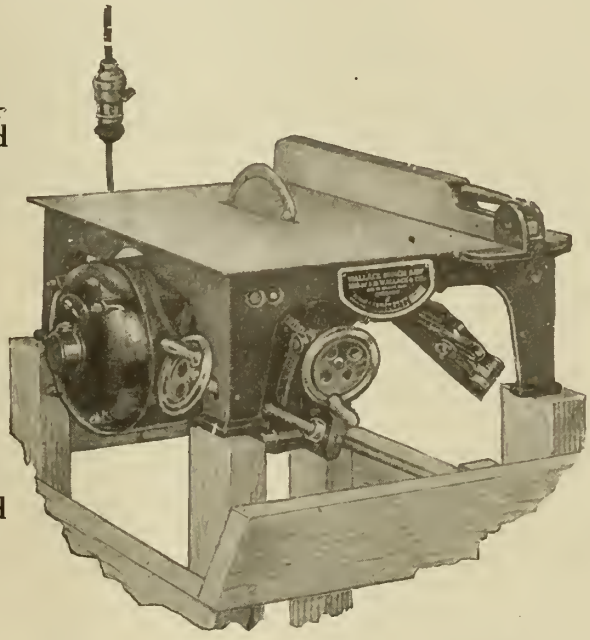

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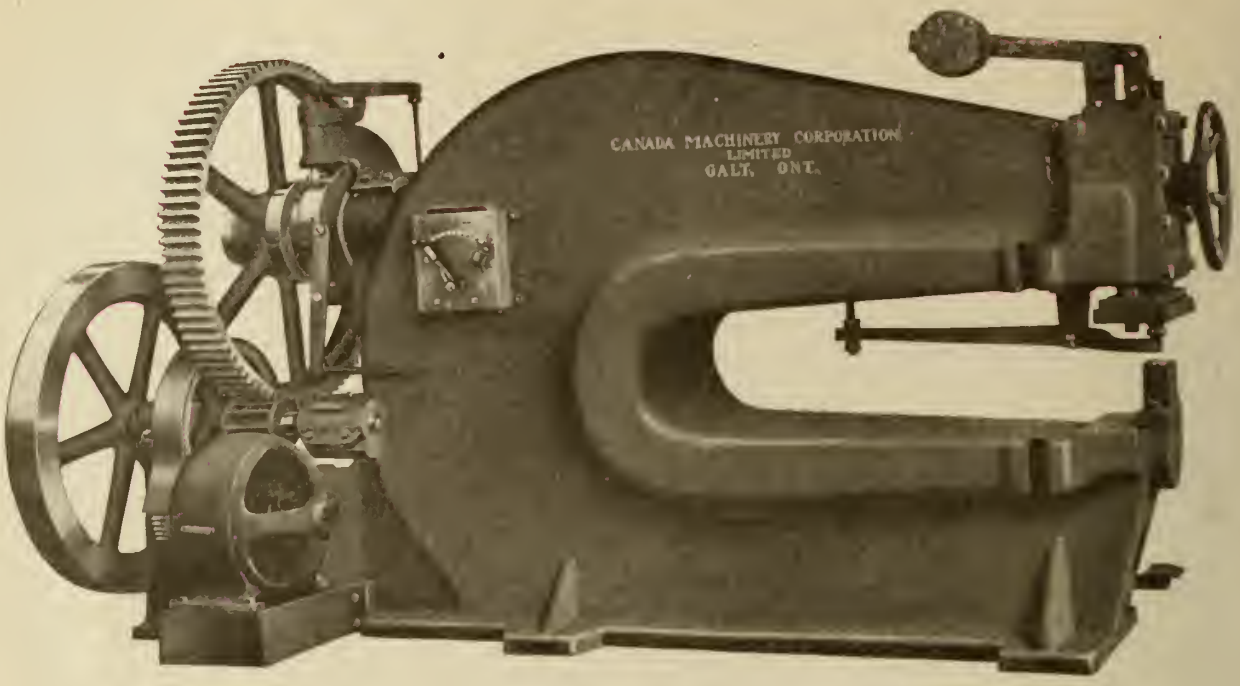

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CANADIAN MACHINERY AND MANUFACTURING NEWS

Vol. XXIV., No. 14 Published by the MacLean Publishing Company, Limited, Toronto September 30, 1920 $4.00 a Year Subscription Price

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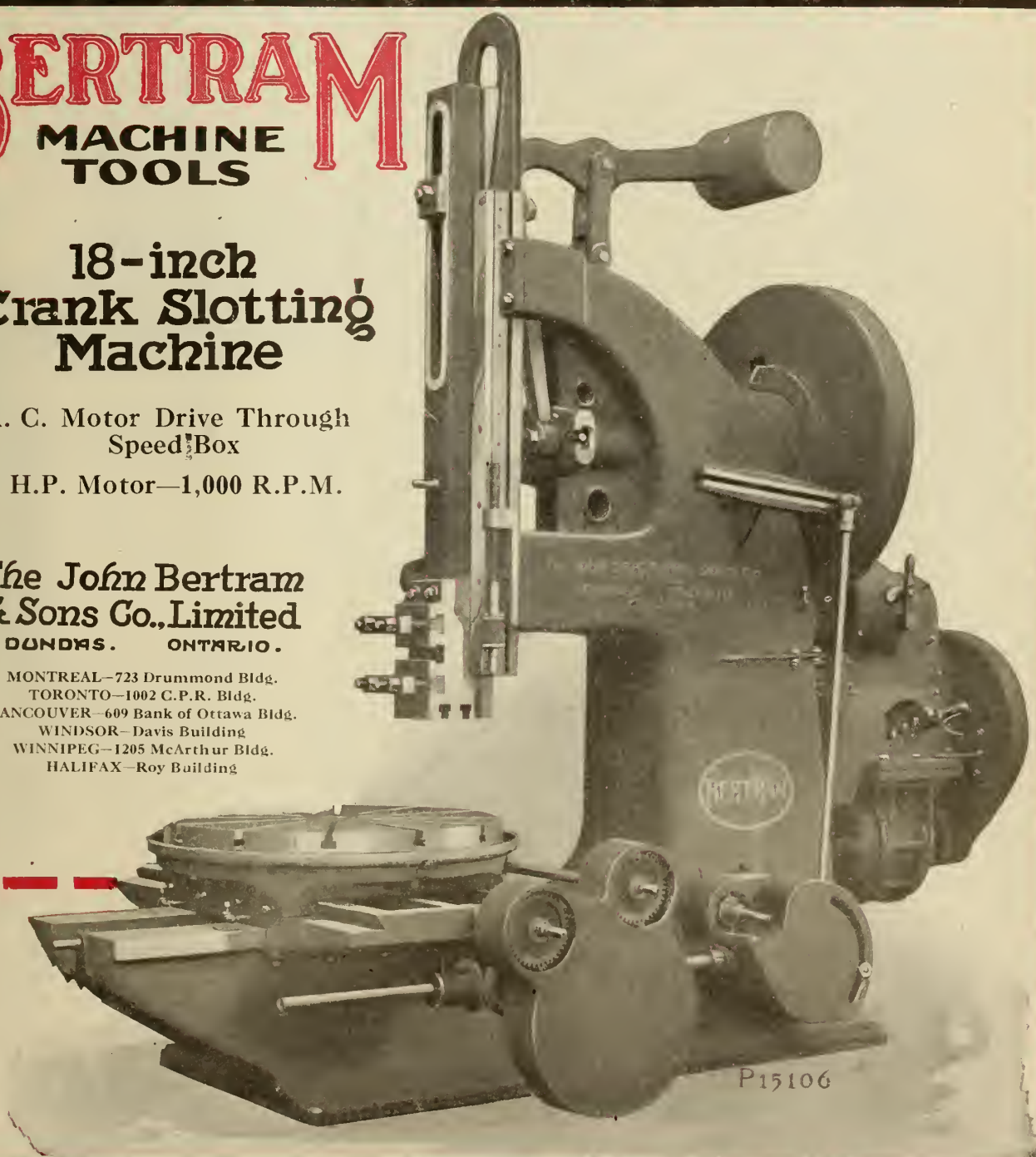

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The BERTRAM Page

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No.4 Single Punch and Shear

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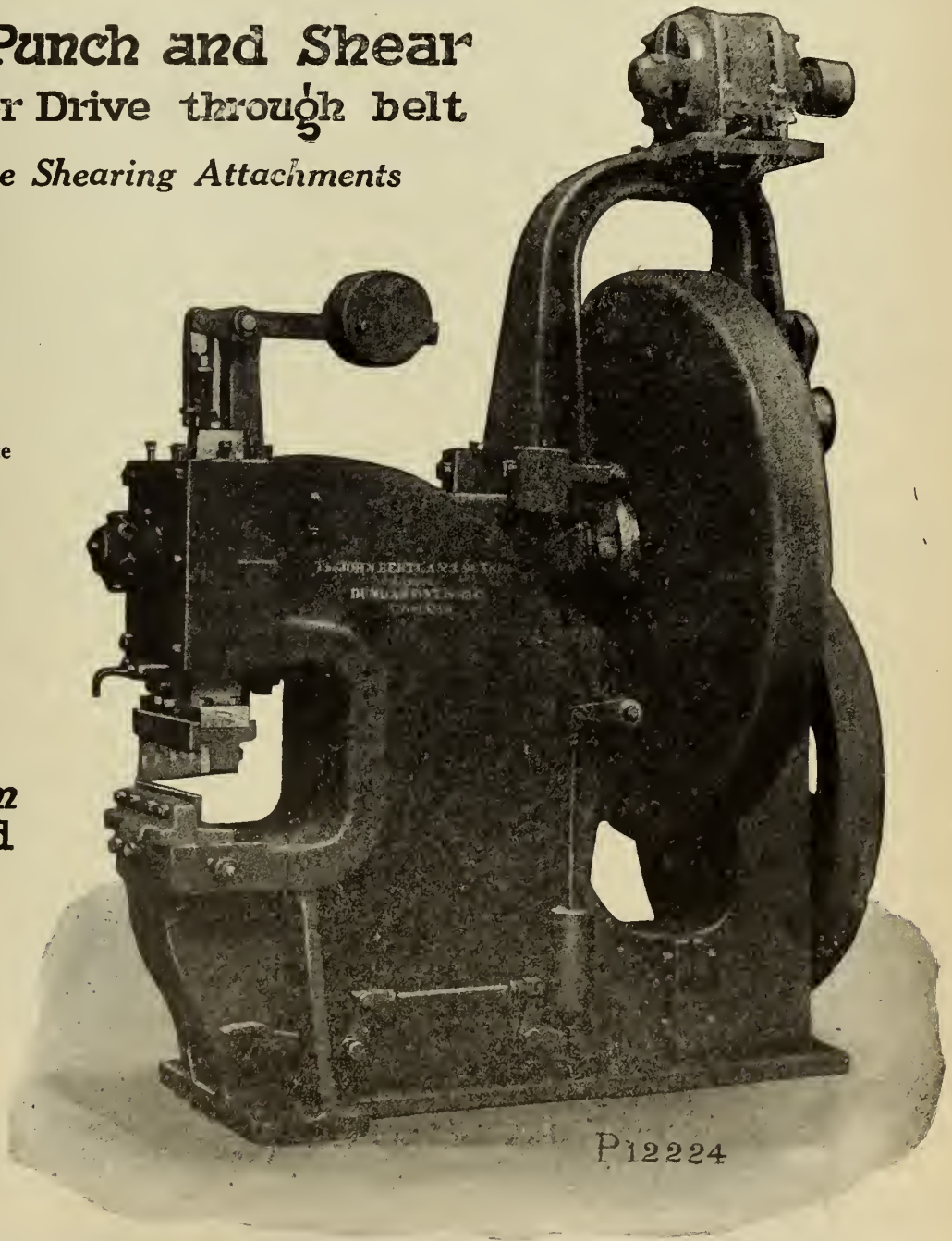
Fitted with Plate Shearing Attachments



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Misik is foreman of the finishing division of the Drawing Instrument department in the Keuffel & Esser Company's factory at Hoboken, N.J., where the world-famous K. & E. drawing instruments are made.

Mason, who is a Speed-grits salesman, watched the workmen putting the finish on the fine nickel-silver compasses by hand with strips of emery cloth. Yes, it was slow—and tedious and costly.

"What's wrong with your machines?" he asked finally, pointing to the row of belt-grinders that stood idle along the wall. "Nothing—with the machines," replied Misik. "It's the belts. The 'jump' from the belt-joints in an abrasive belt spoils the finish on our instruments. I've tried a lot of belts but I stick to hand work."

The first thing Mason did when he got back to his office that afternoon (August of last year) was to send Misik several samples of the new Speed-grits Uniflow Belt. Then several days later, he went back to the K. & E. factory. The first thing that greeted his ears as he came up the stairs was the hum of busily whirring belt-grinders.

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Canada's Dependable Machinery and Supply House

CINCINNATI High Speed Drilling Machines

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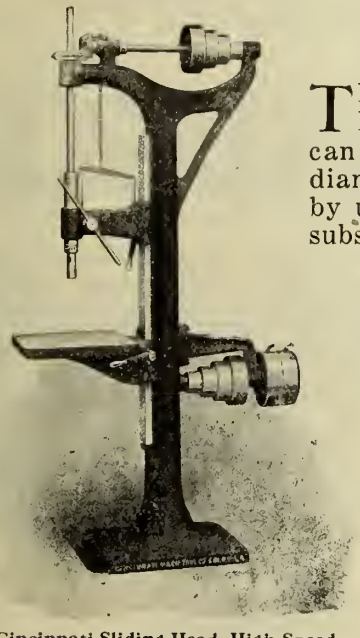
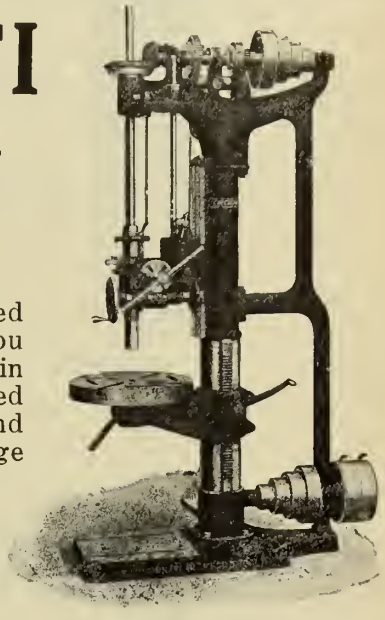


Cincinnati Sliding Head, High Speed 20-inch Drilling Machine



Cincinnati Regular Heavy Pattern Upright Drilling Machine

Another drilling machine of exceptional merit is found in the Cincinnati Regular Heavy Pattern Upright Drilling Machine, made in five sizes (24 to 42 inch) and eight styles. Either square or round tables are furnished and any other equipment to suit particular needs.

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MACHINERY AND SUPPLIES

If interested tear out this page and place with letters to be answered.

Let 'er Down

No waiting—no cussing and fussing or stepping on one another's toes, No — "Now men, altogether" — "steady"—"whoop, take 'er up a little"—"now down"—but—

just a slight pull on the cord and down she comes, easily, steadily, surely, without jump or jar, and she'll go up, down or stop within a hair's breadth if you wish.

For closing molds, setting cores, pouring off, handling castings, etc., CIRCO Air Hoists give you power hoist, power speed, safety and economy at hand hoist cost.

Bulletins on request

Canadian Ingersoll-Rand Company
Limited

SYDNEY SHERBROOKE MONTREAL TORONTO COBALT
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STEEL CASTINGS

We shall be glad to supply information on:

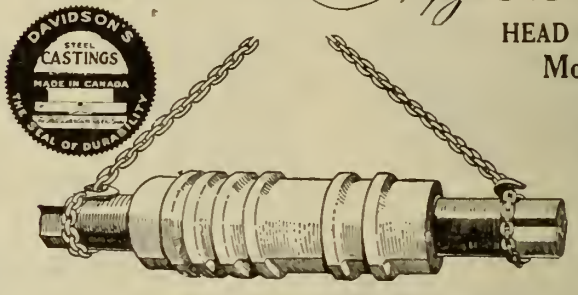
Galvanizing, Enamelled Signs, Stoves, Lithographed Ware, Wire Goods, Anchors, etc.

For Shipbuilding, cars, locomotives, and all classes of machinery.

Superior and reliable Steel Castings by the Acid Electric Process can be made up to fifteen tons.

The Thos. Davidson Mfg. Co. Limited

HEAD OFFICE: Montreal



Branches:
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STEEL CASTINGS

QUICK DELIVERIES

High Carbon Steel
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QUALITY GUARANTEED

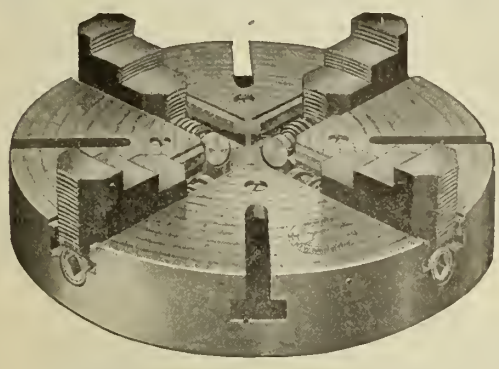
Sizes—½ lb. to 5,000 lbs. each

THE WILLIAM KENNEDY & SONS,
LIMITED
OWEN SOUND, ONTARIO
ESTABLISHED 1860

ALL STEEL

INDEPENDENT CHUCKS

are not an experiment—they have come to stay. They are a necessity with the modern machinery and high-speed steel cutting tools.



THE UNION STEEL BODY CHUCKS

are well designed and have all the elements of strength and durability for which they are designed. We make other types in steel also, including the Geared Scroll Chucks and the Geared Scroll Combination—all designed for heavy work and hard usage.

UNION MANUFACTURING COMPANY

New Britain, Conn.

New York Office: 26 Cortlandt Street

Makers of a complete line of chucks

"Alloyed under the Stanley Process"

for general service

LIONROYAL BABBITT

MADE IN CANADA

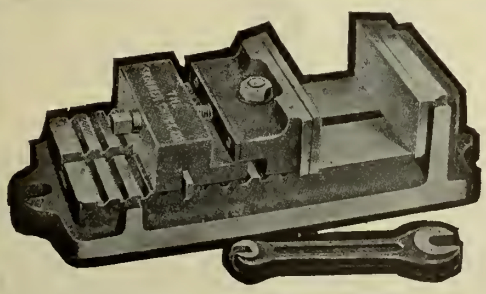
We warrant that no other Babbitt at the price will perform as well in so many different classes of bearings, and are ready to prove this in any case by trial installations in competition with any metal of its type.

The secret of its success is in the method of its alloying. It is produced under the Stanley Process, which is controlled exclusively by us throughout the Empire. Try it and be convinced.

BRITISH SMELTING & REFINING COMPANY LIMITED

MONTREAL

SKINNER DRILL PRESS VISES



Designed for holding either straight or taper work this vise is portable, convenient and durable.

It is truly **THE HANDY TOOL.**

It may be bolted to a drill, planer, miller or shaper by the ears at both ends, clamped as desired by the flange or used at right angles.

THE SKINNER CHUCK COMPANY

NEW BRITAIN, CONN.

New York Office: 94 Reade St.
San Francisco Office: Rialto Bldg.
London Office: 139 Queen Victoria St., London, E. C. 4.

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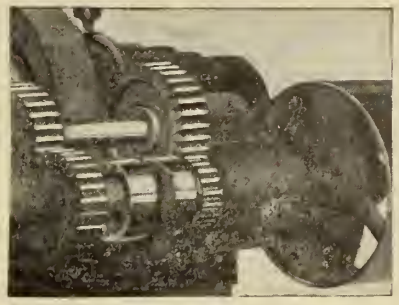
THE JOHNSON FRICTION CLUTCH



Modern Machine Tools Require Good Clutches

and Johnson Clutches are furnished as regular equipment on a large majority of the best machine tools made.

Exceptional qualities are required in a friction clutch to make it operate with the precision demanded by modern machine tools, and stand up under the service that the ordinary machine tool must perform.

The clutch that has proved its ability on hundreds of such installations is capable of good service anywhere.

Here is a common Johnson Clutch application—a double clutch mounted between spur gears for change of speed with single pulley drive. Where two speeds are needed on continuous production work, the greater convenience and superior endurance of Johnson Clutch control are invaluable.

Write for our Yellow catalog and Booklet, "Clutches As Applied To Machine Building."

DOUBLE CLUTCH EXTERIOR

CANADIAN AGENTS:

WILLIAMS & WILSON, LTD., 84 Inspector St., Montreal

CANADIAN FAIRBANKS-MORSE CO., LIMITED, Montreal, Toronto, Winnipeg

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.

STEEL *for*

Every Commercial Purpose

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.

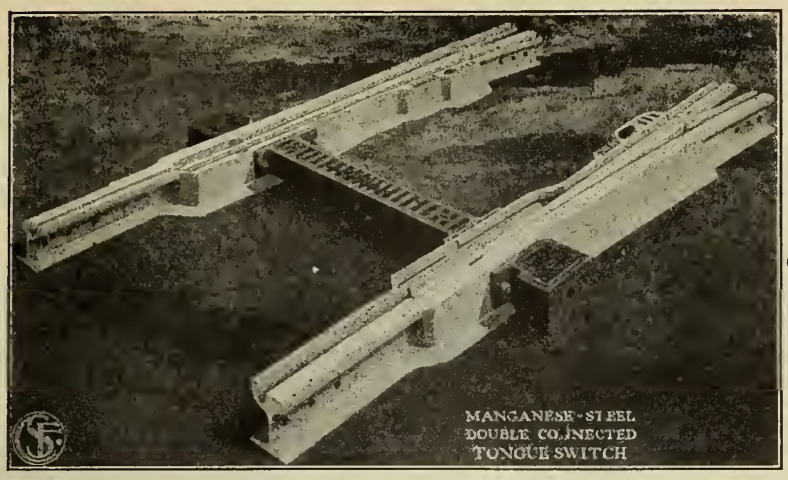
Steel Ingots *by the* HARMET Liquid Process

Nova Scotia Steel and Coal Co., Limited

Head Offices:

New Glasgow, N.S.

Sales Offices:
Western Room 14 Windsor Hotel
MONTREAL



MANGANESE STEEL TRACKWORK

for

Steam and Electric Railways

Manufacturers of Balkwill Articulated Manganese-Steel Crossings

CANADIAN STEEL FOUNDRIES LIMITED

Transportation Building, Montreal

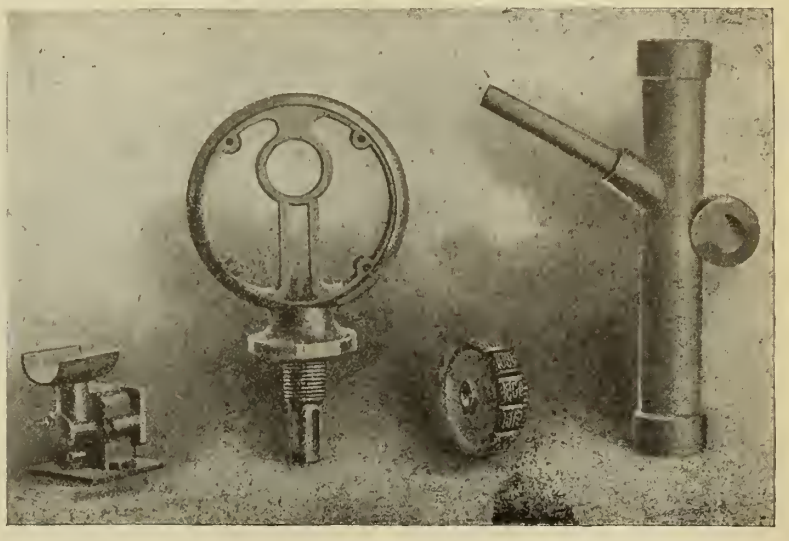
To-day —

While this matter is before you make the first step toward bringing down your production costs: send us blue-prints or samples of your parts and we will give you estimates on the cost of having them die-cast.

DIE-CASTINGS

Save Time and Expense

Our estimates on your work will make it plain how much you can save on all your quality, – production work. Take action to-day on this proposition!



Die-Casting Chat No. 27: The die-casting process is new, but it's no fad. The fact that it has been adopted for making parts for automobiles and other machines is proof of its efficiency and economy. Die-castings are strong, uniform, absolutely accurate—and require no machining. Is there anything you would like to know about die-castings? Write to-day!

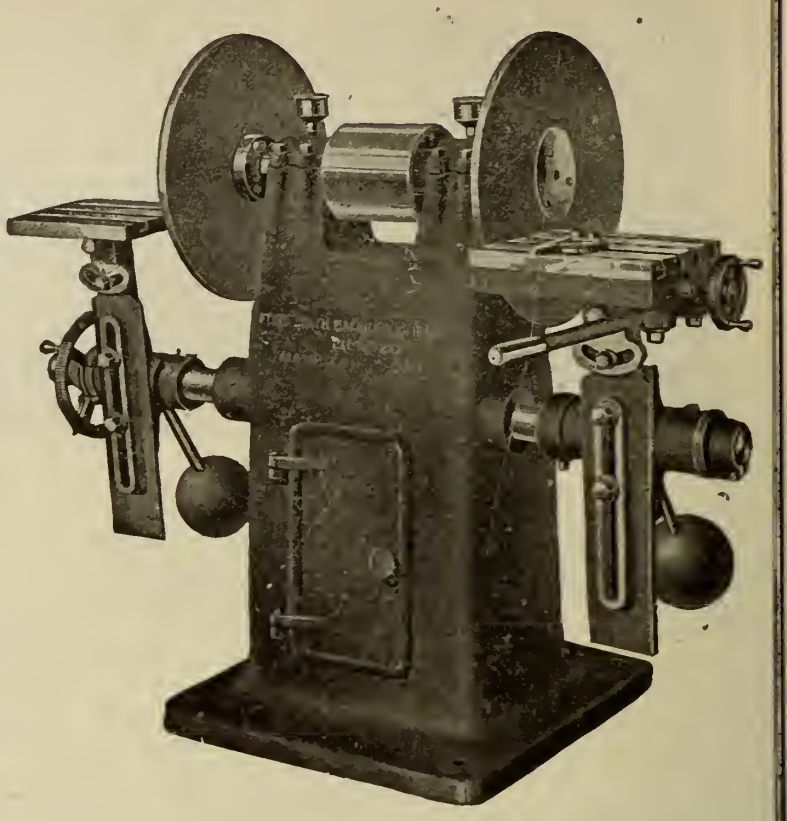
Largest Makers of Die-Castings in Canada

THE FISHER MOTOR CO., LIMITED

ORILLIA, ONTARIO

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

FORD-SMITH GRINDERS



The amount and accuracy of your output depends largely upon your tools being kept correctly ground at all times. Ford-Smith Grinding Machines enable the men to keep their tools in the best of shape with a minimum of time spent over the grinder. Give your men Ford-Smith Grinders and note the satisfactory production you will then obtain.

The Ford-Smith Machine Company, Limited

HAMILTON - ONTARIO

FOREIGN AGENTS:

W. E. Storey, London, England Gollin & Co., Melbourne, Australia
British & Canadian Hydraulic Tube Co., Johannesburg, S. A.

Do You Consider Your Workmen's Temper ?

It's important, because a workman out of temper cannot do good work.

Nothing puts a workman in bad temper more quickly than a dull file.

As soon as the file begins to get dull, discard it and buy a new one.

If you buy Famous Five brands, you will not have to discard files before you have full value out of them.

Made of special steel, well cut and thoroughly hardened, they give the fullest "file value."
The Famous Five brands are :

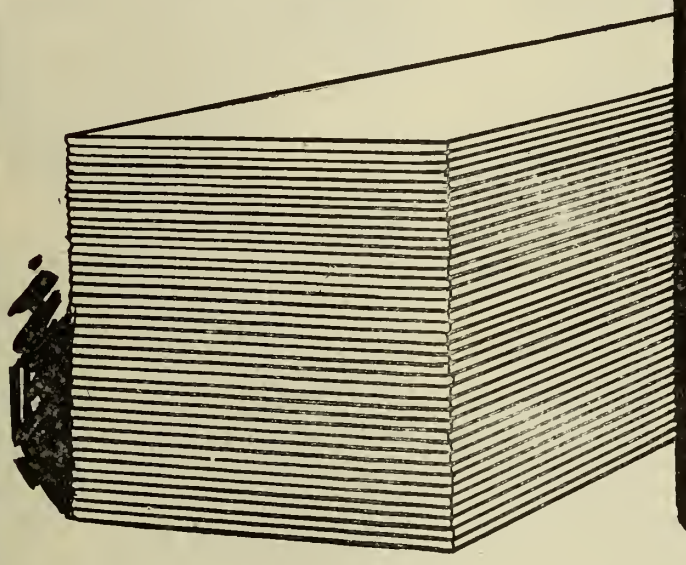
KEARNEY & FOOT
GREAT WESTERN
AMERICAN
ARCADE
GLOBE

MADE IN CANADA BY

NICHOLSON FILE COMPANY

PORT HOPE - ONTARIO

Deep Drawing Plate

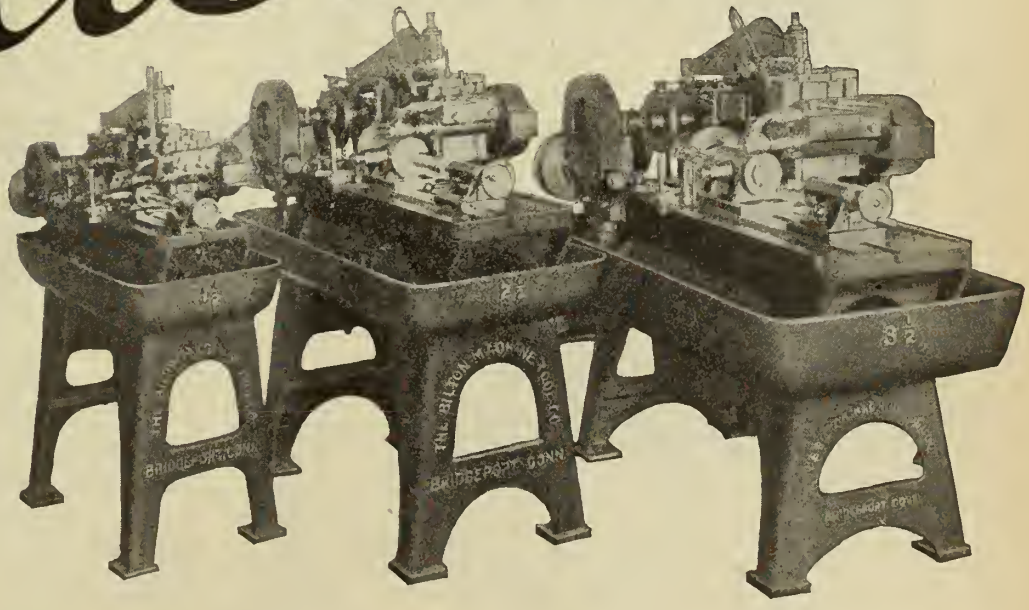


WE manufacture plates of various drawing qualities for such work as

AUTOMOBILE FRAMES
CRANK CASES
BRAKE DRUMS
and
PRESSED STEEL PARTS
of all descriptions

DOMINION FOUNDRIES and STEEL, LIMITED
HAMILTON, ONTARIO

Bilton GEAR MILLERS



Fully Automatic

Their adaptability is almost unlimited on small work—such as cutting spur, bevel, miter, angle gears, saws, ratchets, sprockets, cutters, knurls, taps, cylinders, form cutting, manufacturing, milling, etc.

A big time saver, as indexing takes place during return stroke of cutter — which is removing metal 90% of the time.

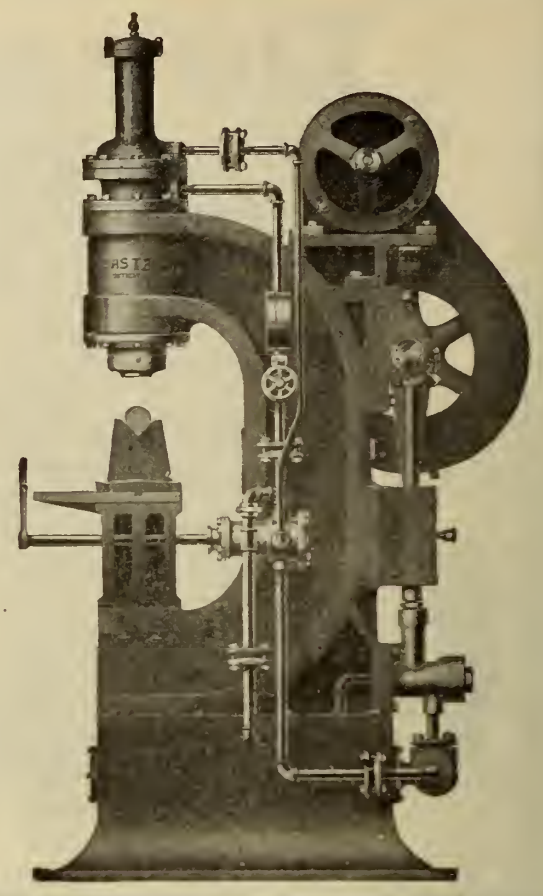
Write us for Catalog 30-6

Over 500 leading manufacturers now use the Bilton for high production on accurate work

Bilton Machine Tool Co. Housatonic Avenue **Bridgeport, Conn., U.S.A.**

Foreign Agents: Alfred Herbert, Ltd. Chas. Churchill & Co., Ltd.

A SELF-CONTAINED HYDRAULIC UNIT



EASTERN UNIVERSAL HYDRAULIC PRESS. Supplied in 20-35 and 50-ton capacities, full hydraulic depending on no springs or weight for return of ram, delivering pressure instantly at a speed of 1½ in. per second, return of ram 3 in. per second.

Length of Ram Travel.....6 in.
Depth of Throat .....10 in.
Length of Table .....8 ft.
Width of Table .....10 in.
Table to Ram .....10 to 14 in.

EASTERN UNIVERSAL PRESSES are tested before leaving our plant at 33 1/3% overload. They are furnished with rolling centres and are unexcelled for straightening of motor crankshafts, heavy wheel shafts, broaching splines in drive plate, differential gears, and others. Straightening front axles and spindles.

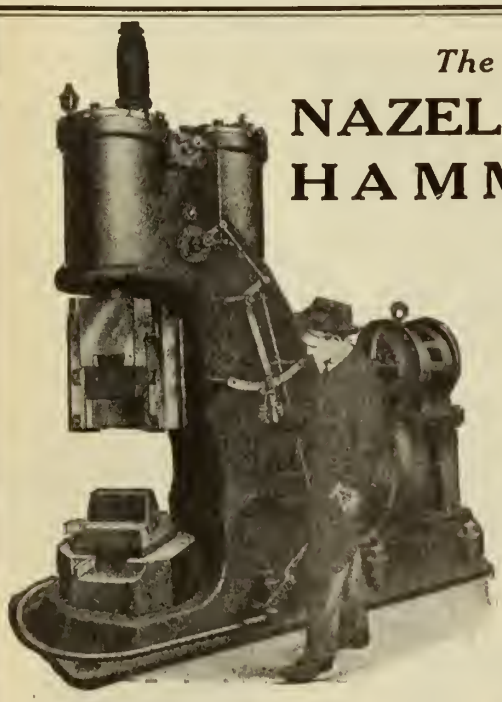
Write for details

EASTERN PRODUCTION COMPANY

137 Leib St., DETROIT, MICH.
120 Wisconsin St MILWAUKEE, WIS

Canadian Representatives:
F. F. BARBER MACHINERY CO., Limited,
Foy Building TORONTO

The
NAZEL AIR HAMMER



NOTED FOR ITS BLOW AND CONTROL

A self-contained unit, HAMMER AND COMPRESSOR COMBINED, built in three types, six sizes arranged for BELT OR DIRECT MOTOR DRIVE, with capacities up to 7 inches square, for all manner of jobbing, manufacturing and certain classes of drop forgings.

Nazel Engineering & Machine Works
Dept. F., Philadelphia, Pa.

"Elkco," "Elkco Special," "Elk Steel"
"St. Marys," "Keystone," "M.D. Elk"
"Rotex," "Elk Ladle," "Elk Dust"
"Keystone Dust"
"Rotex Dust"

ELK BRANDS FIRE BRICKS

A Brand for every purpose ensures the best results.

Each brand of Elk Fire Brick has some particular qualification which fits it to give better results in certain places than other brands we produce. It differs from the others either in grind, mixture of clays, or in method of manufacture, or possibly in chemical composition.

A trial will convince you that both our quality and service equal the best.

Large stocks of various shapes carried in warehouse in Hamilton.

Elk Fire Brick Company of Canada
Limited
Sun Life Building, HAMILTON, ONTARIO

W. ATKINS & CO LD Sheffield ENG

The
HIGH SPEED STEELS
For superior cutting power:
"Double Waco" and
"Waco Superior"
Carbon Tool Steels
For all Purposes.
"Turtle Brand," unequalled for reliability.
MINERS' DRILL STEELS
Solid and Hollow.
All Sections.

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MARSHALL SON & BUNNEY
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Crucible
AND
Open Hearth Steel
Tool Steel
"ARGO" BRAND *HIGH-SPEED* STEEL

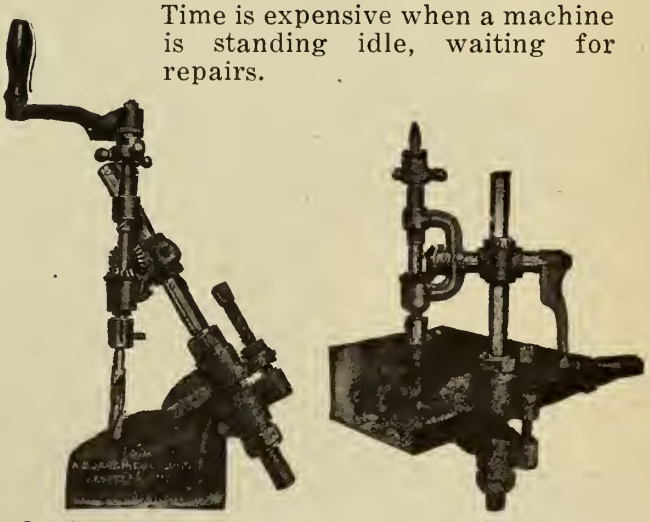
The John Illingworth Steel Co.
1856

Frankford, Phila.
New York Office 217 Broadway

RALPH B. NORTON, AGENT
124 Craig St. W.
Montreal, Canada

Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.



On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, $26.50 net.
Sold by all Machinery and Supply Houses.

A. B. JARDINE & CO., Limited
HESPELER, ONTARIO

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Wherever there's metal to be cut in the quickest possible time, and with the minimum waste of material, Starrett Hack Saws are on the job.

There's a Starrett Blade to suit any kind, size or shape of material. The Starrett Hack Saw Chart points out just which blade to use and how to use it. Choose the right blade, put it to work in the right way, and let it prove that Starrett Blades "cut quicker and last longer."

In these days of high production costs, every little leak shows up big in your running expenses. Let our new service book, "Hack Saws and Their Use," show you how to reduce your cutting costs to the minimum. Write for a free copy.

THE L. S. STARRETT COMPANY

The World's Greatest Toolmakers
Manufacturers of Hack Saws Unexcelled
ATHOL, MASS.

42-103

STARRETT HACK SAWS CUT QUICKER LAST LONGER STARRETT TOOLS

Use Starrett Hack Saws

PISTONS and RINGS

Made on a GRIDLEY SEMI-AUTOMATIC

The Lowest Cost per Piece

method of turning motor pistons and piston rings, is the "Gridley Way." It's backed up by the well-known features of Gridley bar-working machine standardization.

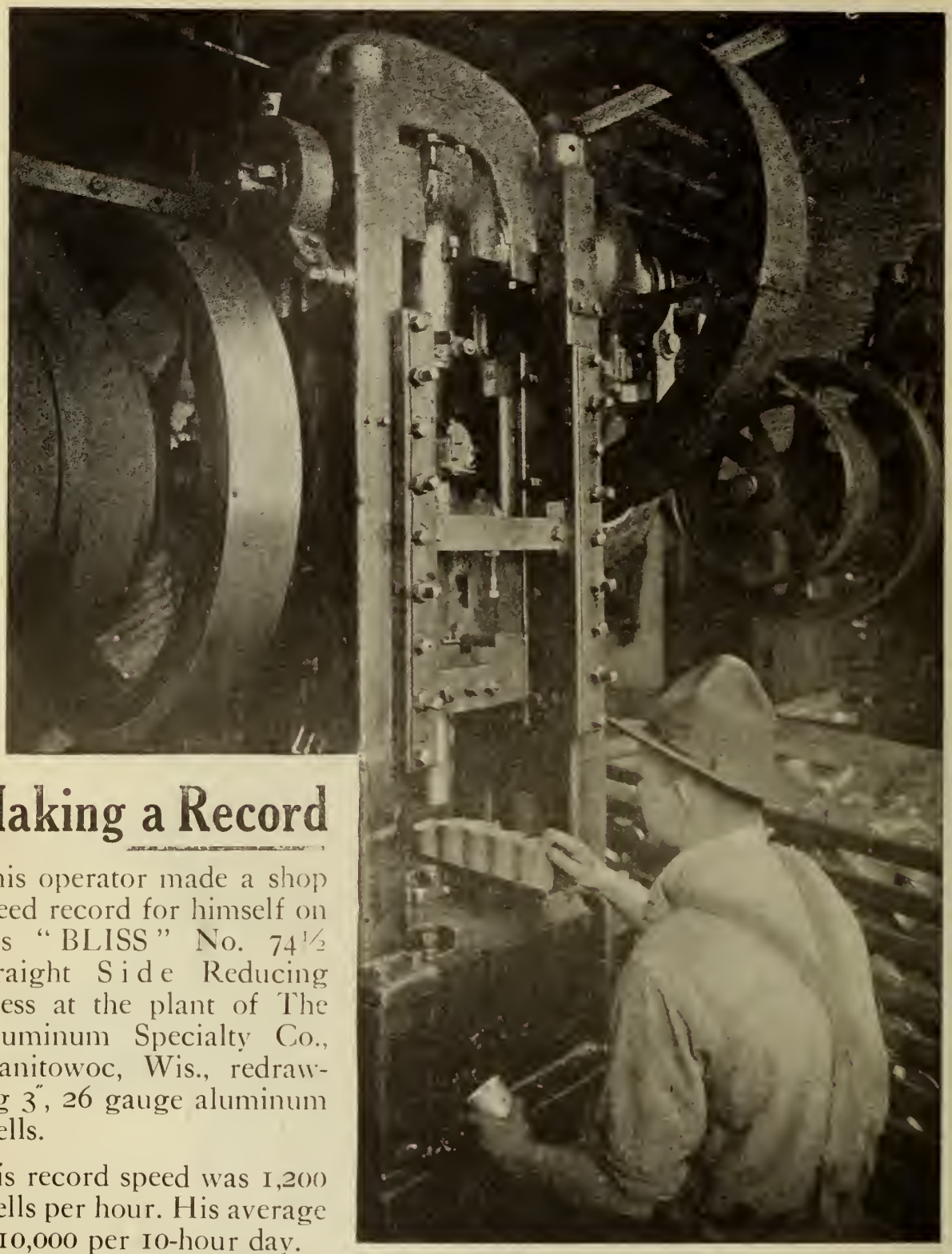
Write for our latest folder—
"Piston and Rings."

THE NATIONAL ACME COMPANY

General Offices: CLEVELAND, OHIO WINDSOR, VERMONT Canadian Screw Plant: MONTREAL, P.Q.

Branch Offices: NEW YORK, BOSTON, CHICAGO, DETROIT, BUFFALO Warehouses: NEW YORK, CHICAGO With Foreign Representatives

Makers of Gridley Single and Multiple Spindle Automatics at Windsor, Vermont and Acme Automatics, Threading Dies and Screw Machine Products at Cleveland, Ohio



Making a Record

This operator made a shop speed record for himself on this "BLISS" No. 74½ Straight Side Reducing Press at the plant of The Aluminum Specialty Co., Manitowoc, Wis., redrawing 3", 26 gauge aluminum shells.

His record speed was 1,200 shells per hour. His average is 10,000 per 10-hour day.

Note the almost automatic feed arrangement

E. W. Bliss Company

Main Offices: BROOKLYN, N.Y., U.S.A.
American Factories: BROOKLYN, N.Y. and HASTINGS, MICH.

1857 1920

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92.

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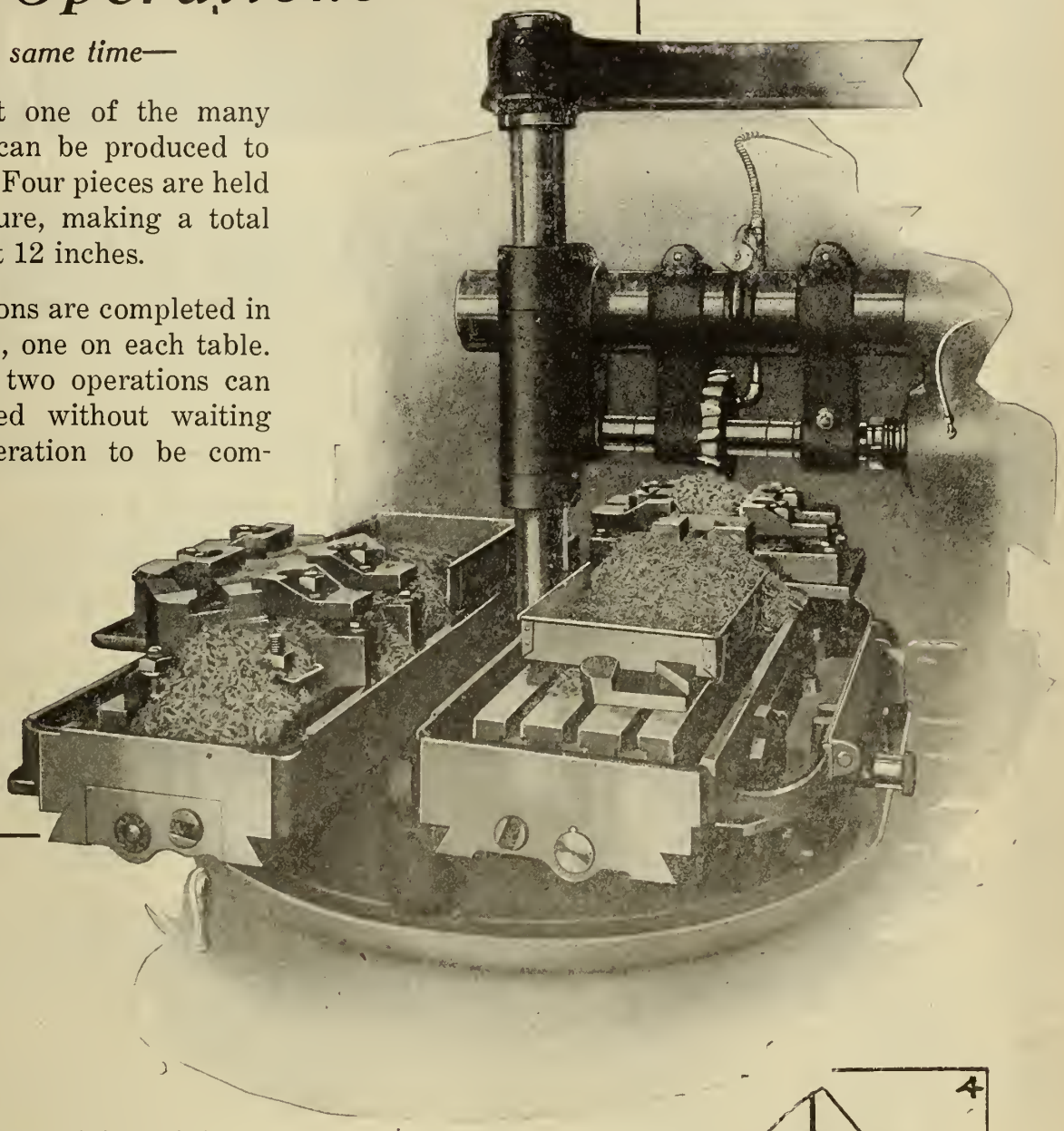
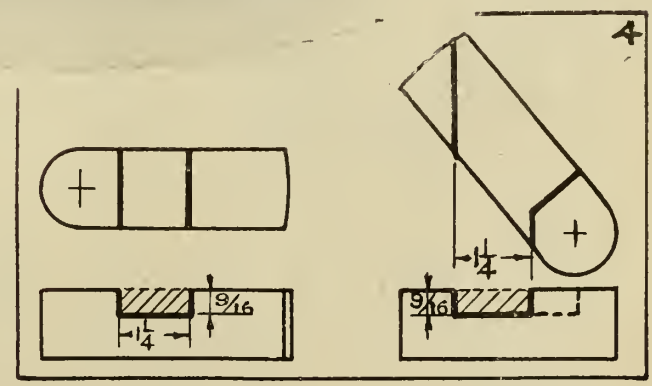
Two Operations

At the same time—

Here is just one of the many pieces that can be produced to advantage. Four pieces are held in each fixture, making a total length of cut 12 inches.

Two operations are completed in this instance, one on each table. In this way two operations can be performed without waiting for one operation to be completed.





Compare this with your work and investigate this manufacturing proposition.
No lost motion.
No marks from returning cutters.

Canadian Offices : POTTER & JOHNSTON MACHINE CO.

ROELOFSON MACHINE & TOOL CO., LIMITED

Head Office and Showrooms :
11 Wellington Street East, TORONTO, Canada

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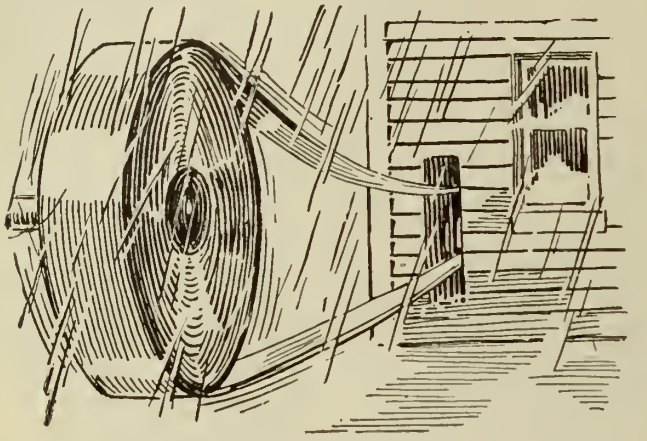
BELTING

SATURN HAIR BELTING

Made of



CAMEL'S and GOAT'S HAIR

The camel's hair, on account of its softness, and the goat hair, on account of its length, give flexibility and strength to the belt.

This belt combines the advantages of a **FLEXIBLE** solid woven belt with **WATERPROOF** qualities. The hair does not shrink when wet.

In addition, by using this belt you will have one of great strength and wearing qualities.

Other Lines

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Lanco Balata Belting
Leather Belting
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Shoe Machinery Belting
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Cable Address:
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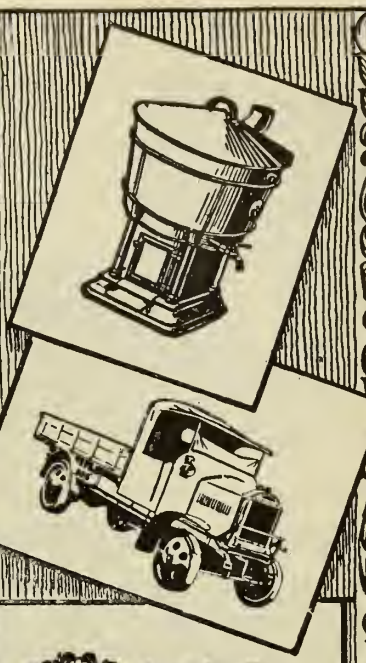

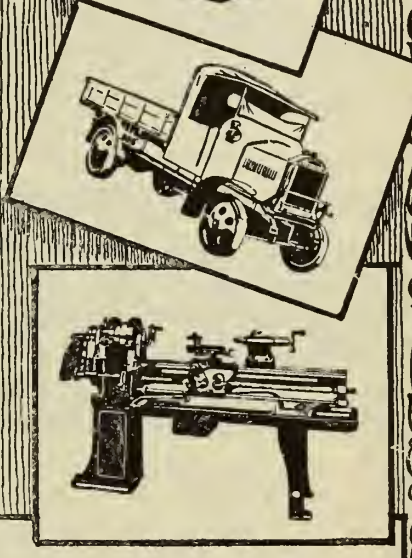

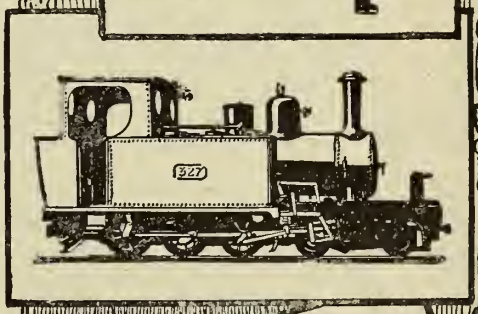

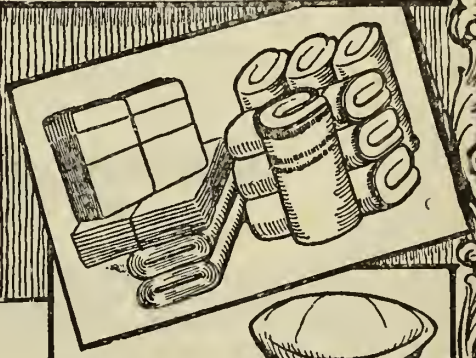

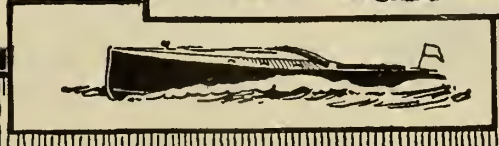

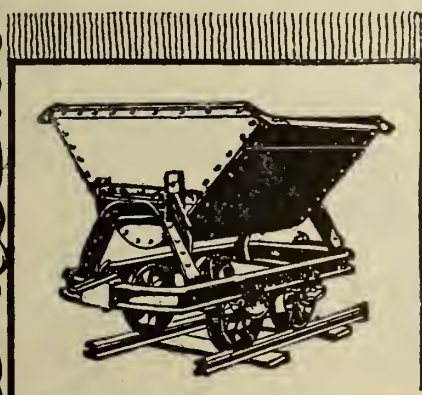

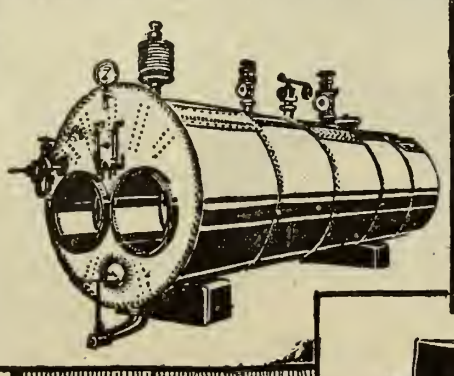

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DUNBAR SPRINGS

ACCURACY ASSURED

You can always depend upon Dunbar Springs being accurate. Before proceeding with any order the first few springs are carefully tested and checked up for this very purpose.

Seventy-two years' experience making flat and spiral springs of every description enables us to furnish you with springs of the highest quality, that can be depended upon under all conditions.

'Send blue prints for estimates.

The Dunbar Brothers Co.

BRISTOL, CONN.

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FOR TRUEING GRINDING WHEELS

QUALITY SERVICE SATISFACTION

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Tools For All Mechanical Purposes

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Hack Saw Blades That Reduce Cutting Cost

SIMONDS

For Machine or Hand Use. Hardness in the teeth for rapid cutting—Flexibility in the blade for long wear. They do not break when properly used.

SIMONDS CANADA SAW COMPANY, LIMITED

St. John, N.B. Montreal, Que. Vancouver, B.C.

Simonds Simonds

Free Tool Grinding Chart

Grind your cutting tools in exactly the right way to get best results—and you save time. That's obvious. It is precisely that that this Tool Grinding Chart enables you to do.

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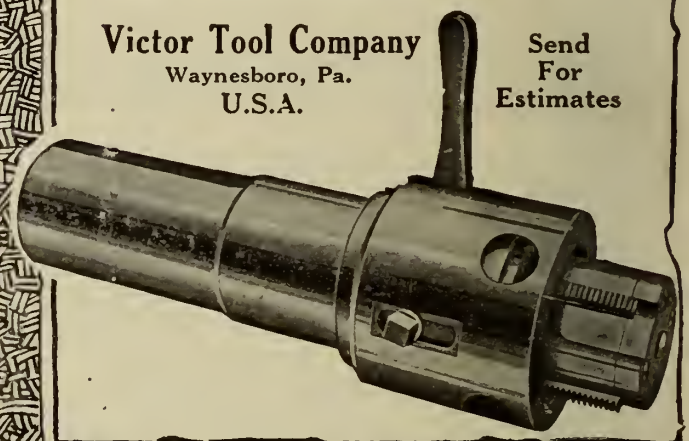

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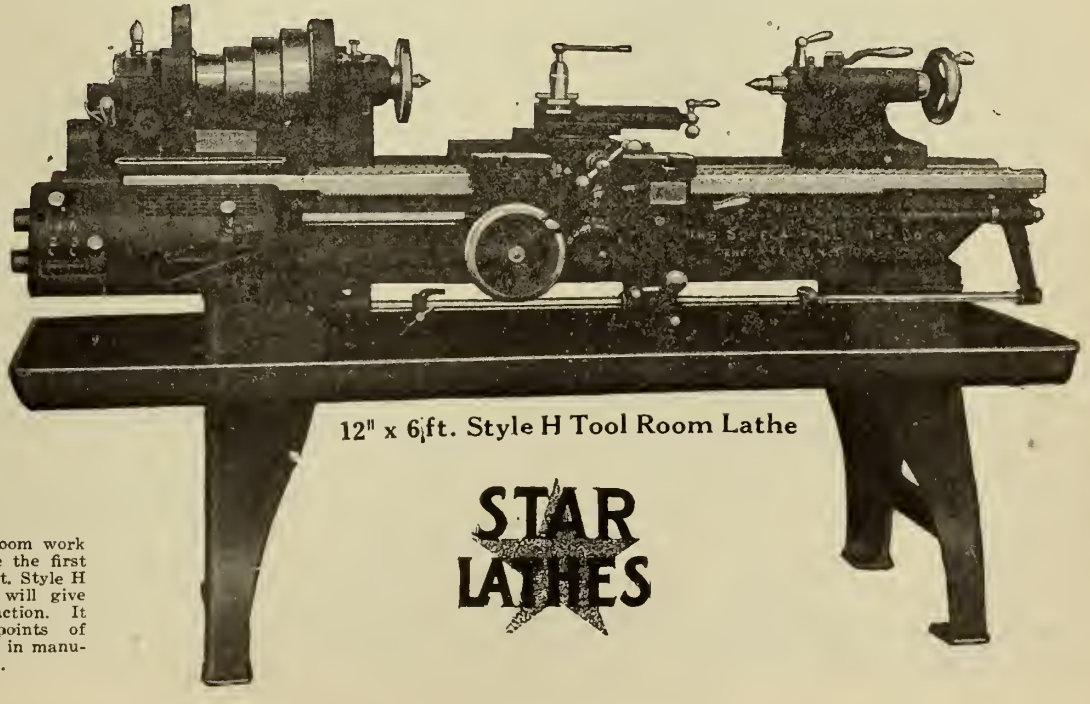

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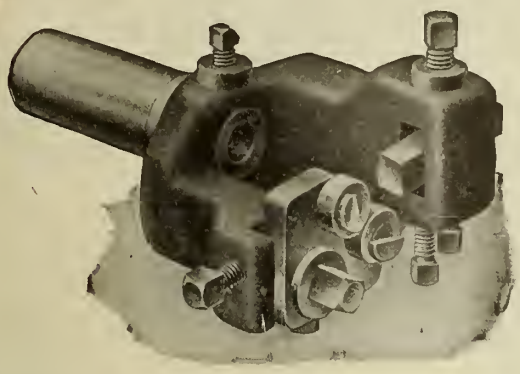

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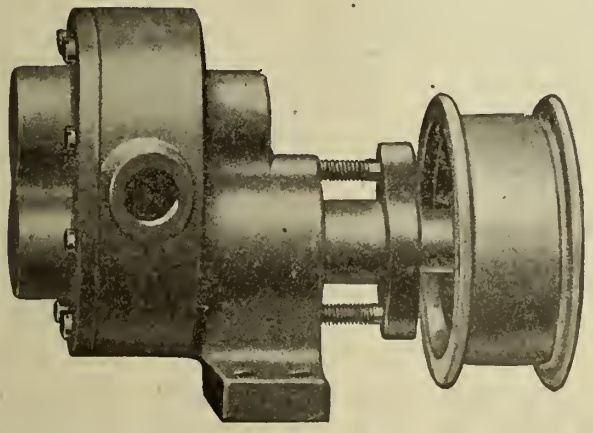

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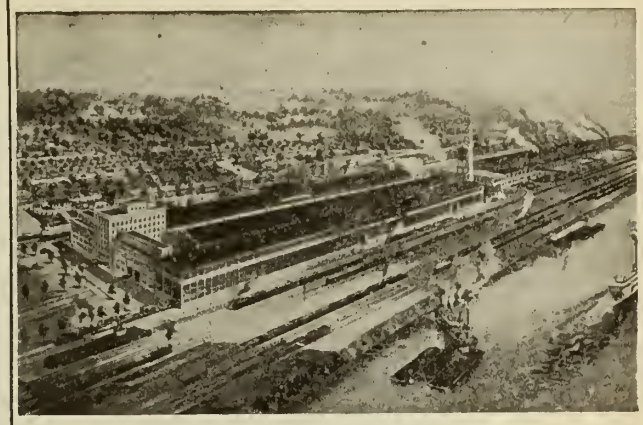

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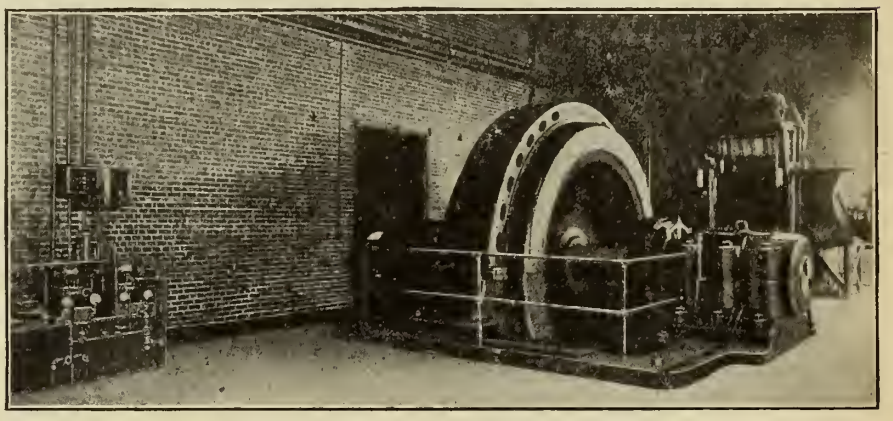

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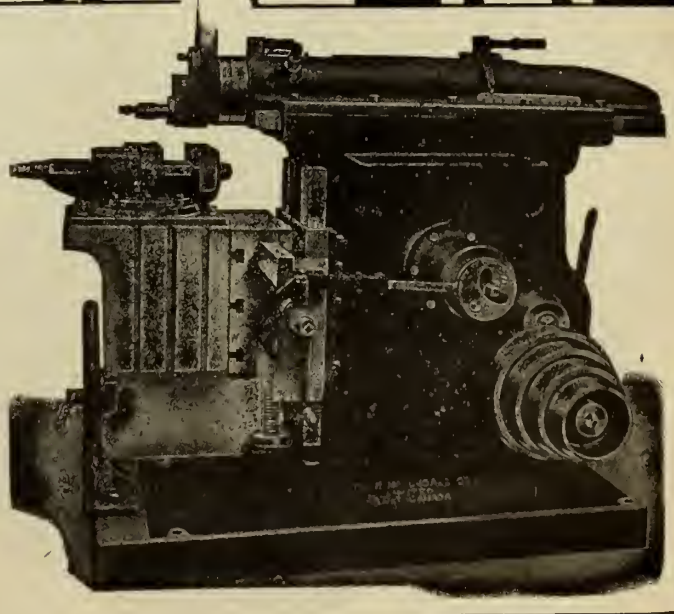

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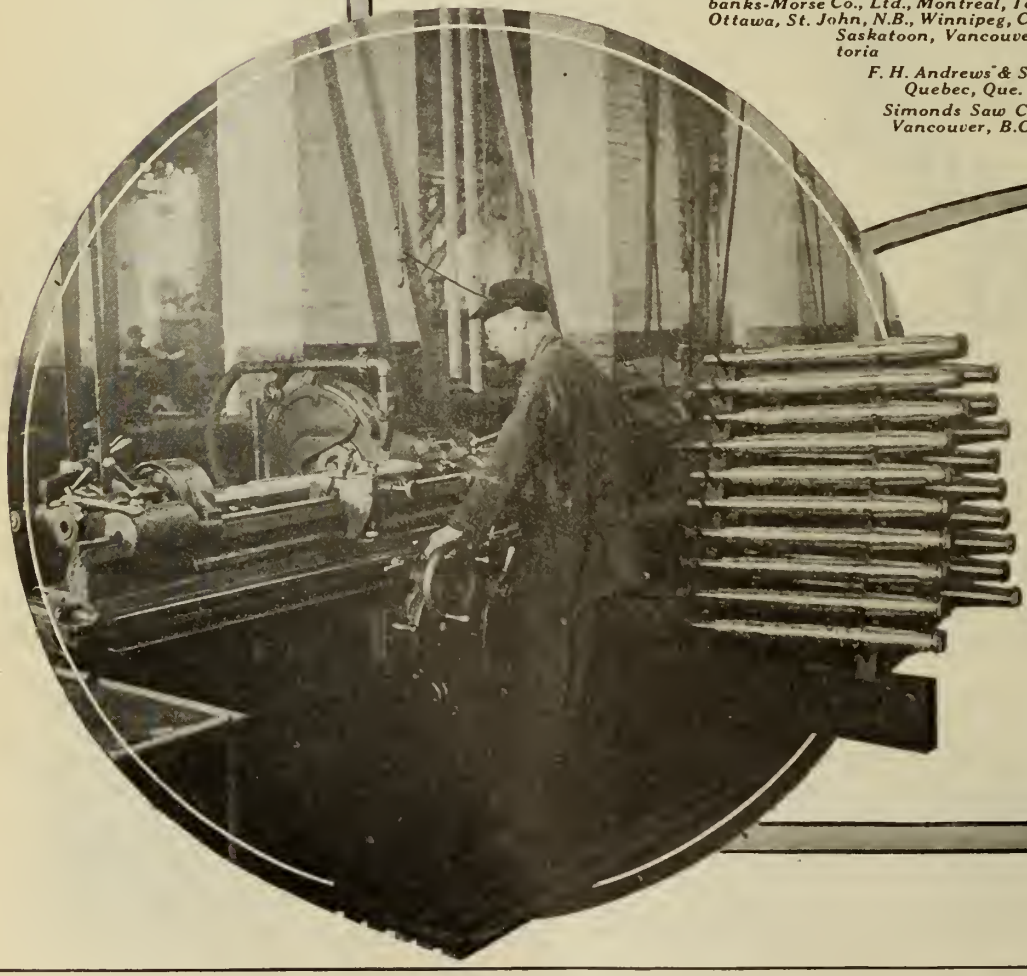

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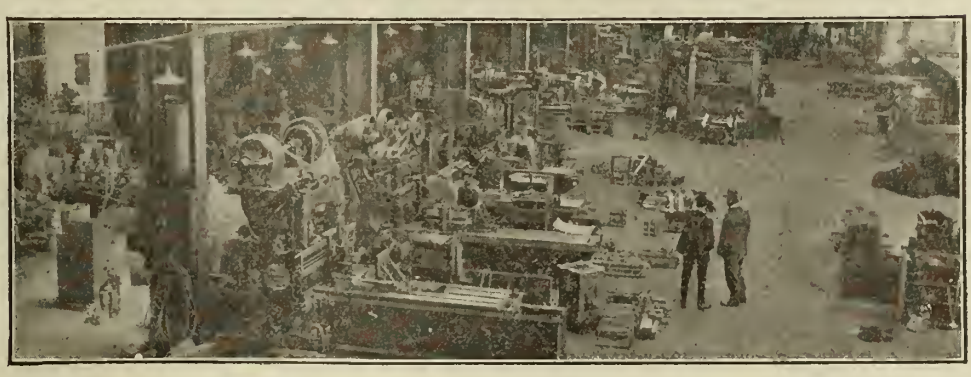

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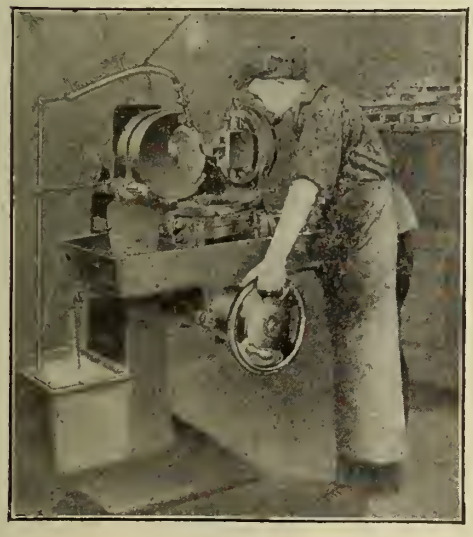

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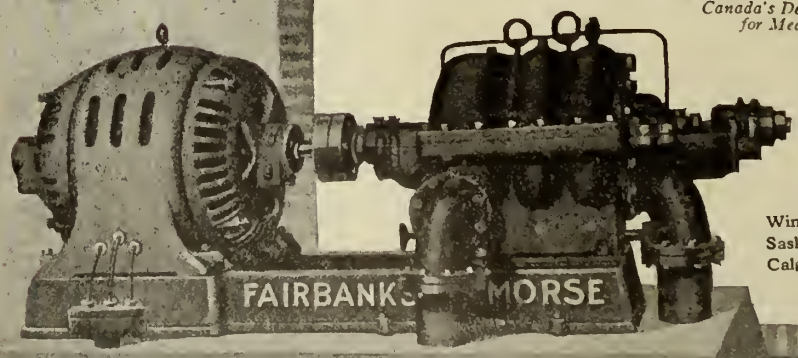

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CANADIAN MACHINERY
AND
MANUFACTURING NEWS

Vol. XXIV. No. 14 September 30, 1920

Blind Workers Prove *Efficient*

Cleveland Shops Have Opened Their Plants to the Blind and Sixty-nine Operations Are Successfully Accomplished by These Sightless Workers

By EVA B. PALMER*

"WE have in our employ a totally blind man who has been with us since Sept. 23, 1918, assembling compensator switches. This work is being done on piece work, and the fact that he is making his rate is proof positive that he is very efficient at this work. It is, I believe, a very severe test for a blind man. The fact that his work is perfect and that his speed is high enough so that he makes out on a piece work rate, which is the same as the rate for a man with all his faculties, is pretty good proof of the fact that he has been able to master a difficult job very satisfactorily. He also is a universal favorite, and I believe, is respected and loved more than any other man in the factory."

The above statement, signed by J. F. Lincoln, vice-president of the Lincoln Electric Co., is an indication of the value placed upon blind workmen by many Cleveland employers. This city was among the first in the country to see the possibilities in industry for blind artisans, and a start was made in February, 1913, when the Society for the Blind placed one man in the Lake Erie Bolt & Nut Co. He did hand nutting, and his pay ranged from 80c to $1.25 a day. He remained two years and left of his own accord, having given entire satisfaction.

The movement progressed slowly until war-time conditions created a shortage of labor, and since then many openings have been secured. To-day there are 81 blind men and women working in 40 different factories, and each placement makes the next one easier. The employer finds himself supplied with a dependable worker, for the blind man realizes that chances for him are not numerous, while the man without sight declares that he would far rather have a *man's* job than a blind man's job. The time-worn trades of chair caning, broom making and carpet weaving are still useful, but to the man who asks no odds of the world because of his affliction a regular man-size job is preferred.

The electrical field has so far revealed more practicable operations than any other, but the automobile industry, with its necessary machine shops, will undoubtedly take the lead in time, especially since machine operations have been proven feasible for blind workmen.

Nutting bolts is still being done in several shops, and W. B. Alexander, general superintendent of the National Screw & Tack Co., has this to say: "We have employed as many as ten blind men at a time, and now have very close to that number. They are employed in nutting bolts by machinery and hand, and we are well pleased with their work and production. I might also state that they are very prompt and lose very little time. During the winter months we had five of our blind employees form an orchestra, composed of piano, drum, violin and two saxaphones, for the benefit of our office help. It was very enjoyable, and furnished good music."

Regarding Accidents

Three questions are nearly always raised when the matter of employing blind labor is brought to a concern for the first time. One is the danger of accident. A large percentage of Cleveland factories carry State insurance, but many insuring with private companies are interested to experiment with blind workers. In 1919 the following modification was made in the Ohio law: "No agreement by an employee to waive his

*Executive Secretary Cleveland Society for the Blind.

rights to compensation under this act shall be valid, except that an employee who is blind may waive the compensation that may become due him for injury or disability in cases where such injury or disability may be directly caused by or due to his blindness. The Industrial Commission of Ohio may adopt and enforce rules governing the employment of such persons and the inspection of their places of employment."

It is interesting to note that only two concerns employing blind workers have availed themselves of this opportunity to escape paying compensation for possible injury. The blind man is easily the most careful in the entire plant, as loss of sight has doubled his caution, and as a result there have been no accidents so far. As employers become educated to consider a man according to what he has left rather than by what he has lost, people with handicaps will not find it so difficult to obtain work.

The second query raised is the one as to production. The person having the responsibility of fitting the blind man into his job must not only be familiar with labor conditions, but must know blindness, its splendid possibilities as well as its painful limitations. When the blind man's production is up to normal it is because most careful selection has been made, first of the job for the man and then of the man for the job. A general error of the uninformed public is to consider that blind people have traits in common, owing to a common handicap. When the employer realizes that their abilities are as varied as possible, and when he has been shown that lack of sight is no hindrance on certain operations, he is willing to try one worker after another until the right person is found. Much of the success of the Cleveland work is due to the skill and personality of the young demonstrator who is seen at work in one of the accompanying illustrations. He went blind in January, 1919, and had no factory experience whatever before losing his sight. He is thus able to meet every objection on the part of employers, as he has learned the use of tools since becoming blind and goes everywhere alone. He tried out 150 operations in 31 Cleveland factories during a period of three months, and proved nearly all of them practicable. In many instances he exceeded the average speed for sighted workers. This is not exceptional, as in several cases blind men are maintaining a higher speed rate than seeing people on the same jobs. In one large plant a blind man arranging carbon brushes on trays does almost twice as much as any one else, and is paid accordingly. In the same factory a blind man does all the work formerly performed by two sighted girls with perfect vision.

In each instance the blind worker conforms to the rules of the shop. If piece work is the rule, he receives the same rate as the other workers, while if day work is the rule he is paid in proportion to his production and receives his bonus if such is given to others in his shop.

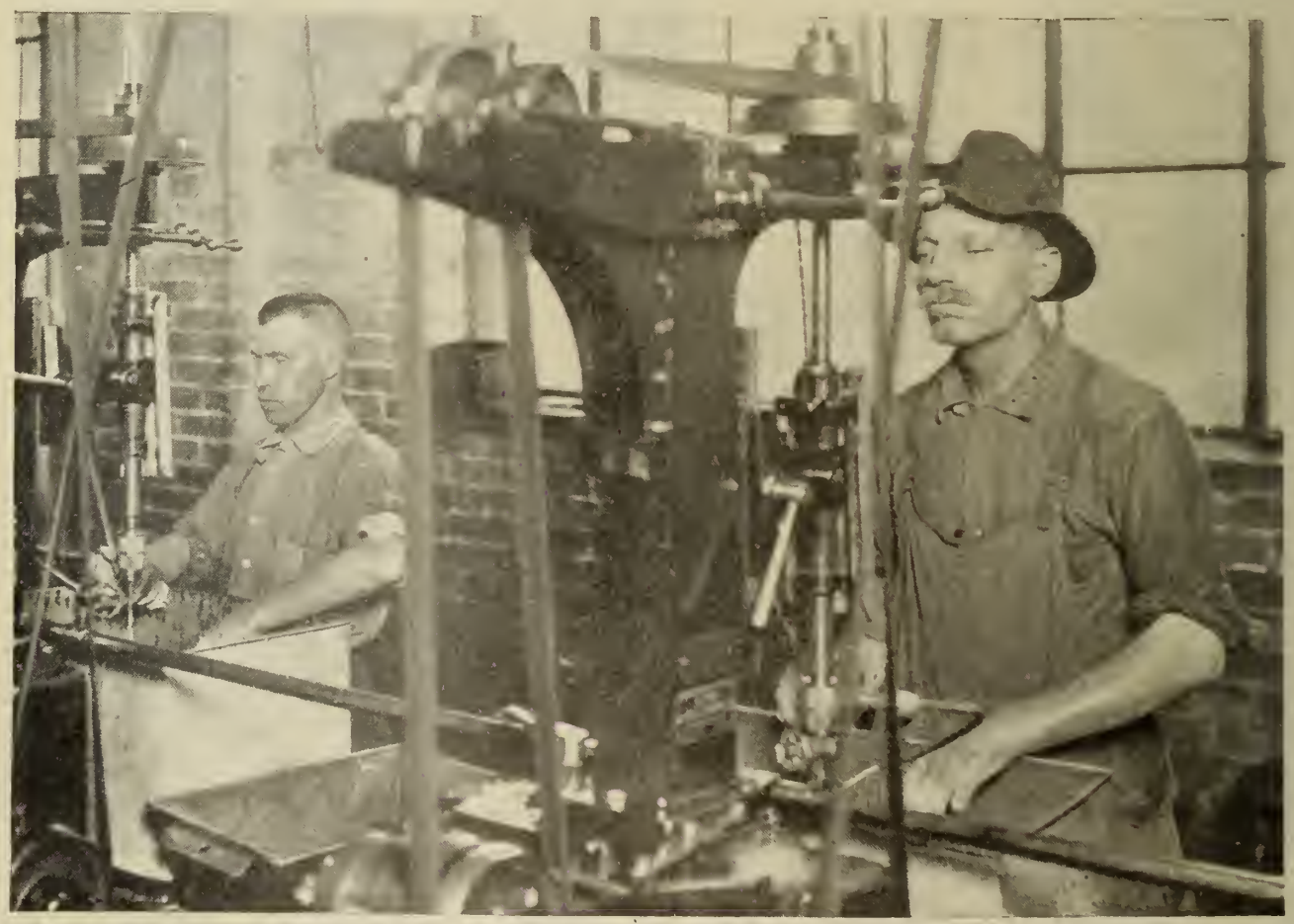
E. G. Greene, superintendent of the Ferry Cap & Set Screw Co., made the following statement which shows the production of the blind men in his shop:

"In regard to the two blind men employed at our factory I will say that they have proved very satisfactory in every way. They are running drill presses and produce as much work as those who can see."

What About Transportation?

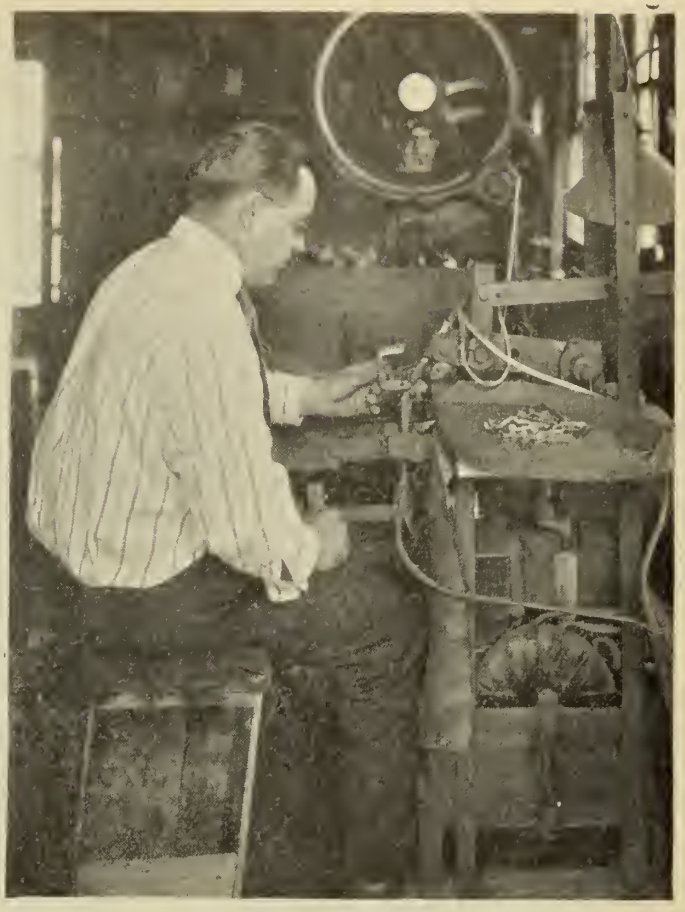
The third question raised is as to transportation. "But how in the world will he get here?" asks the skeptical employer. Here again the skill of the placement agent must be shown. Every effort is made to place the workers in shops accessible from their homes, and while most of the blind men and some of the women go to and from work alone, in some instances this is impracticable. There are several ways of handling this difficulty. Sometimes another member of the family is placed in the same shop, or search is made throughout the factory for an employee who lives near the blind person's home and can act as guide. In several cases the entire family has been moved near the factory.

The placement of blind women in Cleveland factories was undertaken at their own earnest request. Good news travels fast and the girls learned with



DRILLING OIL HOLES FOR SPRING BOLTS ON SINGLE SPINDLE DRILL PRESSES AT THE FERRY CAP & SET SCREW COMPANY.

STACKING COMMUTATORS AT PLANT OF RELIANCE ELECTRIC ENGINEERING CO.



BLIND DEMONSTRATOR OPERATING ELECTRIC SPOT WELDER FOR THE BROWN SPRING OILER CO.

astonishment of the high wages being earned by the blind men. Some of the operations now being done by women are: Counting by weight on balanced scales, taping small coils, assembling small parts of electrical apparatus and of sewing machines, running single spindle drill presses on small work, foiling mints, packing candy, stacking commutators and small laminations, setting up cartons and wrapping butter blocks.

The list given at the end of this article shows the large variety of operations which have been found entirely practicable for both blind men and women. Contrary to the expectation of many employers, the impression made by the blind worker on his fellow employees is good and one superintendent stated that the standard of promptness and also of neatness had been raised throughout the entire department as "Gus" was always on time, clean shaven and smiling. Gus is now earning $40 a week.

A good friend of the Society for the Blind, in its efforts to provide every employable blind person with a well-paid job, is C. L. Collens, president of the Reliance Electric & Engineering Co. He has promoted the undertaking among Cleveland electrical concerns and writes the following letter. "I am very glad to comment on the work of the blind employee in our plant. He is employed on the operation of stacking commutator segments, and we can speak very favorably of his accuracy and speed in this work. One noticeable feature is the steadiness with which he applies himself to his work, as there is no tendency to be distracted or interested by other work going on around him in the plant." The blind have long been an object of charity—and injustice. The new movement demands that the community do for the blind what it does for the seeing: judge each individual according to his merits and give him a fair chance to make good.

Operations Successfully Performed by Cleveland Blind

Arranging carbon brushes on trays.
Assembling:
- Ball-bearing cups for Ford cars.
- Chimneys for oil stoves.
- Compensator switches.
- Control levers.
- Controller slates.
- Door bell transformers.
- Drive flanges and shafts.
- Generators.
- Grease cups.
- Ground wire telephone clamps.
- Hot air boxes.
- Junction boxes.
- Kelly handle bars.
- Locks.
- Pittman rods.
- Plug, nut and bolt in oiler.
- Radiator parts.
- Steering gear.
- Tension studs and shuttles for sewing machines.
- Tools.
- Trolleys for electric cranes.
- Vacuum cleaner parts.
- Vibrator spark coils.
- Vacuum gas tanks.
- Wick raisers for oil stoves.
- Wire rope clamps.

Bench Work:
- Cleaning castings.
- Cleaning fire brick.
- Clamping wicks in metal rings.
- Counting by weight.
- Creasing boxes.
- Cutting and skinning cables.

Etching electric light bulbs.
Foiling mints.
Inspecting separators in storage battery cells.
Making hand-woven hats.
Nutting bolts by hand and machine.
Operating:
- Broaching machine.
- Centering and counter-sinking machine.
- Drill press.
- Grinding machine.
- Lathe for facing brake hubs.
- Milling machine, power and hand.
- Nut facing machine.
- Polishing machine.
- Porter-Cable lathe.
- Punch press.
- Single-spindle and multiple-spindle drill presses.
- Spot welding machine.
- Stamping machine.
- Tapping machine.

(Continued on page 306.)

Honor Memory of the Late Hugh McCulloch, Sr.

Nurses' Home Opened at Galt—As a Memorial to Founder of One of the City's Best Industries—Building Complete and Furnished Throughout is Presented to the City.

AS a memorial to the late Hugh McCulloch, Sr., one of the founders of the Goldie-McCulloch industry in Galt, a splendid nurses' home has been opened and presented to the city by Mr. R. O. McCulloch, one of the donors. The opening of the home, which is complete in every detail as to furnishings and equipment, was a notable occasion, being presided over by His Honor Lieutenant-Governor Clarke. Fitting reference was made to the career of the late Hugh McCulloch, and Mr. R. O. McCulloch in making the presentation gave some interesting facts in connection with the McCulloch family, and also a history of the steps leading up to the decision made by himself and Mrs. Shearson to erect a nurses' home, Mrs. Hugh McCulloch joining in the undertaking by furnishing the building throughout.

"My revered father," said Mr. R. O. McCulloch, "the late Hugh McCulloch, came to Canada from Scotland in 1850, arriving in Galt on August 24th of that year. With the exception of a few months spent in the neighboring village of Ayr, from which place he returned to Galt in 1851, his whole life until his death in 1910 was spent in this community. From 1851 until 1859 he was in the employ of James Crombie. In that year the firm of Goldie & McCulloch came into existence, when the late John Goldie and my father purchased their employer's business. In 1891 the present company was organized, and my father became its first president, which position he occupied until his death in 1910.

The Late HUGH McCULLOCH, Sr.,

To whose memory the new Nurses' Home was erected. He located in Galt in 1851, and in 1859, with the late John Goldie, purchased the Crombie foundry, establishing the firm of Goldie & McCulloch Co. The late Mr. McCulloch passed away on August 24, 1910.

"My late brother, my sister, Mrs. Charles A. Shearson, and I desired to erect a suitable memorial in affectionate remembrance of my father, and many plans and ideas were suggested and discussed, but no definite conclusion had been arrived at when the war broke out. Further consideration of the matter was, of course, postponed, and then my brother became very ill, and after a long illness died in 1917. When the war ended in 1918 the question was again taken up, and my sister-in-law wished to join with us in memory of her late husband. Different plans were canvassed, but none satisfied us until the needs of the hospital were brought to our attention. The appeal of physical suffering makes the strongest appeal to our common humanity. Hospitals were established to alleviate suffering and heal the sick; and trained nurses are the most necessary part of the equipment of a modern hospital. We learned that the accommodation for the nurses was entirely inadequate, and that consequently they were compelled to live in part of the main hospital. Everywhere there was expansion; increasing numbers of patients and more nurses required, but no accommodation for them. A residence or home for nurses appealed to us as the greatest need in the community, and we felt it would commend itself greatly to my father and brother, as they were both much interested in the hospital."

A Worthy Example

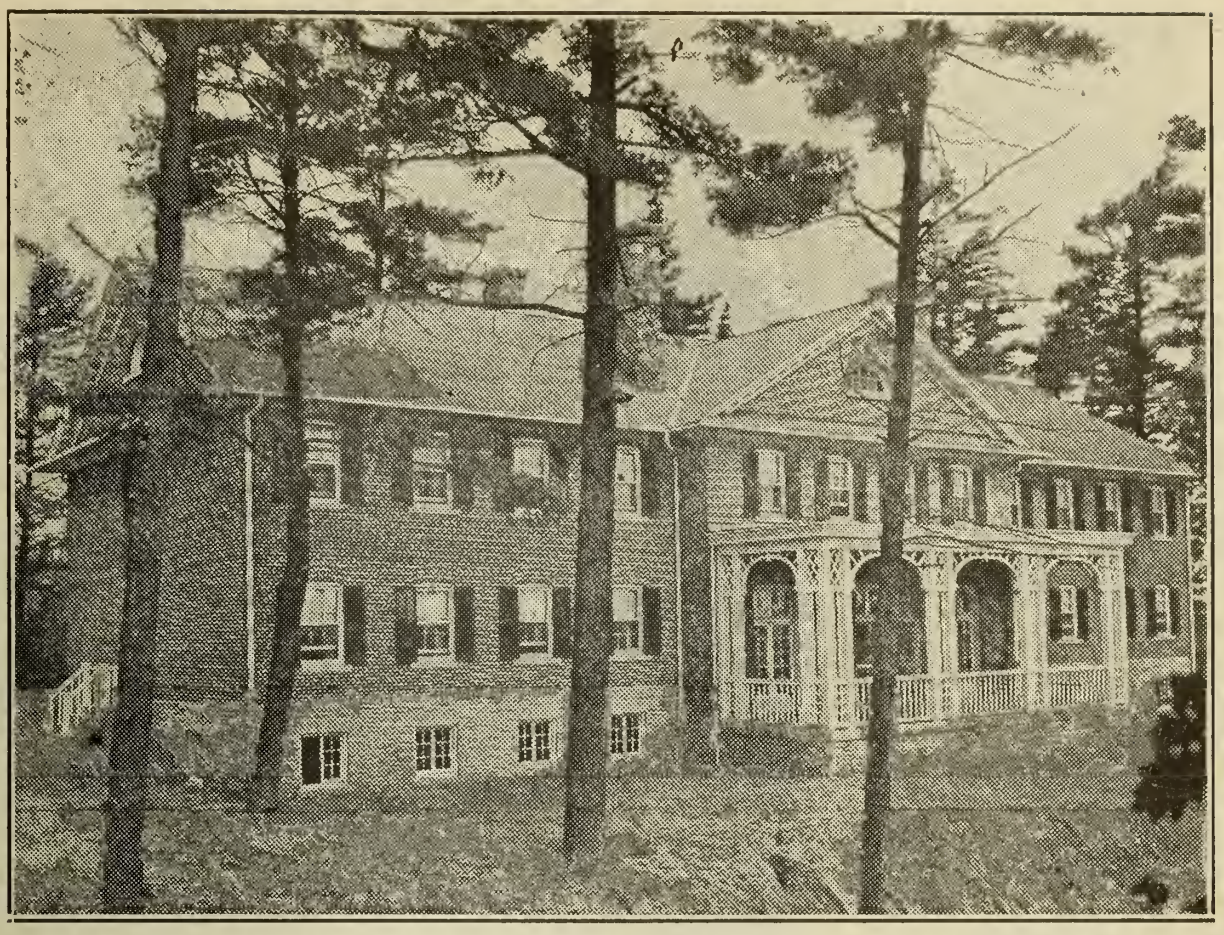
His Honor Lieut.-Governor Clarke, in opening the home, said in part:

"Mr. McCulloch was in more than one sense a real pioneer. He left his native Scotland before the old sailing vessels had been superseded by the steamer, and his passage was a long and rough one, not fewer than seventeen passengers dying during the voyage, which took about seven weeks to complete. He came, like many another pioneer in those days, specially well equipped for a successful career in Canada, which was then at the very beginning of its industrial history. He settled in Galt as far back as 1851, and with the late Mr. John Goldie gradually and surely developed the business associated with their names and known, not only throughout Canada and the United States, but in the Old Country as well. We are sometimes apt to forget the underlying principles on which national life is founded, but we have only to think a little—to look a little below the surface—in order to realize that without a well-developed, healthy and expanding industrial interest, no country can long stand, nor can the amenities of civilized life be enjoyed by its people. Therefore, it may be well to-day to think of the immense debt we owe to the contribution which the little parish of Sorn, Ayrshire, Scotland, made to Canada, when in 1850 it sent one of its sons in the person of Hugh McCulloch, a well-educated, robust and enterprising young man, then only twenty-four years of age, to this country. He very soon found his opportunity and in conjunction with Mr. Goldie, as I have said, organized the business which shares his name. The expansion of that business meant much to Galt, and beyond Galt it meant much to the Dominion, for the products of its industry not only furnished a needy market with the goods required but gave high-class, skilled labor a continually widening field. I mention this side of Mr. McCulloch's service to the country because I believe that a career such as his in this respect ought to be held in the highest esteem. An upright, honorable man, conducting business with enterprise and conscientious integrity is one of the greatest possible assets any country can have and certainly Mr. McCulloch was such a man. . . .

"One word more, I think, ought to

MR. R. O. McCULLOCH,

One of the donors of the Nurses' Home, erected to the memory of his father, who made the formal presentation of the building to the Galt Hospital Trust.



The beautiful Hugh McCulloch Memorial Nurses' Home, officially opened by His Honor, Mr. Lionel Clarke, Lieutenant-Governor of Ontario, and formally presented to the Hospital Trust by Mr. R. O. McCulloch, one of the donors. This view of the building is taken from the east side and shows some of the stalwart pines that surround it. — Photos courtesy Galt "Reporter."

be said and it is this: In erecting this home by Mrs. Shearson and Mr. McCulloch and in the furnishing of it so admirably by Mrs. Hugh McCulloch, this family has set an example to others in Galt and in other places, which would be for the public welfare were it followed, and I am sure that not only would the public welfare be advanced, but the givers themselves would have much joy in their gifts. The privilege of giving—of doing good—is one of which we can all, more or less, avail ourselves in our several ways, but those who exemplify their benevolence in such a way as we witness here to-day are specially fortunate and are to be envied in having afforded to them an opportunity to gratify the heartfelt desires with which they are so worthily inspired."

PLAY SAFE

During the week of October 10th to 16th, the Ontario Safety League will ask the public in Ontario to play safe. It will be known as Safety Week, and during this time an intensive drive will be made against accidents.

Similar large scale campaigns have been held in other cities and have been a notable success. The "Safety Week" held in St. Louis in the autumn of 1918 is the most conspiuous example, as fatal accidents in the corresponding week in 1917 were 24 and in "Safety Week" there was one fatality. Cleveland cut its fatalities in its "Week" last year from 15 in the same week of the previous year to 6 in "Safety Week." Pittsburgh cut its fatalities from 28 to 16. These facts are vital and experience has shown that the good effects of the safety propaganda have been continued month by month ever since. Similar intensive drives against accidents have been a success in industry and on the railroads, and the League looks forward with confidence to success.

During Safety Week, the various committees plan to teach accident and fire prevention to men, women and children in a spectacular educational campaign in which various forms of publicity will be used. The public will be reached by means of posters, bulletins, bill boards, street-car cards, letters, advertisements, meetings and safety shows and given a liberal education in Safety. The Safety Week idea has been approved by big industrial managers, by boards of trade, chambers of commerce, Canadian Manufacturers' Association, Toronto District Labor Council, Ontario Motor League, fire departments, police departments, boards of education, Empire Club, Rotary Club, Kiwanis Clubs, Canadian Clubs, and others.

Subcommittees of the League will cover such subjects as : Publicity, bulletins, motion pictures, schools for industrial safety, statistics, boy scouts, women, traffic, schools and colleges, etc., etc. The various days of the week have been specially designated—Safety Sunday, with special sermons in the churches; Monday is careful day for motorists; Tuesday will be careful day for street car men; Wednesday is set aside for school safety; Thursday will be at home day for safety; Friday is to be called careful day for pedestrians; and the slogan for Saturday will be "Safety for All, All for Safety."

To protect aluminum and aluminum alloys from corrosion, a German inventor has tried the experiment of browning the metal electrolytically. The aluminum is suspended in an electrolyte consisting of a sulphur compound of molybdenum, and zinc is used for the anode. The cell is maintained at a temperature of 60 deg. to 65 deg. Cent. The aluminum is soon covered with a dark brown coating. The metal may be bent or rolled without cracking the coating. A piece of aluminum thus coated is said to have been immersed in a salt solution for two months without showing the slightest trace of corrosion.

The Painting of Agricultural Implements

Painting Methods Differ Considerably Depending Upon the Nature of the Product—The Method of Mixing Paint is Described, Also Other Items Which Will Prove Valuable For Future Reference

By J. H. MOORE

IT is hardly necessary to state that practically all agricultural implements manufactured are noted for their bright and cheering appearance when leaving the factory.

True, they lead a varied life, on reaching their destination, for some farmers take care of their machines, while others allow them to lay out in some field, rain or shine, winter or summer, with the result that in a short time the cheerful look disappears to be superseded by a dilapidated appearance which is far from comforting.

This condition is, of course, up to the farmer himself. and yet, we could not commence with this article without giving our personal comment on the fact that if farmers could only see the pains spent in preparing and painting the machines they abuse, they would be more careful in future.

The Procedure Adopted

Taking it for granted that the various pieces have reached the manufacturing stage where the painting operation comes in natural sequence, we will first consider how the paint is prepared.

The various colors, of which there are quite a few, come to the factory in powder form, or in other words, in dry color form. Depending on the color to be mixed, the painter, or paint mill operator, as he is termed, takes the dry color and places it in an upper can above the grinding mill. He also places the oil which is to be mixed with the dry color in a adjoining pan. Should readers not be familiar with the appearance of a paint mill, we will ask them to consider in their mind's eye, two grindstones revolving slowly in a horizontal position.

FIG. 2—DIPPING McCORMACK MOWER FRAMES.

FIG. 1—NOTE THE TROLLEY AND HOOK ARRANGEMENT.

Imagine these stones grooved with grooves about 1-8-in. wide, and semi-circular in form, each groove leading to the centre of the stones. The size of the stones depends entirely on the capacity of the paint mill.

Directly above the stones is a hopper in which is an agitator somewhat after the shape of a ship's propeller. This should give a fairly good mind picture, so let us proceed to the actual mixing of the paint.

The dry colors, and oils, are now allowed to run into the hopper, where the agitator mixes the two quite thoroughly. The paint, which is now of a thick creamy nature, passes through the grooves of the stones, into a pan placed for the purpose. The paint is thinned out at later stages to suit requirements. Briefly, this explains the method of preparing the different colors. Usually there are 12 grooves to each stone, but again

(Continued on page 306.)

Calculations and Analysis of Riveted Joints

This Article Instructs You How to Design a Riveted Joint of Any Required Efficiency—The Calculations Are by no Means Complex and Are Easily Followed.

By T. H. FENNER, Editor Power House

THE efficiency of a riveted point is expressed always as a percentage of the strength of a solid plate. When holes are drilled or punched out of a plate to allow of riveting, the plate is weakened by the amount of metal cut out. If we have a plate of one square inch section, and remove .25 square inches in drilling, the section remaining is only .75, and the resistance of the plate to stress will be only 75 per cent. of its original resistance. This would represent what is known as per cent. of plate strength to solid plate. This is only one factor. The second factor is the proportion that the strength of the rivets bears to the strength of the solid plate. This will depend on the diameter and number of rivets in the unit section of plate considered, and is also expressed as a percentage. We shall consider the means of arriving at these efficiencies shortly.

There are several styles of riveted joints, and two distinct classes. The lap type of joint is so called because it is made by lapping the edges of the plate over each other and riveting them together. The second type is known as a butt joint and is made by bringing together the edges of the plates to be joined and placing a broad plate over them, riveting all three plates together. In many cases two cover plates are used. These two types of joints are subject to various modifications. Thus a lap joint may be single, double, or treble riveted and the rivets may be placed in regular rows or in staggered rows, known as chain or zig-zag riveting. The butt strap joint amy be made with one or two straps, with equal or unequal straps, with double, treble or quadruple riveting. The type of joint selected will depend upon the pressure to be carried, cost of manufacture and rules of the province in which the boiler is to work. The cut here shown illustrates the type of joints mentioned above.

To Find Efficiency of Joint

The efficiency of a riveted joint varies with the diameter of rivets, pitch of rivets, number of rivets in a pitch, and the thickness of the plate. In considering riveted joint efficiency, the unit of plate area considered is always contained within a pitch or between the centre lines of two adjacent rivets. Where there is more than one row of rivets the pitch of the rivets in the outer row is taken. We will explain each type as we come to them. The most simple is of course the single riveted lap joint. Suppose we have a plate of 5-16 inch in thickness, and with ⅝ rivets pitch 2 inches. We have to consider the strength of the joint as compared to the solid plate. We will consider the plate to be of 60,000 lbs. tensile strength. We shall therefore have a section, before any drilling is done, of 2 x 5-16=⅝ square inches. This section will have a resistance of 60,000 x ⅝=37,500 lbs. Now, after drilling, the amount of metal removed will be in diameter just equal to the diameter of one rivet because in the section we are considering there will be just half a hole on each side. A glance at the sketch which shows the pitch of line passing through the centre of rivets will make this clear. Therefore the amount of metal removed will be equal to the diameter of one rivet multiplied by the thickness of the plate, or $\frac{5}{8} \times \frac{5}{16} = \frac{25}{128}$. This amount substracted from the original area will give the section remaining, and if this remainder be divided by the original section we will have a fraction representing the proportion of original section remaining. To express this as a percentage we multiply by 100. Now to follow out the procedure step by step.

Let P= pitch
d= diameter of rivet.
t= thickness of plate.

We have a plate section of pitch P, and thickness t, the area being Pt. The rivet area will be equal to dt, so that when the holes are drilled we shall have

$$Pt - dt = P - d$$

the t on each side cancelling out.

The proportion of plate section remaining is $\frac{P-d}{P}$ and the percentage of plate to solid plate is $\frac{P-d}{P} \times 100$. Substituting figures, we get

$$Pt = 2 \times \frac{5}{16}$$

$$dt = \frac{5}{8} \times \frac{5}{16}$$

$$Pt - dt = 2 \times \frac{5}{16} - \frac{5}{8} \times \frac{5}{16}$$

$$P - d = 2 - \frac{5}{8}$$

$$\frac{P-d}{P} = \frac{2 - \frac{5}{8}}{2}$$

$$\frac{P-d}{P} \times 100 = \frac{2 - \frac{5}{8}}{2} \times 100$$

$$= \frac{2 - .625}{2} \times 100$$

$$= \frac{1.375}{2} \times 100$$

$$= 68.75$$

So that the proportion of plate strength to solid plate is 68.75 per cent.

This formula is always used, and may be set down

$$\frac{P-d}{P} \times 100 = \text{per cent. of plate strength to solid plate.}$$

In the Ontario regulations the plate efficiency is symbolized by the letters Kt, so the formula is

$$\frac{P-d}{P} \times 100\,Kt$$

The next point to consider is the efficiency of the rivets in the joint. This is the proportion that the area of the rivet in the pitch limit bears to the unit section of plate. As rivets are not as strong in resisting shearing stresses as they are in resisting tensile stresses, an allowance must be made for this difference. The Ontario regulations use the constant C, and this is expressed

$$C = \frac{\text{Shearing strength of rivets}}{\text{Tensile strength of plate}}$$

C may be taken as
.85 for iron rivets in iron plates
.70 for steel rivets in steel plates.
.65 for iron rivets in steel plates.

In the joint we are considering there is but one rivet in the pitch, and as there are but two plates which the rivets pass through they are in single shear. We will then have an area of d×d×.7854, divided by the area of the unit section, which is P×t. This is expressed in the formula:

$$\frac{a \times n}{P \times t} \times C \times 100 = \text{per cent. of rivets' strength to solid plate.}$$

So we have

$$\frac{5 \times 5 \times .7854 \times 1 \times 16 \times C}{8 \times 8 \times 2 \times 5} \times 100 = Ks$$

This worked out becomes, if we take C as .85

$$\frac{5 \times .7854 \times 85}{8} = 41.72 \text{ per cent.}$$

If we neglected the constant C we would get about 40 per cent. This lowest percentage is the one used in calculating the working pressure of the boiler.

In the previous joint considered the plate strength was 68.75 while the rivet strength was only 41.72.

A single riveted lap joint should be about 50 per cent. strength, so that

there is evidently some factor that requires altering. As the plate strength is higher than the rivet strength, it is observed that the factor that is wrong is the pitch. This is arrived at by considering that the plate is of minimum thickness, and the rivet cannot be decreased in diameter. As the pitch is a divisor in the formula for finding rivet strength, it is plain that by decreasing this factor the rivet strength percentage will be brought up. How much must we alter it to get the required figure? We can find that out very easily.

The formula for rivet strength we have seen is:

$$\frac{a\times n}{p\times t}\times C\times 100 = \%\text{ of rivet strength}$$

Now, let us insert the quantities we know. We have 50 per cent. for rivet strength, the other factors, excepting p remaining the same, and it is p we want to find. So we have

$$\frac{5\times 5\times .7854\times 1\times .85\times 100\times 16}{8\times 8\times p\times 5}=50$$

Then, P is the unknown quantity. We will work this out. First by cancellation we simplify the expression and get

$$\frac{5\times 5\times .7854\times .85}{p}=50$$

Transferring we get

$$50p=5\times 5\times .7854\times .85\times 5$$

$$p=\frac{5\times 5\times .7854\times .85\times 5}{50}$$

$$p=1.66$$

The nearest fraction to this is 1⅝. Let us see how this works out on the plate strength. We have

$$\frac{p-d}{p}\times 100 = \%\text{ of plate strength}$$

Substituting figures we get

$$\frac{1\frac{5}{8}-\frac{5}{8}}{1\frac{5}{8}}\times 100=\%$$

This is simpler expressed in decimals, thus

$$\frac{1.625-.625}{1.625}\times 100=61.53\%$$

This is about right, and we have a better balanced joint, with 61.5% plate and 50% rivet strength.

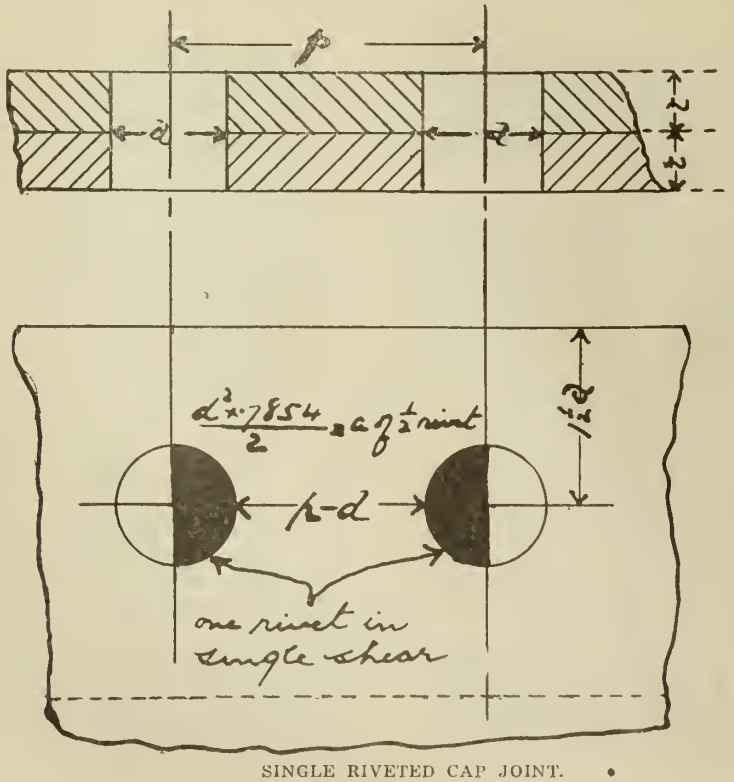
Analysis of Riveted Joints

In considering riveted joints, the various ways in which they may fail must be considered. The joint we are dealing with, being the most simple kind, has the least possible ways of failing. It can fail through the shearing of the rivets, and as there is only one rivet in the pitch limit the resistance of the joint to failing in that way will be the shearing strength of one rivet. It may fail by the plate tearing between the rivet holes, or it may fail by the plate crushing in front of the rivets.

First of all consider the strength of the solid plate. We have a pitch of 1.625 inches, with a thickness of 5-16 of an inch, and a tensile strength of 60,000 lbs. per square inch. The strength of the section will then be

$$p\times t\times 60{,}000$$
$$=1.625\times .3125\times 60{,}000$$
$$=30468.75\text{ lbs.}$$

Then the strength of one rivet in single steel will be if tensile strength of rivet stub is 51,000 (.85 of plate strength) $\frac{5}{8}\times\frac{5}{8}\times .7854\times 51{,}000$.



SINGLE RIVETED CAP JOINT.

This worked out is 15,300 and the percentage to the solid plate is

$$\frac{15{,}300\times 100}{30{,}468.75}=50.2\%$$

The resistance offered by the plate to tearing between the rivet holes will be

$$p-d\times t\times 60{,}000$$

or $(1.625-.625)\times .3125\times 60{,}000$

$$1\times .3125\times 60{,}000=18{,}750$$

and the percentage to the solid section will be:

$$\frac{18{,}750\times 100}{30468.75}=61.53\%$$

This is in exact agreement with the previous result.

We must now consider the plate crushing in front of the rivet holes. We will have a section of plate equal to the diameter of one rivet and the thickness of the plate. The crushing strength of good boiler plate is about 90,000 lbs., so that we have

$$\frac{5}{8}\times 5\text{-}16\times 90{,}000=17571$$

This gives

$$\frac{17571\times 100}{30468.75}=54.3\%$$

which is higher than the rivet stength percentage and may therefore be neglected.

We may say that a joint of this kind is practically never used in the longitudinal seams of a steam boiler, as its low percentage of strength would penalize every other part of the structure. However, they are sometimes met with on steam domes, where the small diameter in comparison to weight of plate elbows allows a low percentage joint to be used. In tank work, where the thickness of plate is much more than is necessary to resist the pressure, a single riveted lap joint is often used. For purely steam boiler work it is hardly to be considered. The next type of joint, and one very widely used, is the double riveted lap joint.

The Double Riveted Lap Joint

This joint has two rows of rivets, and two rivets in a pitch. It is usually designed for a strength of about 70 per cent. of the solid plate rivet strength and plate strength being approximately equal. The same formulae are used in making the calculations, but a new factor is a formula for determining the distance between the rows of rivets. The Ontario regulations prohibit chain riveting, all rows of rivets having to be staggered, or zig-zag.

Let us take a concrete example and work it out, which is the best way of explaining it. Let us assume we want a boiler built of ⅜ inch plate and having a double riveted lap joint of about 2 per cent. strength. We want to get the other dimensions. The diameter of rivet may be taken as ¾ inch, or double the thickness of the plate. Very often in practice the rivet hole will be 13-16 in this size of plate, and of course the rivet size after driving

will be the same as the diameter of the hole. Using the larger diameter in the calculations makes a slightly higher percentage of rivet strength and a slightly lower plate strength. However for our purpose we will consider the diameter as ¾. Now we want to find the pitch that will give the requisite strength with this diameter of rivet. We come back to the formula.

$$\frac{p-d}{p}\times 100 = \%\text{ of plate strength}$$

Substituting we get

$$\frac{p-d}{p}=.72$$

$$p-d=.72\ p$$

$$d=.28\ p$$

Then if d=.75 we get

$$.28\ p : p :: .75 : x$$

which gives

$$\frac{.75\ p}{.28\ p}=2.679 \text{ inches}$$

as the pitch we require. Knowing the diameter of rivet and thickness of plate, and number of rivets in a pitch, we could have found the pitch from the formula for rivet strength, as we did in the case of the single riveted joint. We will in this case, see how the pitch we have found works out for rivet strength. We have

$$\frac{a\times n}{p\times t}\times C\times 100 = \%\text{ rivet strength}$$

Substituting figures we have, using .70 as the constant C in this case, and 2 11-16 as the pitch

$$\frac{3\times 3\times .7854\times 2\times 70\times 16\times 8\times 100}{4\times 4\times 43\times 3\times 100}=\%$$

This worked out gives a percentage of 61.37, which is too low. We wish to make our joint about even, though if the plate strength is a little higher than the rivet strength it is all to the good, as the plate strength may deteriorate in time, through the corrosion or thinning of the plate, which will not likely occur with the rivet.

We can use still another method if we wish, and that is to equate the two strengths to each other, and thus arrive at a pitch that will satisfy both.

This means that if the strength is to be equal, the two formulas must be equal to each other. Let us state this in the form of an equation. We have

$$\frac{p-d}{p}\times 100 = \%\ \text{ and }\ \frac{a\times n\times C}{p\times t}\times 100 = \%$$

If these % are equal the other sides must be equal, so we have

$$\frac{p-d}{p}=\frac{a\times n\times C}{p\times t}$$

$$p-d=\frac{a\times n\times C\times p}{p\times t}$$

$$p=\frac{a\times n\times C}{t}+d$$

Here we have arrived at an expression for pitch which should satisfy us. Let us substitute figures and see

$$p=\frac{3\times 3\times .7584\times 2\times 8\times 70}{4\times 4\times 3\times 100}+¾$$

$$p=2.39, \text{ say } 2.4$$

so we get 2.4 as a pitch. Let us try this again for our plate and rivet strength. First for plate percentage:

$$\frac{2.4-75}{2.4}\times 100=68.75$$

Then for rivet strength

$$\frac{3\times 3\times .7854\times 2\times 5\times 8\times 70\times 100}{4\times 4\times 12\times 3\times 100}=68.72$$

Here we have got a perfectly evenly balanced joint, and though it is some 4% lower than we at first determined on, that is not a very serious matter.

Let us see now how this joint stands comparison in its resistance to failure at different points. It may fail by rupturing between two rivet holes in the outer row and shearing one rivet. It may fail by shearing two rivets, or by tearing between the rivets on the inner row. It can also fail by crushing in front of the rivets in the outer row, and shearing the inner rivet, or by shearing the rivets in the outer row and crushing in front of the rivets in the second row. Let us take these in order. First the unit section is $p\times t\times 60{,}000$

$$2.4\times .375\times 60000=54{,}000$$

If the plate tears between two rivets on the outer row, and shears the rivet in the inner row it will have to overcome a resistance of

$$60000\ (p-d)\ t+a\times .7\times 60000$$

That is, the plate has diameter of one rivet, plus the area of one rivet in single shear, whose resistance to shearing is .7 that of the plate tensile strength. Substituting figures we have

$$(2.4-.75)\times .375\times 60000+75\times .7854\times 42000$$

which gives 74.250 or more than the solid plate. If it fails by shearing two rivets we have

$$a\times 2\times 42000$$
$$=.75\times .75\times .7854\times 2\times 42000$$
$$=37102 \text{ lbs.})$$

which is $\frac{37102\times 100}{54000}=68.7\%$ of the solid

If it tears between two rivets on the inner row, we shall have again

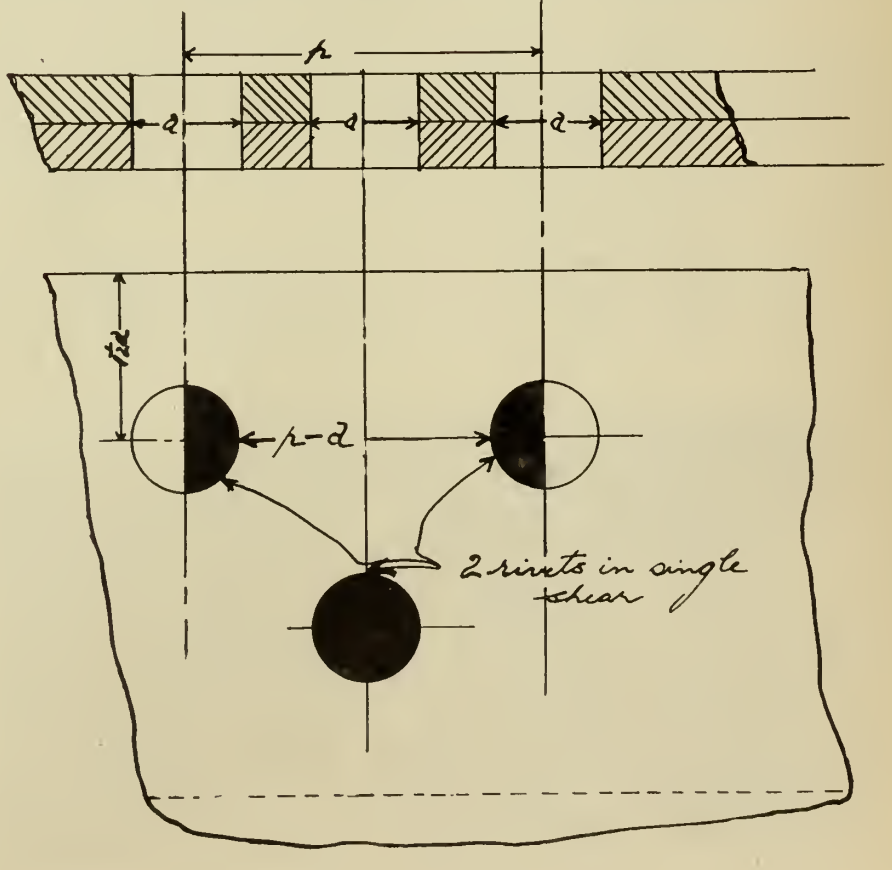
$$\frac{(p-d)\times t\times 60000}{(2.4-.75)\times .375\times 60000}=68.7\%$$

If it crushes the plate in front of the rivets in the outer row and shears one rivet in the inner row we have then

$$(d\times t\times 90000)+(a\times 42000)$$
$$(.75\times .375\times 90000)+(.75^2\times .7584\ 42000)=43872.3$$

and $\frac{438723}{54000}\times 100=81.2\%$

which is much higher than either the plate or rivet %. The last two cases are exactly the same as each other so we see that 68.7% is the strength of the joint. The minimum distance between



DOUBLE RIVETED CAP JOINT.

rows of rivets is found from the formula.

$$\frac{(11\frac{1}{2}+4\ d\ (p+4\ d)=\text{minimum distance}}{10}$$

The treble riveted lap joint shown in the sketch is not very much used, as there is not much advantage in employing it. The percentage obtainable is not much greater than with the double riveted joint, and the cost of manufacture is increased. The calculations are made exactly in the same way as for a double riveted joint, excepting that there are three rivets in single shear instead of two. It may fail by the plate breaking between the outer rivets and shearing two rivets. It may crush the plate in front of one rivet and shear two rivets. It may shear three rivets. The plate may break between the rivets in the centre row and shear one rivet in the inner row. It may fail between the rivets in the inner row, and this of course is the weakest part, so that $\frac{p-d}{p}$ is the governing factor.

The calculations would be as follows:

1st case — $(p-d)\ t\times 60000+a\times 2\times 42000$.

2nd case—$d\times t\times 90000+a\times 2\times 42000$.

3rd case—$a\times 3\times 42000$.

4th case — $(p\times d)t\times 60000+a\times 42000$. 42000.

5th case—$(p-d)\ t\times 60000$.

In the next article we will take up butt joints.

STEEL TREATERS

J. H. Moore

The writer had the pleasure of attending the recent convention of Steel Treaters in Philadelphia and brings back pleasant memories of the event. The advance notices predicted were lived up to in every respect, and the various exhibits were both neatly and efficiently displayed. The floor space was arranged in ideal style, and those attending had a splendid opportunity to view each exhibit without confusion. To speak of any particular exhibit is unnecessary, as we printed in a previous issue the firms who were to be represented. Enough to say that every concern showed good taste in their display and ideas of considerable educational value were to be found at the various booths.

The meetings in the lecture room were of vital importance, over seventy papers being presented. Some of these were presented by the authors themselves, others by title. We intend issuing through our columns some of these papers, so that readers will get the next best thing to an actual visit. A glance over our list previously printed will show the subjects covered in these papers and will emphasize the treat in store.

The amalgamation of the Steel Treaters Research Society and the American Steel Treaters Society took place on the Tuesday morning, Sept. 14th, and the new body is now known as the American Society for Steel Treating. The joining of these two bodies makes the society even a more important one than before. To go into all the details is impossible at this time, but as soon as the official proceedings are issued, we will give more particulars.

PAINTING IMPLEMENTS

(Continued from page 302.)

that depends on the stone, and the paint being milled.

The various methods of painting are many, varying from the hand to the dip method. In some cases the nature of the pieces necessitate the painting by hand, in order to protect some other portion, for in many cases the parts are painted after partial, or even complete assembly.

Special trucks are used where painting by hand is necessary, these trucks being so constructed that the workman can get at all parts of the piece without any trouble. The number of coats given the piece depends entirely on its duty, and exposure to weather when in use. As a general rule the pieces are varnished in addition to being painted.

Wherever possible the work is handled by air hoists, this speeding up the operation considerably. All work is carefully routed, for a delay in any one portion would more than likely hold back subsequent operations.

A good method of handling their product is shown at Fig. 1. In this case the hooks are of individual nature running on a single trolley line as shown. The work being performed is that of varnishing mower frames, and the manner of suspension is self-apparent. By this means the workmen can easily reach all parts to be varnished without undue effort.

The method shown at Fig. 2 is known as the dipping process, and the work being dipped is one of the McCormack Mower Frames This portion gets two coats of paint and one of varnish, and as can be noted an air hoist is used for handling purposes. The paint in these dip tanks is kept in constant motion, some by screw agitators and others by the use of air, thus ensuring a thoroughly mixed paint.

Ideal ventilation is provided throughout the entire paint building, and every convenience for the workmen has been provided.

BLIND PROVE EFFICIENT

(Continued from page 299.)

Warner & Swasey hand screw machine.
Warner & Swasey turret lathe.
Packing:
Heel plates.
Tools.
Packing and sorting metal stampings.
Setting up cartons.
Splitting mica for condensers.
Stacking:
Laminations.
Commutators.
Straightening wire brushes.
Taping:
Field coils.
High-speed magneto coils.
Open armature coils.
Shunt coils.
Stator coils.
Wrapping and packing:
Butter.
Candy.

INTERESTING FACTS TO BE FOUND IN THIS WEEK'S ADVERTISING SECTION

That the cutting of metal should be studied carefully if maximum production is to be obtained.

A concern that states that the ordinary scroll chuck is not good enough for high speed cutting tools.

That the consumption of mineral oil products is increasing faster than the production. How to conserve these oils is stated.

How to accomplish two operations at the same time.

Information of decided interest on automatic furnaces.

That the performance of a machine should be figured by the year and not by the hour.

How to banish tap breakage.

How to prevent waiting, cussing and fussing.

A challenge to put a certain product to a hard test.

How to secure the lowest cost per piece method of turning motor pistons and piston rings.

How to maintain the standards of accuracy.

A photograph of a machine that is doing extremely accurate work after eleven years of hard service.

A man that made a record to be proud of.

What to do if delays are not desired.

A machine that keeps the men on the job.

A concern that changes its policy after 37 years.

How to take the jump out of your belts.

How to bring down your production cost.

A book that is well worth securing.

Galvanizing, What it is and How it is Done

Describing and Illustrating the Process as It is Practised in One of Canada's Leading Industries, together with a Short Story of Its Origin.

By F. H. BELL, Editor Canadian Foundryman

THE subject of galvanizing is one which will be read with interest by many foundrymen, and being a comparatively simple process, and in many respects a part of the foundry business, I will endeavor to describe in a brief way how it is accomplished.

There are two processes by which galvanizing is performed. The original method, and the one from which the art derived its name, is that of an electro-galvanic battery operating on a bath in which zinc anodes are placed along with the articles to be galvanized, and is in many respects similar to electro-plating of any kind. The battery which has since been succeeded by the electric dynamo was originally the work of Aloysius Galvani, an Italian electrician, who was born at Bologna, Italy, in 1737, and died in his native town in 1798. Galvani did not discover the art of galvanizing, but one, Febroni, observing that the zinc in batteries became oxidized in contact with the acidulated water, and adhered to copper or whatever metal it came in contact with, adopted the name of galvanize. Electro-galvanizing is still practised on some classes of work, but it is not on this process that we will dwell on this occasion.

While the word "galvanize" rightfully belongs to the genus "electrique," it has become so associated with the process of zinc plating that its original meaning has been forgotten. As a matter of fact it never rightfully belonged to the original process for the reason that Galvani's discoveries and inventions never reached the stage where the zinc pole was used, but his successes gave his contemporary, Alessandro Volta, a foundation upon which to build, and which led up to the discovery of the zinc and copper positive and negative poles, known as the "Voltaic Pile," but usually referred to as the "Galvanic Battery."

The process of galvanizing which I will attempt to describe on this occasion is that of immersing the article to be treated in a vessel of molten zinc. While this may appear to be simply a mechanical process it is in reality a chemical process, although perhaps unbeknown to the mechanic who performs the operation. In chemistry there are two elements to be considered, one the metallic and the other the acid. Different acids act differently in contact with different metals, but we will not go into the chemical aspect of the subject, suffice it to say that the acid and the heat generated by the electric current caused the two metals to adhere to each other in the former process, while the acid and the heat generated by fire cause the two to adhere to each other in the process about to be described.

In the illustration will be seen a typical galvanizing plant, being that of the Goold, Shapley and Muir Co., Limited, Brantford, Ont. This company manufactures a line of windmills, pumps and sundry other specialties which require galvanizing, and incidentally do an enormous amount of the custom galvanizing which is done throughout Canada. At the extreme right of the illustration and behind the workman is a large wooden vat, a portion of which is shown. This vat is approximately 20 feet long, six feet wide and two feet deep, and contains diluted sulphuric acid. It is connected up to steam pipes for the purpose of heating the acid, not by radiation, but by the direct action of the steam being forced into the acid. The vat, as we have seen, is of wood. The acid would dissolve an iron one, but strange as it may seem, does not affect the wood.

Next to this and in front of the workman is another vat containing muriatic acid.

To the front of the picture and behind the pile of pipes will be seen the end of another vat containing water.

Beyond this will be seen one of the kettles in which the molten zinc is contained, and at the rear left corner of the room will be seen another of the kettles.

At the rear, to the right, will be seen the open doors of the hot air ovens. Thus we have the equipment of a modern galvanizing plant.

The kettles are of electrically welded steel, one and three-quarter inches in thickness on the sides, slightly thicker on the bottom, and flanged at the top. These kettles are built into furnaces with fire doors the entire length. Soft coke is the fuel used and the metal is kept melted continuously. One of these kettles is long and shallow, being in dimensions 21 feet long, 22 inches wide and 30 inches deep, and with a capacity of approximately 20 tons of melted metal. The other kettle is 5½ feet by 8 feet by 22 inches, and holds approximately 16 tons of metal.

By having two kettles of such different dimensions it is quite possible to galvanize almost any piece which could be offered.

When material is brought to be galvanized, if it is a casting with sand burned into it, the sand should be removed by means of an emery block or file, and if necessary, by the application of hydrofluoric acid, which will dissolve the silica even though burned into glass. A plant where much of this would require to be done would have a vat of hydrofluoric acid, but where the bulk of the work to be done is on sheet metal this is not necessary.

For the regular run of work such as is done at this establishment, the articles to be galvanized are put into the sulphuric acid, where they may remain all night if the acid is not boiled. In the day-time steam is turned into it, keeping the acid in a boiling state. This hastens the action and several lots may be done in one day. When the article shows that all scale has been loosened, it is removed from the acid in a slimy state (from the action of the acid) and is taken to the water vat and washed. From this it is taken to the muriatic acid vat and allowed to remain in this for a short time, when every vestige of the first acid will be removed and the article will be perfectly clean metal with a thin film of chloride of iron on the surface. Muriatic acid is a combination

Continued on page 310

VIEW OF GALVANIZING DEPARTMENT, GOULD, SHAPLEY, & MUIR CO., LTD., BRANTFORD.
(Photo taken by star-light.)

Some Interesting Examples of Gauge Making

Making Gauges is at Any Time a Ticklish Proposition, as Accuracy is the Main Consideration—Herein is Described, from Practical Engineer, How Various Gauges Were Completed.

By A. G. ROBSON, A.M.I.Mech.E.

AN internal cylindrical gauge is referred to in Fig. 1 as a plug gauge. After the steel is cut from a bar it should be annealed and then turned in the lathe, the diameter being made 0.010 in. larger than the finished size of the plug. The surface should be fairly smooth without any irregularities. The plug is made "dead" hard by uniformly heating to a very bright red and suddenly cooling in water; it will then be found to have increased in diameter by 0.002 in. to 0.003 in. A grinding arrangement is now secured in the slide rest of a high-speed lathe, while the plug is placed between the centres. In Fig. 1 the plug is indicated by the letter P, and the emery wheel by EW. H is the holder, FP the fixed pulley, and B the bearings. An additional countershaft is required for driving the emery wheel. The arrows indicate that the directions of rotation of plug and emery wheel are opposite. The bearings must be very carefully fitted and should be examined from time to time. The grinding is done by moving the hand slide rest whilst the plug and wheel rotate, and should be continued until the plug is .001 in. larger than the finished size.

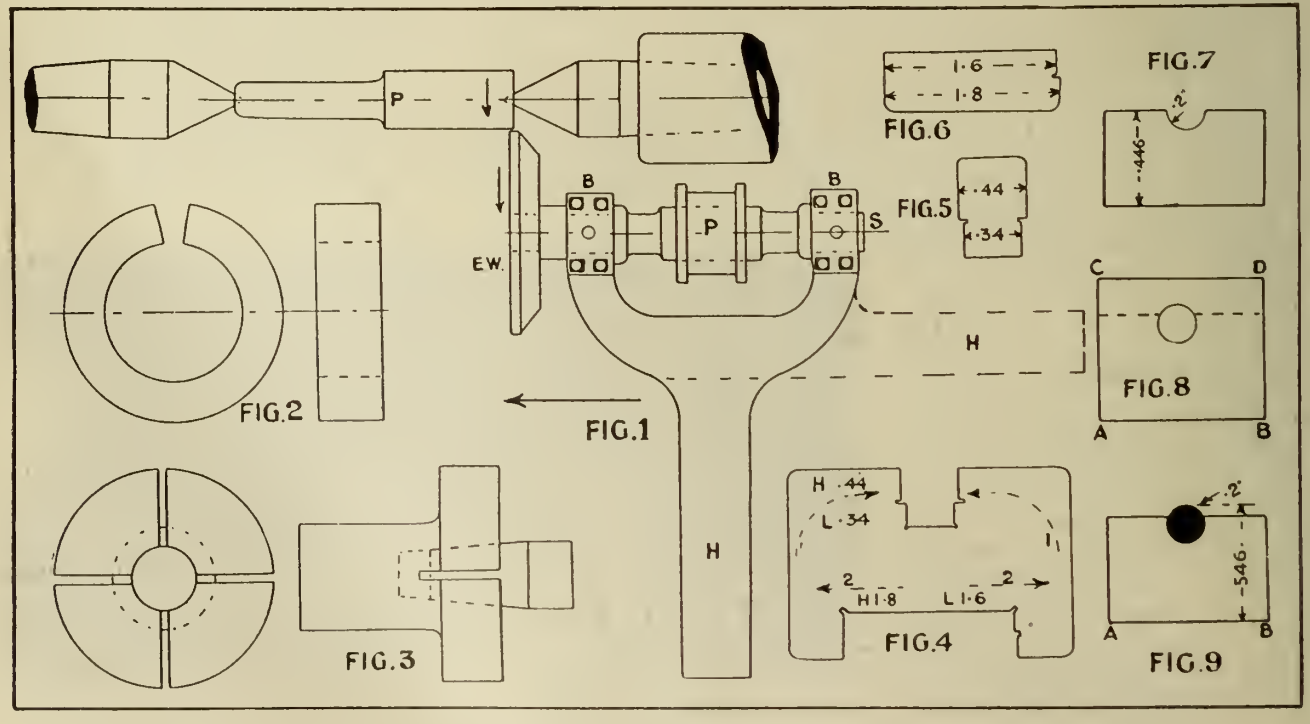
Lapping

The excess of .001 in. on the plug is removed by lapping off, a process which will remove any unevenness which can only be detected by applying the micrometer, and at the same time will produce a smooth, shiny surface. The lap consists of a lead ring (Fig. 2), which is bored to fit just over the plug, but with a portion removed as shown. The lathe being started, the plug rotates whilst the lead ring is held stationary by hand, and oil and fine emery powder are placed in the slot in the ring. The ring will exert a pressure upon the plug and the emery powder and oil will be sucked in around it. The powder tends to become fixed in the lead surface, and consequently the lapping is more effectual. The plug should be tested by the micrometer to see that it is parallel.

A plug of lead is used for lapping the hole, and about .001 in. would be allowed for this operation after grinding. (It is advisable in this case to allow slightly more than 0.010 in. for grinding. In the case of the internal gauge above described any increase on the diameter due to hardening is an advantage, but any increase on the diameter of an external gauge will result in there being less to grind out of the hole.) The lead plug would be turned to fit the hole and the smaller diameter in Fig. 3 would be secured in the lathe chuck. The lathe is started, and whilst the lead plug revolves the ring gauge is held over the plug to prevent rotation. The ring is gently moved to and fro to secure even lapping. Oil and fine emery powder are placed on the plug, and as the lapping proceeds the powder tends to "pin in" the lead surface. If a large number of holes require lapping provision must be made to compensate for the wear on the lead plug. It is therefore sawn in four places and a conical hole made in the end. As the plug wears a slight tapping of a steel pin shown in Fig. 3 will spring the lead and increase the diameter.

Plate Gauges

There are many varieties of plate gauges. A very common one is shown in Fig. 4. If a number of these were required, cast steel blanks would first be cut from ⅛ in. plate. After being roughly milled the faces and sides would be cleaned up and the particulars of the gauge stamped upon the face. The letters H and L refer to the high and low sizes respectively. The next operation consists of making "working checks" (working check gauges), which will appear as shown in Figs. 5 and 6. The making of working checks is of great importance. The pieces of plate are filed and scraped until about 0.001 in. larger than their sizes, after which they are case-hardened by ferro-cyanide of potassium being placed on the faces and edges when heated, and they are then plunged into water. By washing the gauge in water the powder will easily be removed. The checks should now be lapped. A piece of copper about ⅛ in. or 3-16 in. diameter has two flat surfaces filed on one end. Fine emery powder and oil are then mixed together and the copper lap is placed in the mixture and rubbed on



THIS VIEW INCLUDES FIGS. 1 TO 9.

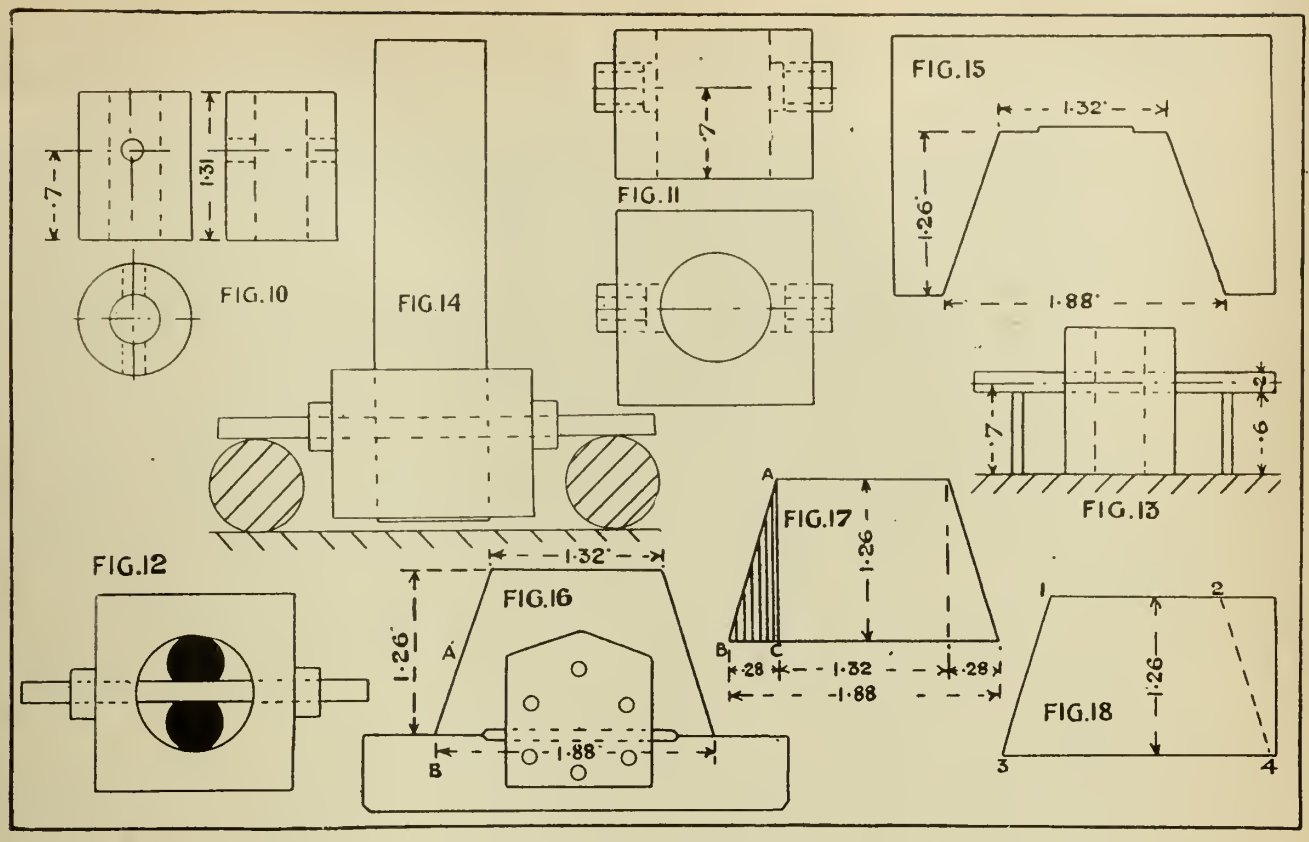


FIG. 10 TO FIG. 18 INCLUSIVE.

the finished faces of the checks. This gives a bright surface and a remarkably good finish. The checks should be occasionally tested by the micrometer during the process of lapping, and a small straight-edge applied to the faces.

Working Limits

Working limits are usually allowed on gauges, so the checks must also be made within these limits. The high measurement is given as 1.8 in. If 0.0003 in. were allowed on this high size then the size of the check should be the mean of this added to 1.8 in.; that is, 1.80015 in., or one and a half ten-thousandths larger than 1.8. The check would also be correct if it were made 1.8003 in., but then it would have to fit tightly in the gauge, as this measurement is the high limit to the high size of the gauge.

In the case of the low measurement, 1.6 in., assuming the same allowances were permitted, this part of the check should be the mean of 0.003 in. deducted from 1.6 in.; that is, 1.59985 in., which is one and a half ten-thousandths less than 1.6 in.

Fitting of Checks

The gauges should now have the checks fitted to them. The first step is to obtain a true surface on one side of the openings shown in Fig. 4 and then work the other faces to suit the checks. It is well to make the checks tight-fitting at this stage prior to case-hardening. Gauges will behave in a very peculiar manner during the process of case-hardening, but it is found that by heating them to the least temperature sufficient to fuse the case-hardening powder there is very little change in size after the gauge is immersed in water. Overheating will prevent the gauge from contracting to its original size and it remains larger than the check gauge. The amount may be as much as 0.002 in. When this is the case and the gauge has to be closed in to fit the check it is hammered in the direction of arrows, 1, Fig. 4. Care must be taken that the high measurements of the gauge are not increased also. Should the gap in a gauge be too small and require enlarging the metal face should be hammered lightly in the direction of arrows 2, Fig. 4, commencing from the centre. Having now made the gauges nearly to fit the checks, the surfaces of the gauges must be lapped by the copper lap until the checks fit easily by hand. Care should be taken to prevent the checks becoming affected by the heat from the hand or by holding them too near the light. Gauges may be made a "proper" fit to a check gauge in the warm atmosphere of the workshop at night, but in the low temperature of the following morning they will be found to have altered. In working to the ten-thousandth part of an inch due regard must be paid to the temperature of the room, and to assist in this direction micrometers should be mounted on wood or metal stands.

External Semi-Circular Gauge

In Fig. 7 an external semi-circular plate gauge is shown. The important parts of this gauge are the size of the hole and the semi-circle. In Fig. 8 a piece of ¼ in. plate A B C D is shown. The face A B C D should first be trued up by a grinding machine. This face should now be placed upon the face of a magnetic chuck, secured to the table of the grinding machine, whilst the opposite face is ground. The position of the hole in the plate is not very important. In Fig. 8 the hole is drilled as shown. As the finished size of the semi-circle is 0.2 in., then the hole in Fig. 8 should be about 0.003 in. smaller than the diameter, 0.4 in. The hole is enlarged so as to be 0.001 in. less than 0.4 in. This 0.001 in. is removed by lapping the hole. The size of the hole is finally determined by a lapped plug tightly fitting in. The plate is then sawn through along the dotted line.

It will be observed that this line is above the centre of the hole. Now the surface A B of the plate is made true by applying a straight-edge to it and removing the high places by an oil stone. Having completed this lower surface, the plug is then inserted as shown in Fig. 9. The micrometer is then applied to ascertain the measurement from this surface to the top of the plug. In Fig. 9 this is shown to be 0.546 in. In order to have a semi-circle in the plate the distance from the centre of the plug to the base will be 0.546 in.—0.1 in. (the radius of the plug) = 0.446 in. The upper face is then filed and finally lapped until the measurement, 0.446 in., is obtained as shown in Fig. 7.

Cross-Hole Gauge

A cross-hole gauge is seen in Fig. 10. It consists of a piece of circular cast steel with a central hole. Two other holes (one on each side) are at right angles to the central hole and also in the same plane. The central hole would

rst be drilled and lapped to the correct ize; the gauges would then be turned n the outside by fitting a mandrel in he hole. A drill block is then made as hown in Fig. 11. It is a rectangular iece of steel, bored out to suit the out- ide diameter of the gauges. Two holes re drilled and these are then bushed. n order to test whether these holes are t right angles a rod resting on two smoothly turned pins of the same dia- meter is passed through the bushes (see Fig. 14). Another rod, with a hole through it to permit the first rod pass- ng through, is placed in the block as shown. A square tried each side of the rod will show whether the holes are at right angles. To test the alignment of the holes a round pin has a tapered face filed on it, and by trying this pin as shown in Fig. 12 and measuring the dis- tance it projects through the other side for each position the holes are checked for being in line with each other.

After the cross holes are drilled they should be finished by a rimer, which can also be used for rectifying the holes should they not be in the same plane or at right angles to each other. To finally determine the distance 0.7 in. two "slips" should be made. If the cross hole is 0.2 in. then the distance 0.7 in. is determined as shown in Fig. 13. A tight-fitting 0.2 in. pin is placed through the holes, and the two slips, which should be made 0.6 in., must just touch the pin easily.

A type of gauge introducing a little calculation is seen in Fig. 15. It is a simple plane surface gauge and the small undercut on the inner face is only clearance. It is at once apparent that the check will be to the shape and sizes shown in Fig. 16. It consists of two pieces A and B held together on a back plate by small screws. The piece B requires its upper face to be lapped true. Difficulty with the check will be ex- perienced in making the piece A, as the micrometer cannot be used to determine the measurement 1.32 in. The easiest and most reliable means will be to find what the angle A B C in Fig. 17 measures. If this angle is accurately de- termined the measurement 1.88 could be measured by the micrometer, and then the 1.32 in. should agree when the height is 1.26 in. Looking at the shaded right- angled triangle A B C the base B C is found to be 0.28 in.

Now the tangent of angle A B C $= \frac{A\,C}{B\,C}$

$= \frac{1.26}{0.28} = 4.5.$

Looking at a table of tangents of angles, it will be seen that 4.5 is between the tangent of 77 deg. and 78 deg. The tangents are as follows:

Tan 78 deg. = 4.7046
Tan 77 deg. = 4.3315
∴ Difference for 1 deg. = 0.3731

Now the angle between 77 deg. and 78 deg. must be found. Let this angle be called 77.x deg.

Then Tan 77.x deg. = 4.5
and Tan 77 deg. = 4.3315

∴ Difference for 0.x deg. = .1685
but 0.3731 is difference for 1 deg.

∴ 0.1685 is difference for $\frac{0.1685}{0.3731} = 0.45$

∴ 77.x deg. = 77.45 deg.,

which is the angle A B C. The standard protractor in the workshop should be carefully set to this number of degrees. A piece of metal is next obtained and the two opposite faces rubbed down and lap- ped until they are 1.26 in. apart. The angle on one end, as shown in Fig. 18, should now be obtained by filing, rub- bing down, and lapping. When the angle 1 3 4 agrees with the protractor the dis- tance 3 4 should be made a few thous- andths of an inch greater than 1.88 in.; then the angle 2 4 3 is obtained by the protractor. The whole face 2 4 should now be rubbed down and lapped until the distance 3 4 is 1.88 in. Care must be taken in checking the angle whilst this is being done, as unevenly distributed pressure upon the plate will cause it to alter. It will facilitate adjustment, and ensure the two faces of the check com- ing together if each face is undercut as shown in Fig. 16. The back plate is now drilled, and after the holes are marked off upon the two parts of the check these may be drilled. The check must be light- tight to the gauges, and whether this is so can be observed by holding the check and gauge upon a piece of glass up to the light.

GALVANIZING

(Continued from page 307.)

of chlorine and hydrogen, sometimes re- ferred to as hydrochloric acid. This acid not only cleans the surface of the iron but eats into it, and the chlorine combines with the iron, forming the coating referred to. The article is taken in this condition and placed in the oven and dried with this coating on it. When thoroughly dry and preferably when still warm, it is immersed in the melted zinc. When dipping anything long like a pipe or even a flat plate it should be put into the zinc very carefully, one end first, and should be taken from the tank with equal care.

When the melted zinc comes in con- tact with the chloride of iron it becomes impregnated and the zinc is actually al- loyed with the iron through the influence of the chlorine rather than adhering to the surface. The acid, while assisting in the work of securing the zinc to the iron, also attacks the melted zinc as well as the article being galvanized and also to a certain extent the tank in which the metal is melted. Oxidation also takes place and the effect of these vari- ous influences is to form a sort of dross or crystallized zinc, and, unlike zinc oxide or iron oxide which would float on the surface, this dross settles to the bottom, and if allowed to remain there would soon cause the ruination of the kettle. To avoid this lead is introduced, and the lead being heavier than the zinc or dross settles down to the bottom and as the dross settles it remains between the zinc and the lead, and is scooped out with a perforated ladle and pounded into iron molds, from which it is taken and ship- ped back to the refinery where it is again converted into good zinc.

As we have said a certain amount of oxidation takes place and that some of the oxide was in the dross which settled to the bottom, but as a matter of fact the percentage of oxygen in that ma- terial would be small. The bulk of the oxidized zinc gathers on the top and is skimmed off. Some of this will be seen in the pile in front of the tank. This would be much more in evidence were it not for the use of flux in the metal. The flux removes the oxygen from the metal and at the same time forms a covering on the melted metal which to some extent prevents it from further oxidation. The zinc is only exposed by skimming when a piece is to be dipped, and only at such a portion as is neces- sary to allow the dipping to take place. The flux used consists of sal-ammoniac and sawdust, and in some cases glycerine and sawdust. The pile of skimmings seen in the illustration contains a cer- tain amount of good zinc which can be recovered.

As might be imagined, coats are not required in this department. The fel- low with the coat on is only a visitor. The gentleman next to him is Mr. Wm. Lusby, who for the last 20 years has been superintendent of this department and knows the galvanizing business from A to Z.

This galvanizing room is but one de- partment of the Goold, Shapley and Muir Co.'s works, and the windmills, etc., which require to be galvanized form only part of the output of this plant. Gas, gasoline and oil engines, station- ary and portable, are among their pro- ducts. They also manufacture a line of pumps, from the smallest kitchen pump to the largest of mining pumps. But the windmill which they have manufac- tured in unlimited numbers and which was their earliest venture, has gained such a hold on the public mind that the plant is commonly known as "The Wind- mill."

The company, in their various depart- ments, employ some 300 hands, and were among the first to undertake the art of galvanizing in Canada.

In conclusion I would say that while galvanizing is a comparatively simple art, it represents quite an outlay. The electrically welded steel kettles constitute a big item, and the 30 odd tons of zinc at 18c. per pound, which is the pre- vailing price, is no small item. This being kept in a molten state year in and year out would consume a considerable quantity of fuel. But such is business.

RAIL BENDING PRESS

The Hydraulic Press Mfg. Co., Mount Gilead, Ohio, have placed on the market a hydraulic rail-bending press which has a capacity of 35 tons. It is of the horizontal type, and mounted on wheels so that it can be readily be moved into the position where it is to be used.

Temperatures for Heat Treating Carbon Steels

It is Well Known the Lowest Temperature Which Will Give the Best Results is the Best Temperature, But What is the Lowest Temperature?—This Question Has Puzzled Many.

By F. L. MOISTER

THE lowest temperature which will give the desired results is the best temperature. This leaves open the question—which is the lowest temperature.

Heat treatment begins with the ingot. The size of the ingot grain is in direct ratio to the rapidity in freezing. Rapid freezing means small grain, slow freezing means larger grain. In practice the ingot is stripped as soon as the walls have solidified enough to permit handling without danger of bleeding and immediately charged into the soaking pit. If the pit temperature is right the heat equalizes and freezing is normal. If too hot, as sometimes occurs, freezing is delayed. The writer is of the opinion that the wide variation in physical properties of steel of same melt and same product is due more to variations in size of ingot grain than to any other cause.

High temperatures and delayed cooling in rolling or forging mean large grain. Low temperature and normal cooling mean fine grain.

Some authorities claim that the lowest temperatures for annealing and hardening are always above recalescence. This is true for annealing, but even in that operation the lowest temperature above recalescence is best, for low annealing temperature with longer time is infinitely better than higher temperature. The low temperature annealed steel will be finer grained and superior in ductility and elasticity.

Consider forgings, both open and die; few forge shops pay much attention to the forging temperature; what they aim at is a soaking heat, the steel highly plastic, so hammer work is reduced to a minimum. The finishing work is often at such high temperatures that the grain grows in cooling and frequently the hot forgings are piled and cooling delayed. Delayed or interrupted cooling from high finishing temperatures induces grain growth.

A glaring instance of this occurred in a shop using their own make of smith's hand tools. A 4 in. flatter broke off at the base before it had been in use one hour. The fractured surface was very coarse grained and showed pronounced evidence of what might be termed "Acute Detail Fracture." The smiths, to a man, called it burned steel. The writer held it to be a case of slow cooling from a high finishing temperature.

The flatter was forged from a 2 in. x 2 in. bar of flatter steel, carbon .82, the bar was cut into lengths, handle hole punched, tapered to enter die, reheated a bright orange and flashed in the die with three blows of a trip hammer. They were piled while very hot and cooling delayed. Such tools were issued to the shop without further treatment.

The shank of the broken tool was quartered longitudinally and two diagonal pieces broken transversely by pressure. The fractures were very coarse crystalline, of pronounced fiery lustre, and there were no signs of bending before occurred.

The other two pieces were heated to 1,450 deg. F, held for some time to allow for lag, and cooled in the air. They were broken in the same manner. The fractures were fine grained, no fiery lustre, and the pieces had bent considerably before rupture occurred. This test proved the writer's contention, that the steel had been injured, not by burning, but by delaying cooling from a high finishing temperature.

Two flatters were taken from the same lot, heated 1,450 deg. F, cooled in the air. Then heated to 1,400 deg. F, and quenched in water. One was drawn to 900 deg. F, and the other to 850 deg. F, and both put on same work as the broken one. The first was in constant use for 26 days, had mushroomed to 3½ in. across the hammer end with but one slight crack showing. The second was in use for nine weeks, had curled down at hammer end, no chips had broken from it and it was good for many more weeks' service. An excellent tool.

In forging a cold chisel of carbon .4, the smith will heat the steel cherry red, forge it into shape with light blows and quench in water when the color is a dull red. It will be hard as a diamond but brittle, and drawing back to a straw color will make it tough and hard. A good tool. Had he quenched in water at cherry red the steel would be full of shrinkage cracks and the tool useless. He selected the lowest temperatures for his purposes.

The effect of quenching in water from too high temperatures can be seen by etching the face of most any make of machinists' hammers. The etched surface will show a network of fine shrinkage cracks which cause the steel to spall off in use. Some years ago the writer investigated such hammers which were causing injury to workmen by chips flying from them. Several makes were selected for the test and all but one make, when etched, showed the network of shrinkage cracks. Under an intensified work test—striking the face of an anvil with a full arm blow—some hammers spalled at less than 20 blows, and none showing cracks stood 50 blows. The ones that did not show cracks stood over 100 blows without spalling.

In heat treating locomotive forgings to a specification which called for:

Carbon	.40	.55
Manganese	.40	.70
Silicon	.10	.30
Phosphorus		.05 Max.
Sulphur		.05 "
Chronium		.30 "
Nickel		.40 "

55000 lb. Elastic Limit in forgings up to 4 in. dia. or 2 in. wall,

90000 lb. Tensile Strength in forgings up to 4 in. dia. or 2 in. wall,

50000 lb. Elastic Limit in forgings over 4 in. dia. or 3½ in. wall,

85000 lb. Tensile Strength in forgings over 4 in. dia. or 3½ in. wall.

20.5 per cent. min., elongation in 2 in.

F. hold for heat to be equalized, and allow for lag, cool in air, with forgings separated so as not to del[illegible] the steel in excellent condition for heat treating. The forgings were made by several smiths, observation showed widely varying finishing temperatures, and therefore the annealing temperature had to be held long enough to correct the grain in the hottest finished ones.

Heat slowly to 1450 deg. F., hold at that point till thoroughly heated, and quench in freely circulating water. Draw 950 deg. F. to 1000 deg. F. if 55000 lbs. Elastic Limit is required,

1000 deg. F. to 1050 deg. F. if 50000 lbs. Elastic Limit is required.

Temperature varying for carbon content and section of forging.

Tests made from such forgings gave perfect results. All forgings were accepted. The elongation and reductions were in excess of requirements and the fractures were fine, dense gray lipped.

Forgings quenched in oil from higher temperatures, when tested, did not have as fine grain, high elasticity or ductility. The fractures were not as regular and did not have the clear silky appearance of the water quenched.

A fairly wide range of quenching temperatures is possible, if tensile qualities only are desired, and the steel can be made reasonably uniform by varying the draw. But if tensile and shock resisting qualities are desired, the quench should be as low as possible so the grain will be fine and the draw low. The steel will have equal ductility, greater elasticity and thus superior shock resisting qualities.

Grain change above recalescence is not instantaneous. Time is as important as temperature. There is a definite grain for a definite temperature. Assuming a 1700 deg. F. grain steel; it will take more time to refine such a grain down to a 1450 deg. F. grain to a 1600 deg. F. grain.

This brings us back to the original premises: The lowest possible temperature is the best temperature.

In all cases the grain mentioned is the MACROGRAIN.

WHAT OUR READERS THINK AND DO

SOME HANDY HINTS

By Fred Horner

The first scheme is that depicted at A. The illustration shows the use of a dog on an arbor, and this idea is very useful under certain conditions, such as where the work is too delicate to stand hard forcing, or the bore is a trifle too large to give a good driving fit on the arbor. Provided the work has arms or holes through which the tail of a dog may be passed, the latter can be gripped on to the mandrel (with strips of brass or copper for protection) and applied to carry the work round as depicted.

Spot Marking

The second hint is shown at B. This illustrates the marking of spots on opposite sides of round work.

There are many ways of getting locations at exact opposite sides of a shaft. The marking may be done with vee blocks and surface-gauge, or in the lathe, or with one of the special double centering punches. As an emergency dodge, in the absence of all these facilities, it is possible to secure indications by means of a toolmaker's clamp, gripping it lightly upon the shaft and moving it through, with a slight motion sufficient to make bright spots that may be centerpopped. Chalk or whiting can be applied to the shaft first if preferred. The same method may be pursued with a slide gauge, or even a pair of ordinary calipers if passed over the shaft carefully.

The Third Idea

The last idea, shown at C, is a dodge for setting and maintaining a thin washer square on an ordinary arbor. A toolmaker's clamp is gripped on the arbor behind the washer, as seen in the face view, so that it can be noted whether the washer is square across. The clamp backs up and sustains the washer against the pressure of the facing tool. This hint is necessary, because the bore of a thin washer is too short to ensure locating the work square upon the arbor.

THE MACHINING ALLOWANCE

By G. Blake

In these days of mass production and the consequent cutting down of all unnecessary expense, some firms are inclined to err on the allowance for machining on castings, stampings, forgings, etc. In many cases there is not sufficient metal left for machining up, with the result that the saving in weight and cost of metal is very small compared with the cost and upkeep of tools. For instance, the cost of tool grinding is far higher than it should be on account of the scanty amount of metal taken off in the machining. As the tool is only taking off the black skin it very soon puts a dull edge on the best high-speed steel tools. When the allowance is increased, i.e., more metal left on to be machined, the tool stands up better, requires less grinding, and lasts longer, and above all makes a better finish.

Of course where there is a pickling and sand blasting plant the allowance can be cut down somewhat, but the difference is so small that it is of no account in the final cost of the job. The pickling and sand blasting plant saves trouble in the way of tools, and it is a matter of wonder to the writer why so few firms are in possession of such an outfit.

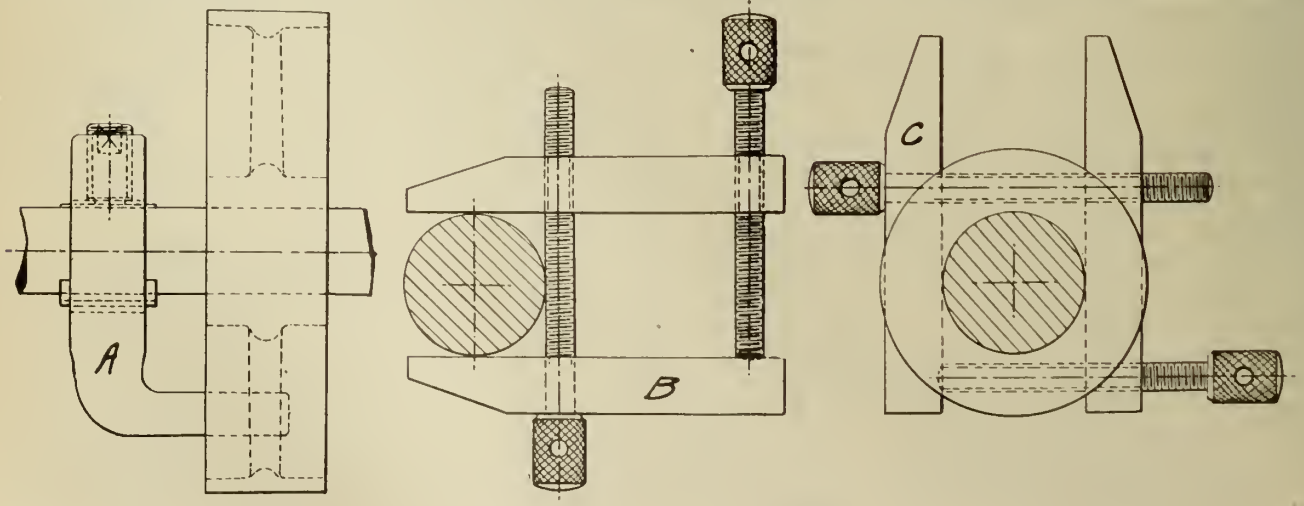
Another point brought before the writer's notice some time ago in the motor trade was the number of small forgings, castings, and hot stampings having cored holes which might well have been left solid as it cost more to open the holes out to size than if they had been solid. This was on account of extra drill and cutter grinding involved.

Another point is the normalizing and annealing of all castings, forgings, stampings, etc. Much can be done in this way to overcome machining costs. Of course this applies more to the small firms as most of the large concerns have their own foundry, forges and drop-stamping department. With small firms it is very essential to insist that all castings, forgings, and stampings supplied from outside makes be thoroughly annealed. In some cases a Brinell test is misleading as very often hard spots are encountered in the machining.

KEEPING THE PLANER BUSY

By Donald H. Hampson.

Machine shops that have planers over thirty-inch frequently find that it is hard to keep them busy more than a quarter of the time. These shops know the facilities of the other shops in the region and they know the requirements of the manufacturing plants in the same territory from this knowledge, they can see no way to keep the planer busier than it is. To stand idle three-fourths of the time is to have



HERE ARE SHOWN THE THREE IDEAS

so much capital idle — not to speak of the room the planer takes up. An idle planer invariably becomes the target of all the odds and ends conceivable, so that when a job does come along it takes a machinist and the floor boy about an hour to dig away the debris.

The printing industry offers work for idle planers in all well populated districts. Printers do not go around hunting machinists to do planer work — the machinists have got to solicit the work, in fact, they have got to call the printers' attention to the need of having the work done. Once the need is shown, the printer will consent quickly enough. There was a time when printers were the most forlorn and run down business people on the list—and this accounts for the presence of vast quantities of second-hand machinery in their plants that needs repairs. But thanks to the Standard Cost System and the Ben Franklin Clubs, the printing industry is on a well paying basis to-day and printers' credit is good at the banks. When it comes to figuring costs on a job, printers are ten years in advance of most machine shops—their "Taylor-White" systems go right down to the two-man establishments and show them everything exactly to a penny.

Returning to planer work. Job presses, also called "platen presses," have two cast iron plates flat on one side and ribbed on the other like a surface plate. Between these two flat surfaces the printing is done. In time the surfaces get worn so that to get an even impression on the "low" spots, the pressman must stop and paper up by trial amounts to turn out good work. The amount of time he spends in a week on such tinkering would pay for the re-planing of the two castings.

The same is true of cylinder presses. Oftentimes the re-planing of the bed of a cylinder press, including a cut over the ways, will make an old press do work almost as good as a new one. These castings may be as large as 40 in. x 60 in. and weigh a thousand pounds, whereas the job press castings are found as small as 10 in. x 12 in., and of only 50 pounds weight.

Paper cutting machines also depend upon the planer work for the accuracy of the product they turn out. The table of the machine is a flat casting with light ribs beneath; it gets some wear and the seasoning of time coupled with standing on uneven floors frequently get them an eighth of an inch out. There is a slot about an inch wide and the full length which guides what is known as the "back gauge" (a part corresponding to the gauge on a sheet metal squaring shears.) This slot gets badly worn; in that condition it is safe to say that it costs the average printer a dollar a week for spoiled work and time spent in dickering with it. Several other parts subject to wear are planer parts.

Then the proof presses come in for a share of attention. These are of two types—one in which a cylinder travels (rolls) along a track at a fixed distance from a planed flat cast iron plate and the other, the old-fashioned Washington hand press, which has two plates similar to a job press and which are caused to approach each other by hand operation, giving the impression in that way. Both types of proof presses are used in some cases for actual printing of commercial work as well as for proving (testing) cuts, advertising matter, set up pages, etc. The proof press must be more accurate than the power presses or their test of the work is void. The worn or bruised plates require a light cut over them to become as good as new.

The above mentioned are the most common examples of planer work to be secured in printing offices. Others might be mentioned according to the extent of the equipment. In many cases there is other work that must be done along with the planer cutting, in others the newly planed surface with a little adjusting will suffice. It is doubtful if any printer would refuse to have such repairs made after his attention had been called to their need and to the shop's facilities for handling the work.

A visit to the shop of any manufacturer of presses or folders or cutters or other printers' equipment will show at once the pre-eminence of the planer as a machine tool on such work, and if any shop with idle planers is within reasonable distance of one of these plants, they have only to qualify to obtain plenty of extra work, for with planers at $8,000 and up, they are scarce even with the shops that have ample capital.

SIMPLE PIN CUTTER

By Tyke

Having received an order for one thousand small pins ⅝ of an inch long and .968 inch in diameter, to be made of drill rod, the question as to how these were to be cut off accurately, quickly, and with reasonably square ends, was gone into. After a little consideration the following method was adopted, which gave every satisfaction as to accuracy, and proved to be exceedingly cheap and rapid. The accompanying sketch is virtually self-explanatory, XX being the jaws of the shaper vise, B a tool steel block drilled a few thousandths larger than the drill rod used, and hardened at the drilled end only. C is a machine steel block with a step ⅝ x ⅝ inch milled at one end. D is a tool steel tool grooved as shown in order to eliminate producing a flat on one side of the wire when shearing. This tool was given the merest suggestion of clearance and suitably hardened. The entire device was now ready to use; C and B were firmly held in the shaper vise, as shown, and the tool properly located in the caliper box, barely touching the tool steel block B. A length of drill rod was inserted in the hole at Y and advanced untitl it touched the opposite face of the piece C. The stroke was set at 3 inches and the speed about 60 per minute. The whole thousand pins were cut off in twenty minutes and the tool was good for several thousand more. This simple method more than paid for itself, and with slight modifications could be made adjustable, such as a screw stop in C and different size holes in B, thus taking care of larger or smaller pins of varying lengths.

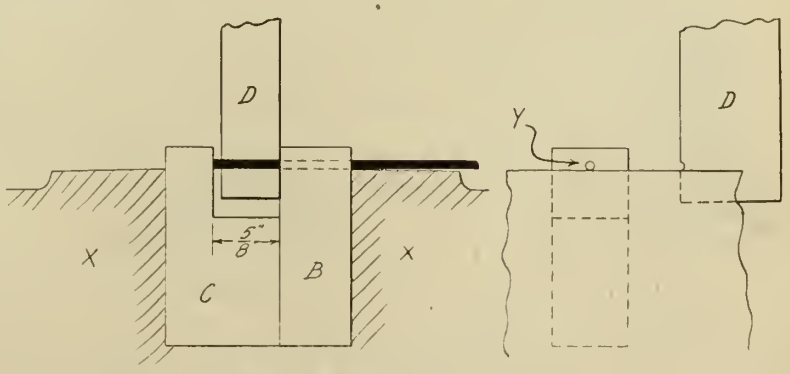
HINTS ON USING NEW TOOLS

By G. Blake

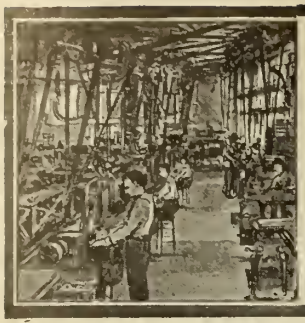
To my mind these are precautions which should be observed in using new tools such as drills, reamers, broaches, etc. Many tools are broken through the operator's ignorance and neglect. A new drill, reamer or broach has been drawn from the tool store and smashed in a few seconds, especially in cold weather. Most tools give best results when slightly warmed.

Say in the case of a new drill, the operator will fix it in the socket, start up the machine, and put the feed on right away. The result is that the sudden shock on the new drill causes the drill to break. When using new drills over ½ inch diameter, reamers or broaches, the writer recommends that they be warmed by dipping in hot oil. In the case of drills, you should use a light feed for the first few holes.

The same applies to broaches, which, if treated in the above manner, will amply repay the trouble and time spent. Of course this is not necessary in very hot weather, but it is essential in cold climates and during frosts. It has been observed during very severe frosts that machine tools, etc, are very easily broken.



GENERAL VIEW OF THE PIN CUTTER.



DEVELOPMENTS IN SHOP EQUIPMENT

COAL OIL LAMPS

The Standard Meter Co., Ltd., 10 Morrow Ave., Toronto, Canada, have placed on the market a very interesting line of lamps which are described herewith. At Fig. 1 is shown what is known as the Monitor high power coal oil brazing lamp. This lamp is used for brazing

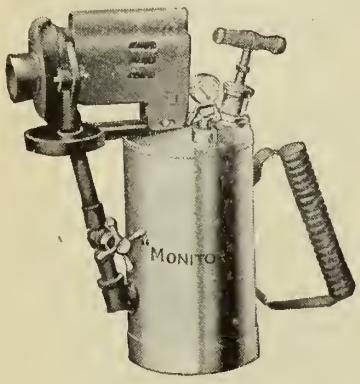


FIG. 1—SHOWING BRAZING LAMP.

and work of similar nature on a large scale and can be used in any position. It is said to be both portable and powerful. They are made in 2, 4, and 5 pint sizes.

The next type of lamp shown at Fig. 2 is known as the Monitor high power coal oil blow lamp. This style of lamp is both wind and rain proof and is used extensively by millrights, plumbers,

FIG. 2—SHOWING BLOW LAMP.

electricians and hot water engineers. This lamp is made in 2-3 pint, 1 pint, and 2 pint sizes.

Another type of lamp carried by this concern is known as the Petropark high power inverted incandescent coal oil lamp. The latter style lamp is used as portable light for country railroad stations, farm buildings, fair grounds, large workshops, wharves and other innumerable places where portable lights are desired.

TOOL STANDS, RACKS AND STOOLS

The old days when a manager would discharge a man for sitting down to his work have passed. It has been proved that for certain classes of work the workman can become more effective by sitting, and the same holds good insomuch that men are no longer allowed to waste time running all over the shop to find tools. Nowadays tool stands, drawers and benches are always handy to the various machines, or at least such is the case in the real up-to-the-minute plants.

The National Engineering Co., Ltd., Sarnia, Canada, are firm believers in all the above statements and to follow out their belief have placed on the market a varied line of time savers. These include tool stands of various nature and sizes, some being supplied with drawers and some without. They also market an all steel storage rack which can be built in any number of sections and combinations for use against a wall, or placed back to back. Such racks are especially useful in warehouses, or in the cut off department.

In addition to the above mentioned lines they make a shop stool of novel design. This stool is depicted in the illustration standing alongside one of the tool stands as made by this concern. The stool is so simple, yet efficient, that it requires no explanation except that it is made in three heights, 24-ins., 27-ins. and 30-ins.

The A. R. Williams Machinery Co., Toronto, are handling this line and will be pleased to give all information regarding the same upon application.

VIEW OF THE STOOL AND THE TOOL STAND.

METAL CUTTING MACHINE

The Yoder Co., Cleveland, Ohio, have issued a machine for use in cutting sheet metal into strips suitable for various purposes. It is claimed that this equipment provides a rapid means of performing the operation and that the work is done in a way that insures parallelism of the edges. Machines of this type

are made in several sizes to accommodate various widths and thicknesses of metal.

TURRET CHUCK

The Scully-Jones & Co., 647 Railway Exchange Building, Chicago, Ill., have placed on the market what is known as a "Wear-ever" turret chuck. This chuck is of the same general construction as other chucks of this company's manufacture, but is designed to hold square-end tap shanks or other tools with shanks of the same form. Various sizes of chucks are made to fit different diameters of tap shanks, and standard bushings to be furnished to allow a chuck to be used in large turret holes.

SHEET TINNING MACHINE

The Aetna Foundry & Machine Co., Warren, Ohio, have placed on the market a machine designed for use in tinning heavy sheets used in the manufacture of milk-can bodies. There are three pairs of rolls, the lower pair acting as feed-rolls, the second pair, which run in a bath of tin, acting as spreaders, and the upper pair of rolls, which run in an oil bath, removing the excess tin, and leaving the sheets with the desired coating and finish.

AIR OPERATED CHUCKS

The Logansport Machine Co., Logansport, Inc., have issued a new line of air chucks with a duplex control mechanism which allows them to be used on double spindle turret lathes built by the Jones & Lamson Machine Co., of Springfield, Vt. Frank G. Payson Co., 9 S. Clinton St., Chicago, Ill., is the selling agent.

PORTABLE PROJECTOR

The Graphoscope Development Co., 50 E. 42nd St., New York City, have issued a moving picture apparatus especially designed for the use of salesmen. This complete unit, ready for operation, is packed in a case of about the same size as an ordinary suitcase. It is equipped with a motor drive and is of simple construction. The machine uses standard films and will project a picture 10 feet square at a distance of 35 feet.

U. S. SUB-PRESS

The U.S. Tool Company, of Newark, N.J., are now manufacturing sub-presses for various classes of stamped work. Stock sizes with platens of 2 by 3 inches and 6 x 8 inches are carried, and special sizes for particular work may be obtained.

STANDARDIZATION OF MATERIALS

For the first time in Australia, systematic and comprehensive steps are being taken for the standardization of various materials used in industry. This question was taken up some time ago, quotes the "Commonwealth Engineer," by the Institute of Science and Industry, and the first Australian standard specification for the Commonwealth, relating to steel, used for structural purposes such as angles, tees, beams and channels, has now been published. This is the first of a number of Australian standard specifications which will be issued by the institute, which has already brought into line the views of both manufacturers and users as to uniform standards for not only structural steel, but also of railway rails and fishplates and tramway rails and fishplates. Standard specifications for the two latter will be published by the institute shortly.

AIR PLANER

The Turbine Air Tool Co., 710 Huron Road, Cleveland, Ohio, have placed on the market a line of air planers which are adapted for such uses as shaving telegraph poles, telephone poles, etc., etc. They are also used for railroad tie making, pile peeling, removing bark from logs for foundation building, and general dock, wharf, and dam building. There are of course many other uses for such a type of tool but let us go into a description of the same.

As can be noted light weight has been considered. The device has only thirteen primary parts, and has no reciprocal parts. The only wearing portions are the ball bearings and the only parts requiring replacement are the knives and ball bearings. The work of making these replacements is exceedingly simple.

The power used is compressed air, and the speed is from nothing to 12,000 r.p.m. at the knife. The model P

FIG. 1—SHOWING MODEL P PLANER.

shown at Fig. 1 should be operated from an air compressor with 100 pounds pressure, giving 45 cubic feet of free air per minute.

The cost of maintenance is said to be

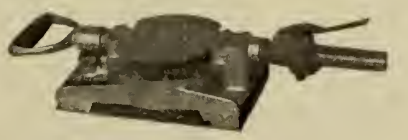
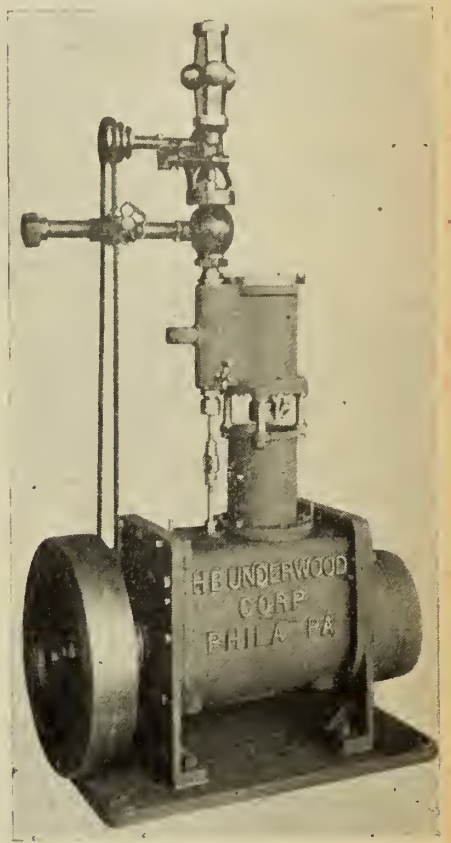


FIG. 2—ILLUSTRATING MODEL D.

negligible and the machine is easily kept in working order. The model D shown at Fig. 2 is similar to Fig. 1, with the exception that it is designed primarily for work on flat surfaces.

AIR OR STEAM ENGINE

The H. B. Underwood & Co., 1015-1025 Hamilton Street, Philadelphia, Pa., have placed on the market what are



GENERAL VIEW OF THE ENGINE.

known as their 3 and 5 h.p. steam or air engines. These engines are built in the two sizes above mentioned, and the illustration herewith gives one a good idea of their general appearance. They are used and designed for driving portable tools such as boring bars, valve seat rotary planers, drilling machines etc., and are constructed to use either compressed air or steam.

All working parts are enclosed in an oil tight case, which is formed in the base of the engine, making it dust proof, and reducing wear to a minimum. The cylinder of the 3 h.p. engine is 3½-inches diameter and of the 5 h.p., 4½-inches diameter, both engines having 3 1-2-inch stroke. The design of the piston valve used is said to reduce friction and wear to a minimum.

The crankshaft is a solid forging finished 1½-inches diameter. The engine is well balanced, uses 70 to 125 pound pressure, and runs at 250 r.p.m. This engine should particularly interest railroad shops.

The floor space required is 12-inches 21-inches, and the height from base to extreme top of governor 46 inches. The net weight is 270 pounds.

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Steel Market Still High

THE premium market may crack, but the steel market in general is not on the skids.

The premium market is a peculiar sort of a creation. If you desire you can refer to the operators in it as a lot of gougers, but if you take the trouble to sit back and think it over a bit, you may find that the frenzied bidding that was done by some lines of industry for available material had much to do with the creation and the upkeep of the premium market.

The automobile business has done more than any other line to build up a premium market in sheets. There were stove makers who, months ago, parted with their stocks of sheets, letting car builders have them at prices that were larger than the profits that would have been made by putting these sheets into stoves.

When any man has a group of buyers around him bidding for something he has for sale, the chances are ten to one that the price is going to go up. The buyers made the premium market in the first place, and the mills are showing no tendency to let the profitable thing die on their hands as long as they can pulmotor an ounce of steam into its system.

The Canadian trade stands to benefit by a better supply of steel coming from the mills of United States. Stocks are low, as buying has been done on a very limited scale.

Buyers may get some relief shortly. It is coming to them that any reduction shall be passed on to them at once, for most of them have been buying from the premium mills and paying the long price.

Heat Treating of Steel

THE convention and exhibition of Steel Treaters held during the week of Sept. 14 to 18 at Philadelphia marks an important step in metallurgical progress. It is only a matter of two years since this organization came into being, yet in that short time they have obtained a membership in the neighborhood of 4,000, and local chapters are now to be found in practically all cities interested in the treatment of steel.

The need of development in the steel treating industry has been felt for some time, and the society is doing a splendid work in this regard. The demand for quality steel is now a common one, and steel treatment is well known to bring out the best qualities in the steel.

The heat treatment of steel is no longer considered a fad. It is a recognized science. The eye is not sufficient these days to judge or guess at the correct heat. Up-to-the-minute apparatus is employed, such as optical pyrometers and testing equipment of all kinds. The age of scientific steel treatment is here to stay.

Toronto has so far the honor of being the only Canadian Chapter, but in the next few years we will, no doubt, see other Canadian branches arising.

The Strike of Iron Workers

THE argument has been put forward many times that union workmen are out for the benefit of all the workers.

The strength of concerted action is supposed to help the little man who otherwise would have a hard time going up against some of the large combinations of capital and talent.

Just now iron workers in Toronto are striking for recognition of their union and $1 per hour as their rate of wages. They have left several large jobs, and are already tieing up the work.

The secretary of the Building Trades Council has this remark:—

> "The serious feature of it is that the roofs of many structures will not be on by the time winter sets in if the strike is allowed to continue. No inside work could be done during the winter."

That is plain enough. The strike of the steel workers for an increased wage and recognition of their own union may mean that tradesmen in half a dozen other lines shall be kept from securing employment on these buildings during the winter months.

This is a point where unions have failed to show the consideration for others that one might reasonably expect.

Do Boilers in Sinking Ships Explode?

DID you ever read about the boilers in a sinking ship exploding? The average man has neither been shipwrecked, nor has he been gazing on the boilers of a sinking ship to see just what does happen. And further, most people who happen to have gone down, lingering in the vicinity of the boiler in a sinking ship, have not returned to make out a report on what really did happen.

Mr. T. H. Fenner, editor of Power House, and a close student of such matters, claims the old theory is all wrong. In a recent issue of his paper he says:—

"In a newspaper report of a recent disaster on the Great Lakes, the statement is made that as the vessel was sinking, the boiler exploded. This is not an unusual statement, but we venture to say it has little but the reporter's imagination to back it up. Is there any good reason why a boiler should explode on a sinking ship? The thoughtless individual usually jumps to the hard-worked explanation of the sudden contraction and lets it go at that. What, then, does this sudden contraction perform? Does the shell contract so much that the pressure is increased beyond the resisting strength of the metal? Most assuredly not. The sudden contraction theory does not hold water. The fact is that the boilers do not explode when the ship is sinking. If they did, it would be of little use trying to salvage sunken steamers, as they would be damaged to such an extent that salvage would be impossible. Of all the steamers sunk by mine and torpedo during the war, were there any cases of boiler explosions unless the boiler shell was actually ruptured by a piece of shell, or other projectile? As a matter of fact, the boilers on steamers sunk and afterwards salvaged are usually found intact and fit for use again. This idea of the boilers on a sinking ship exploding is one that has been fostered by non-technical writers in the daily press, and accepted without question by men who should know better, and who would recognize the error of the statement if they gave the matter a little thought."

Price Tendencies Much Discussed This Week

WHEN the announcement was made from Detroit a few days ago that the Ford Company had cut deeply into the price of cars, the question at once came up: What will the makers of cars in Canada do to meet this?

It creates a very real situation. For some months past the automobile industry in Canada has been doing the great bulk of the buying in the machine tool market. They have been speeding up production, and there has been a market for their cars. There has been a lot of money in the country, and makers were able to pass on increasing costs to the consumer.

To-day the makers of motor cars are not speeding up production. They are making what cars they can sell in the present market. Were they to do otherwise they would be ruined. All that would be necessary to accomplish this would be to go ahead and fill up warehouses and agency branches with high cost cars, and then sell them in a declining market. One automobile maker, discussing the matter with Canadian Machinery this week, stated:

"The move of Henry Ford certainly puts it up to us in such a way that there is no use trying to dodge the issue. We will have to face it. I have no doubt but that our salesmen in the farthest corners of the country were asked that question the first morning the Ford cut was announced: What is your firm going to do about it? You can take it for granted that the makers of cars did not put up prices this year because they wanted to. The buying public were expecting a move in the opposite direction and there is nothing that would have been better for the automobile business. But what happened? We were in a very high market for everything that went into a car, and when we announced an increase in price we did the very same thing that other makers did, acted because our cost sheets pointed the way we must take. It was either a case of lower the cost of the car or get more for it. When this condition came about there was only one thing to do, viz., keep production well in hand with immediate sales.

"Now then, for the lowering of costs in Canada. That is your question, and my reply would be off-hand that if selling prices go down then everything must crack: the steel market, the wages, the dividends, and general commodities. There will undoubtedly be an announcement made in this matter soon, but the bolt—and it is a real bolt—came so suddenly that the situation cannot be figured out in a day or so."

The Implement Manufacturers

Another of the fields that is already feeling the demand for a lower price is the plow shops. As a general thing these places are working a year in advance. That is, they are buying now for what they will make in the last part of 1921 and the first of 1922. Several of these firms have warehouses pretty well filled up with high-cost product, and they are anxious naturally to speed up their sales in order to get the stock out before a lower price becomes recognized by the trade. The implement business recognizes that the rupture that has taken place in the price equilibrium of the automobile market is bound to have an effect on the whole metal working field, especially since Ford has cut into the price of tractors as well as touring cars.

Welcomes the Move

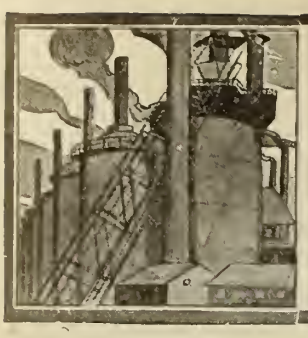
Here is another idea of the president of a firm doing particularly fine work in the mechanical field:

"The move that is taking place now and which was started by Henry Ford, is right. It should have been made a long time ago, and I hope it will spread all through our industrial life. I am not afraid of it in the least, for fundamentally we are sound. The trouble is we have been joking ourselves too long. There are actually people who believe that all that is necessary to have good times is to keep on printing paper money. I sat in at a conference of manufacturers and bankers two days after the signing of the armistice, and we discussed this very thing for hours. At that time I wanted a readjustment and I have never seen anything since to make me change my views. For two years now we have been fooling ourselves. We have been like the squirrel in the cage that chases his tail. It has been higher prices, higher wages, higher prices, higher wages until we have got to the point where there is no stability in anything. We are paying out a lot of money to men and when they go out in the markets to buy they find they have not so very much after all.

"So what have we? On one hand we have the workers and the wage-earners calling for more money, we have the men selling raw materials to us calling for more money, we have the men who are going to build a factory addition calling for more money, and every person who does anything is calling for more money, and in most cases getting it. On the other hand, we have the bankers, who are trying their best to save the credit of the country, working in the opposite direction, trying to keep down credits, and make the amount of business conform to the amount of money we had in circulation. There are too many fine adjustments in connection with economics and finance that we have overlooked, or if we have not overlooked them we have not had the courage to face them. As a result of all this we have the man in business having to get in touch with about two and a half times as much money as he did in 1914 to finance a given volume of trade and to take care of the decreased output of the men in the shop. The thing cannot go on as it is.

"When the war was over we should have done generally what Henry Ford has now set out to do. People were expecting something to happen then. We all knew we had been living on war tension. Men knew they were making war wages, and they expected that they would drop with the close of the war. Men who had put money into war ventures made big returns, and they never expected them to continue after the war. Commodity prices never had a good reason for staying up except for the artificial bolstering that has been put under them. I contended right after the war was the time to take our bumps, and I have never seen anything since then that has caused me to change my mind. I could get the backing of only two men at the conference I mentioned before to such a course. The rest were afraid of that thing they call unrest, and feared the consequences of an effort to let things take their own natural course in the process of readjustment. We were expecting something to happen right after the war, and right after the war was the time when this something should have happened that they are trying to bring about to-day.

"Now it is here, at least to my mind there is nothing more certain than that prices are going to crack. When we get some of the big leaders setting the pace in that direction the movement is on, no matter if it is in United States, because the markets here directly reflect any influence that is set in motion there. As I said before, our firm does not fear the bust, the crack, the explosion, or whatever else you care to call it. It will simply mean that we can get more money, that the money we get will finance more business, and we will be nearer our proper position having regard to the gold standard, and the value of our money in the foreign markets."



MARKET DEVELOPMENTS

Prices Not Tumbling in Steel or Tools

Business Being Placed at To-day's Prices for Six Months to Come —New York Reports That Machine Market There Does Not Look for Improvement Before First of the Year.

TALK of price cutting in the iron, steel and machine tool market finds no reflection in fact. It is safe to presume that the premium steel market is due for a setback, and this may be brought about by the attitude of buyers themselves rather than by any desire on the part of the mills to have cheaper steel. Buyers, by their persistence in bidding for material, have had much to do with keeping the premium mills busy. This is particularly true of the sheet mills.

A pretty good indication of what dealers think of the chances for lower prices can be secured from the attitude of the warehouses. One firm this week, in the face of price lowering talk, placed an order for tonnage that will take care of his business for the next six months; this was in bar iron, which is to-day selling at 5.75 per pound, a record price for this district. This dealer cannot see easier steel prices for some time, and he is willing to back his opinion with his own money.

Machine tool dealers have nothing on which they can announce a lower price. Makers speak of increasing transportation costs of labor increases, and they see no relief in all the things they put into their machines. Some of the schedules are still some weeks behind. The buyers of tools figure that there is more real selling going on now than for months past and from past experience they believe lower prices may come. Dealers say nothing to encourage this view.

The scrap metal market is very dull.. The large buyers are not in the market yet, and until they come trading is going to be confined to small lots.

MACHINE TOOL BUSINESS BELOW NORMAL IN MONTREAL MARKET

Special to CANADIAN MACHINERY.

MONTREAL, Que., Sept. 27—Business appears to be reaching another stage in its history when uncertainty will be the ruling factor, and this will result in a further policy of conservatism in the buying attitude of consumers. This feature has been more or less pronounced during the past year, but the belief that the present is an opportune time for a determined start to be made in peace time adjustment seems to be taking hold of many of those directly associated with industrial enterprises. This trend of thought has been developed in seclusion and will likely be gradually impressed in a more concrete form from now on.

Steel Market Unsteady

While there is no visible evidence to substantiate the statement, the early trend of prices in many steel commodities will probably be in a downward direction. Dealers here are not looking forward to any drastic reduction in prices, but there are very few but what believe that before the close of another month the conditions will warrant a decline on existing quotations. Observations by dealers' representatives, who have been in the States recently, state that the mill congestion is much less marked at present, owing to the better facilities of the railroads and the improved movement of freight of every description. This condition has enabled producers to operate to increased advantage and the greater output will, no doubt, be felt in trade circles in the near future. The sheet situation is far from normal, but the lessening activity of the motor industry has created an increased supply of sheets that has materially assisted in bringing relief in other directions, notably to stove and car manufacturers. Consumers, apparently, are better pleased with the way material is coming to hand, and dealers are being freed from the necessity of urging heavier shipments from the mills. This may be due to several causes, among which may be mentioned a visible decline of general industrial activity, and the fact that builders and manufacturers are assuming a waiting attitude in the expectation that prices are coming down. Such a situation may develop, but there is little to support a belief that any such movement will affect, to any great extent, the present prevailing prices. It is true that production is on the increase, but this is primarily due to the more regular operation of the mills, the cost of producing being generally maintained by the high character of wages.

Machine Tools Quieter

Despite the occasional announcement that machine tool business is good, the general impression gathered from reports from dealers is to the effect that present activity, while showing slight improvement over that of the midsummer months, is, nevertheless, below the normal for this period of the year. No one branch of industry seems to be responsible for this condition as orders are widely distributed and general in character. The aggregate business, however, is reasonably well maintained by the steady supply business that is practically unaffected by the noticeable trend to industrial curtailment. Even here, however, the buying is of a conservative nature and it would not be surprising to see lighter buying in the near future.

Metals Unsteady

The metal market has not been featured by any outstanding development but has been subject to slight fluctuations in price quotations. Coppers have been moving normally with prices well maintained, conditions tending to weaker quotations. Tin has shown a little unsteadiness owing to the uncertain industrial conditions in England, but apart from disturbing the even tone of the local market, the English situation has influenced prices here but slightly. Present quotations are on the nominal basis of 54 cents per lb. Spelter is steady at 10¾ cents, while lead is easier at 9

cents per lb. Antimony is in good demand at 9½ cents per lb.

Scrap Continues Quiet

"We are here for the sake of appearances. Trade is very quiet and the buying policy of the consumer is not a stimulant to greater business. The market is not strong, neither is it weak, but it is very quiet. Price is little inducement in making sales. Material is bought only when it is needed." This statement outlines the old material situation and is a good indication of the dull state of the situation generally. Foundry iron and steel scraps are the heaviest movers.

CAN SEE NO CRACK IN PRICES HERE

Some Steel Dealers Are Buying at To-day's Prices For Six Months to Come

TORONTO.—The talk of price cutting is something that one hears much of in the markets to-day, but signs to show where it has actually visited the steel, iron and machinery market are lacking. It might be expected that steel warehouses that carry on a merchant business would be first to respond to price reductions, were any seriously in sight. No evidence of such a move can be found.

Machinery dealers claim that they have heard nothing from their principals, and until they do there is absolutely no chance of them making any reductions, as they for the most part simply sell the machines at a fixed rate of profit.

Some of the dealers in the city have sold a lot of machine tools during the past week. There are no large orders in the market, but a number of smaller deals have been put through. The trade does not expect much from the automobile industry just now, realizing that they are not likely to go ahead with much rapidity in face of the recent price slashing in certain makes of cars.

"Our deliveries are coming through very well," said one dealer, "but we are still some weeks behind in many lines. I can't see where prices are going to crack, although I will admit there is more or less of a demand for such a move on the part of the buyers. I do not see any reduction yet in iron, steel or wages, nor yet in transportation costs. The material the makers are working out now is all high price stuff, and I cannot see, unless something very unexpected happens, why or how we can have cheaper machine tools for some time to come."

Other dealers hold views along this line. They all admit that it would be a nice thing to be authorized to announce a 10 or 20 per cent. reduction, but they are all equally emphatic in stating that they do not see how it can come about yet.

POINTS IN WEEK'S MARKETING NOTES

Some of the independent steel producers in the Pittsburgh district admit that they expect their prices to fall.

—

It is claimed that most of the U.S. automobiles that have been placed on the market at high prices have been manufactured from steel that was bought at the March 21, 1919, War Board schedule, and that the prices paid for the steel did not warrant the prices asked for cars.

—

There is very little buying being done in the United States steel markets. Deliveries have been quite rapid in the last few weeks and the amount of steel piled at the mills has been rapidly decreasing.

—

The talk of price cutting in the steel, iron or machine tool markets finds no reflection in actual reduction. Dealers in Toronto say they have no word from their principals in regard to price changes.

—

One Toronto warehousing firm this week placed orders at present prices for their supply of bar iron for the next six months, showing that they do not anticipate any reduction in price during that period.

—

The scrap metal market in Canada is a still and uninteresting affair. Larger buyers such as the steel mills are not in the market and little improvement is looked for until there is something definite done in the way of stabilizing the prices.

The Steel Market

Here is the opinion of one of the leading steel merchants in Toronto, and it covers the case pretty well:

'We look to see some of the premium prices taken off first, and at the same time it is likely that prices of the Steel Corporation will go up. Of course I have no knowledge of the affairs of the Steel Corporation, but I have been through the steel country lately and that seems to be the generally accepted opinion there. Now we are not looking for a drop in prices of steel for some months. We may be wrong, but I have gone pretty carefully over the situation, looking to such things as the supply of coal and iron ore, and the closing in of the shipping situation on the lakes. These are all factors that have a great deal to do with the output for the coming six months or a year for that matter. I cannot see anything to make me believe that the prices of steel are going to come down."

Backing His Beliefs

"Have you enough confidence in that prediction to buy for some months to come?" we asked.

"I have, and only this week we placed orders for a large tonnage of bars from a Canadian mill, covering deliveries for the next six months. The price paid is the price right now, and it means that we will still have to sell bar iron and steel at 5.75c per pound, which is the highest figure that we have ever experienced in a good many years of business in this city. We are willing to take a chance on our guess being right. If the market cracks, as people say, we will have an interesting time of it, but the only thing that can crack it is an over-production, and do you see it coming? What is more, it does not pay us to pay too much attention to every little price flurry. We are dealing in the most requisite thing possible, steel, and it will not be possible in years to get steel at anything like the prices that were prevailing before the war."

There is a fair tonnage of premium mills sheets in some of the warehouses. These were taken in at a high price, but there is no intention on the part of the warehouses to reduce the price. "Were we to start that we would at once defeat our own object, and what is more we are not going to trim the price. We paid a lot of money for them and we must sell on the basis of cost. The market is empty of these lines and we have no fear about getting rid of them."

A Weak Market

The scrap metal market is decidedly weak. The interests relied on to keep up the buying in large quantities are not in the market, nor do they show any inclination to come in. Copper is not moving in any degree. "Until prices get down to something definite we do not look for an improvement," is the way one dealer sized up the situation.

NO IMPROVEMENT LOOKED FOR IN 1920

New York Machine Tool Market Is Quiet and Nothing Is in Sight to Revive It

Special to CANADIAN MACHINERY.

NEW YORK, Sept. 30—There has been no change in the machine-tool situation. There is very little inquiry and orders are few. Except for a fair amount of railroad buying at Chicago, the demand for machine shop equipment over the entire United States is quieter than it has been since 1913-14. Some plants are letting men go and are reducing operations.

It is apparent that there will be no general resumption of machine-tool buying until industrial conditions are on a more stable basis. The deflation of prices, which has been in progress for some months in certain lines, and which within the past week has hit the automobile industry, must progress to a

point where buyers will have more confidence.

The announcement of the Ford Motor Co. of a reduction of automobile prices to the pre-war basis is the most far-reaching single item in the present industrial situation. This reduction has been followed by similar cuts by the Franklin and Crow-Elkhart companies and undoubtedly others will follow suit soon. It was the activity in the automobile trade which brought about general business prosperity in 1919, and it was the slump in automobile demand, caused largely by tight money, which has brought about the present inactive conditions. This is particularly true with relation to machine tools. When a considerable number of automobile manufacturers have reduced their prices the way may be paved for a resumption of automobile buying, followed by the same business boom which resulted from the automobile buying fever last year.

Many automobile manufacturers had plans in mind for further expansion, and a few new plants were in course of construction, when the slump hit the automobile trade. Wholesale cancellations of machine tools, which followed this slump, have hit the machine-tool industry hard. It is quite possible that resumption of automobile activity, together with increasing railroad buying, will restore prosperous conditions to the tool industry next year. Few expect better business conditions before January 1.

PREMIUM MILLS MAY COME DOWN BUT NO GREAT REDUCTION IN SIGHT

Special to CANADIAN MACHINERY.

PITTSBURGH, September 30.—Independent steel producers make considerably less effort than formerly to conceal the fact that they expect steel prices to decline. A common prediction now is that prices will not go below the Steel Corporation level. As no one had predicted that they would the statement is not particularly important, except as a definite admission of an abandonment of the hopes independents had entertained from time to time that the Steel Corporation would advance its prices. The main question now is one of time, when it will be that the independent steel prices will drop. Thus far they have not declined to any really noticeable extent, for the decrease in premiums for particularly prompt shipment that has been in progress at intervals for three months or more does not represent a general market decline. Naturally, in keeping with traditions, the aim of independent mills is to hold their prices up as long as they have much contract business on their books, as to reduce prices would be to encourage cancellations and suspensions of shipment.

The Automobile Declines

Up to date, Ford, Franklin and Crow-Elkhart have announced reductions in the prices of their cars, from 15 to 30 per cent. In some quarters these reductions, doubtless to be followed by other automobile makers, are regarded as containing a challenge to the steel industry to reduce its prices. The steel industry, however, shows some indisposition to admit that any challenge of this sort is necessarily implied. They point out that during the past nine months, or say since the first of the year, the automobile makers have received steel at a very wide range of prices. In the aggregate, by far the major part was at the Industrial Board prices, and a relatively small part was at very fancy prices. It is asserted that automobile prices of late have been in relation with the highest priced steel, constituting the smallest tonnage, rather than in relation with the lowest priced steel, constituting by far the bulk of the tonnage. The fanciest prices were made by the automobile industry, seeking additional tonnages to supplement deliveries due on contract, and practically disappeared when that particular trade stopped buying.

In view of the fact that the sharp price advances in steel products early this year were due in great part to the eager and extravagant bidding of the automobile industry, and were recognized at the time as being caused chiefly by that industry, when other consumers who wanted steel were unable or unwilling to bid fancy prices, it might be considered natural enough that now the automobile industry should be able to exert an influence in the opposite direction, and produce low prices as it formerly produced high prices. One difficulty, however, is that the automobile industry does not really take any large part of the steel output, and another is that the trade has been so sudden in its recent cancellations of orders and instructions to suspend shipments that its contracts cannot well be set at a high valuation, excepting, of course, one or more large makers who are good in living up to contracts.

Heavy Deliveries of Steel

The great increase in steel deliveries that has occurred in the past few weeks does not seem to be rated as high as it deserves to be in constituting a market factor. The stagnation in new buying is properly attributable chiefly to this increase in deliveries. It should be noted, first, that the production of steel in August was seven per cent. more than the production in July, while the production August 1 to date has been well in excess of output in the same length of time prior to August 1. Next it must be noted that up to about August 1, and beginning in April, the steel mills were stocking steel, on account of car shortage. Since about the beginning of August they have been moving their stocks, and the highest estimate is that one-third of the stocks remain, while the lowest estimate is that practically nothing remains of the stocks. Thus the stocks have been moved at a much greater rate than that by which they accumulated, and the production itself, also moved, has been greater than formerly. Obviously the tonnages of steel received by jobbers and manufacturing consumers have been much greater in the past few weeks than in July and preceding months. This change would in itself be amply sufficient to account for the stagnant market.

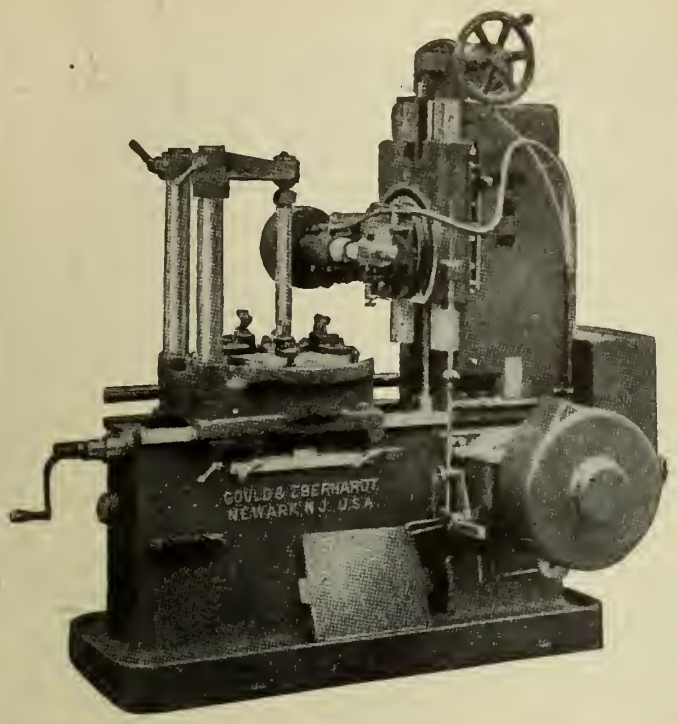
It is the common view, however, that there is a decrease in consumption of steel, with further decreases in prospect, and thus no one seems to expect the market to recover. The common view is that prices will have to go through a course of liquidation, so that the only questions are when the readjustment will occur and how far prices will drop.

As to decreases in consumption, there is the automobile industry, which is consuming less than one-half as much steel as it did at the top point, and then there is the showing made by the fabricating shops, the report of the Bridge Builders' and Structural Society showing bookings of fabricated steel contracts in August equal to 40 per cent. of the fabricating capacity, against 50 per cent. for July and an average of 72 per cent. for the first six months of the year. Again, there is the case of the railroads, which are buying but little now, and are hardly likely to be in the market again in the near future. In the first eight months of the year about 65,000 freight cars were ordered by the railroads and industrial concerns, but there is no likelihood that the last four months of the year will add much more business.

Steel Prices

The independent plate market is quotable at about 3.25c. There are rumors of lower prices being done, but these lack positive confirmation. Merchant steel bars can generally be bought at 3c by buyers with regular mill connections, and mills that are quoting higher prices, up to 3.50c or more are probably getting little, if any, business. Shapes are 3.10c, but with scarcely any buying. Black and galvanized sheets show a declining tendency, but are very difficult to obtain for early delivery at any price. A fair average of the independent sheet market is 7c to 7.50c for black, 8.75c for galvanized, 5.25c for 5.50c for the heavier gauges of blue annealed, say 12 and heavier, with 5.75c base for 16 gauge.

The Steel Corporation prices, which are going to be more and more in evidence, are: Bars, 2.35c; shapes, 2.45c; plates, 2.65; blue annealed sheets, 3.55c; black sheets, 4.35c; galvanized sheets,



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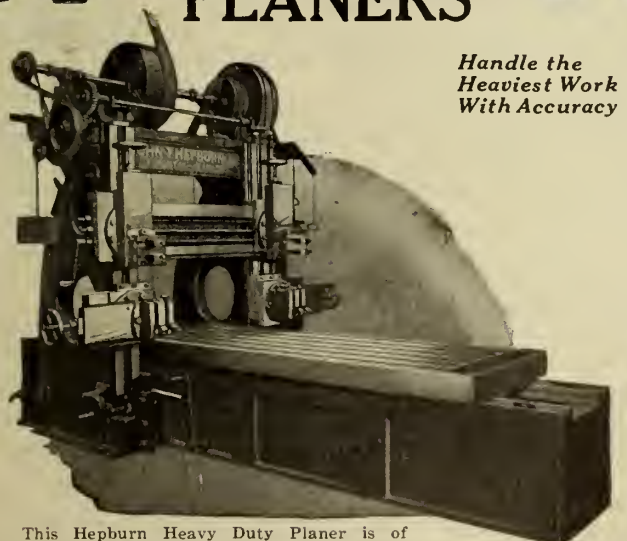

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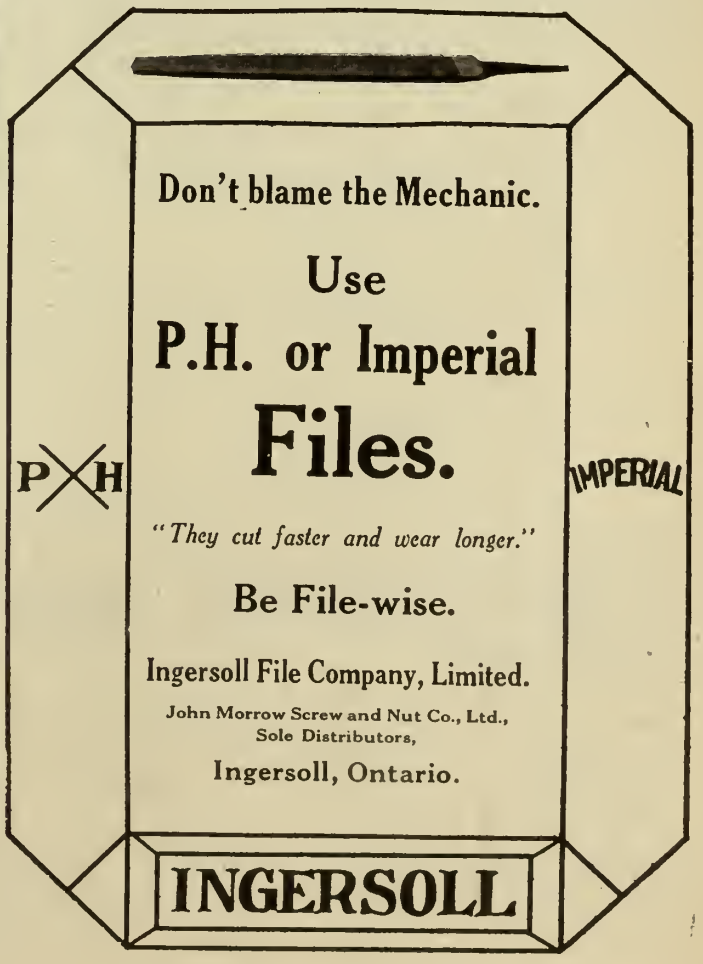


5.70c. These apply only to the domestic market.

Pig Iron

The local pig iron market is quotable unchanged simply because nothing has occurred, and the "market" must be given at the levels at which business was last done, $50 for foundry and malleable, and $48.50 for Bessemer and basic, f.o.b. valley furnaces. Lower prices might be quoted even now if there were any inquiry, but there is none. Pittsburgh foundries do not even buy southern iron, which can be had at $2.36 less, delivered Pittsburgh, than valley iron.

PIG IRON TRADE

The pig iron market continues firm. Orders on producers books equal five months' output of furnaces. Shipments are moving freely. Resale iron is more plentiful on the market at Philadelphia owing to better railroad conditions. Enough basic has been sold to establish the price at $50 eastern Pennsylvania, or around $52.50 delivered. More than 1,000 tons of malleable was bought under $52, which appears exceptional as malleable has been strong and scarce.

The market is very quiet in Chicago. Cancellation of automobile castings has affected the melters in Michigan and Indiana, who are booked up with automobile business.

Sales of pig iron at Boston have been small, mostly limited to prompt shipment. The price for 1.75 to 2.25 per cent. silicon iron is quoted at $51; $52.25 for 2.25 to 2.75 silicon, and $55 for 2.24 to 3.25 silicon. One Tennessee furnace was closed down during the week on account of lack of coke.

New York reports shipments of pig iron have increased owing to improved railroad conditions. In this connection, Buffalo foundry iron at $48 Buffalo for the 1.75 to 2.25 silicon grade. Some Central Pennsylvania foundry has been sold for prompt shipment during the past week at $50 furnace for 2.25 to 2.75 silicon.

The market at Pittsburgh is extremely dull, consumers showing practically no interest. Furnaces are well booked for the remainder of the year. Better car supply and larger deliveries of fuel have increased the pig iron output somewhat and the Carnegie Steel Co. is operating 41 of its 59 furnaces, which is an increase of one stack over last week.

Basic is quoted at $50 on the Buffalo market. All the sales last week were for last half delivery.

The tone of the pig iron market at St. Louis is less favorable than recently. In the past few weeks a considerable tonnage has accumulated in the yards of the southern furnaces. Prices have not changed excepting that several makers who had been quoting $45 for No. 2 southern (1.75 to 2.25 silicon) have gone to $42, there being plenty of iron offered at that figure.

U.S. SCRAP METAL

CHICAGO reports that the decline in quotations on iron and steel scrap continues steadily on the market. Consumers are avoiding purchases as long as possible to reduce their reserves to the lowest point and avoid losses by further decline.

On the whole the market in New York is quiet. There has been a slightly improved demand and as a result an advance of 50 cents in turnings, clean cast borings, and wrought pipe of special dimensions.

Considerable scrap has been sold at Philadelphia following the purchase by one firm of 5,000 tons at $27 delivered about ten days ago. There is a scarcity of rerolling rails.

The American Steel & Wire Co., Worcester, Mass., has come into the market again at Boston, for heavy melting steel. As high as $23 at shipping point is being offered for sizable lots of heavy melting steel.

The market at Pittsburgh is very quiet, with no inquiries or new business. Heavy melting and No. 2 railroad wrought is somewhat firmer.

The demand for all kinds of scrap is heavy for delivery in from one to two months, at Buffalo. There is a strong demand for machine shop turnings and cast iron borings, as well as heavy melting steel. Railroad conditions are much better.

The recent buying movement in the Detroit market has subsided. Much scrap is available, but the higher prices developed by the movement continue to prevail.

Prices of scrap iron and steel have declined from 50 cents to 2.50 per ton during the past week at St. Louis. All dealers want to sell at once. Melters are taking advantage of this state of affairs.

HYDRAULIC NEVER TO REPLACE COAL

Interesting Figures Brought Out by Authority in United States Field

Dr. Charles P. Steinmetz, chief consulting engineer of the General Electric Company, New York, warns against a too general belief that the power of our water may ever completely replace the use of coal and oil for power purposes.

The maximum possible hydraulic energy of the nation, he estimates at the tremendous figure of 370,000,000 horsepower, which is little more than the total energy which we now produce from coal, and is about equal to the present total energy consumption of the country, including all forms of energy.

"This is rather startling," said Dr. Steinmetz. "It means that the idea that when coal once begins to fail we may use the water power of the country as the source of energy, is, and must, remain a dream, because if all our potential waterpowers were developed and every raindrop used, it would not supply our present energy demand.

"Thus hydraulic power may and should supplement that of coal, but can never entirely replace it as a source of energy. This probably is the strongest argument for efforts to increase the efficiency of our methods of burning coal.

"Obviously, of course, we can never hope to develop more than a part of the maximum potential energy of the water, and I merely cite these figures to show that our water power resources, if developed, to theoretical perfection, would still fall short of meeting the energy demands of the country to-day."

The total present developed water power in the United States exceeds 7,000,000 horsepower with 19,000,000 still undeveloped, and potential water power capable of development amounting to 31,000,000 horsepower.

The present use of water power saves the country from upward of 33,000,000 tons of coal annually.

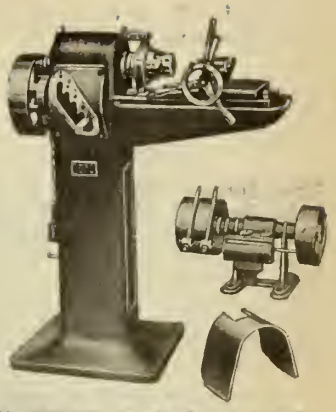
BRANTFORD NEEDS MORE POWER NOW

But the Chances of Getting the Supply Seem to Be Very Limited

The shortage of coal, the scarcity of wood in the civic yards there were augmented when the Brantford city council was informed by the local Hydro-Electric Commission that this city was now carrying a load of 200 more horsepower than it was getting, and that the situation would get worse instead of better with the approach of winter, with lessened supply and greater demand. The only ray of hope was shed when the Gas Committee reported that with new fields opening up and available because of increased prices, the Dominion Natural Gas Company would be in a position to give assurance that a greater supply of better quality gas would be available for Brantford this winter.

Sell Forging Plant.—It is understood from a reliable source that the offer received by Canada Forgings for the Delaney plant at Buffalo will put the company in a strong position financially. A meeting of the shareholders has been called for Sept. 28th at the head office in Brockville to deal with the offer, which is said to be made by a syndicate. The operations of the company are stated to be running along smoothly and satisfactorily, and it was asserted by one of the directors that James Smart Manufacturing Co., one of the three component parts of the company, is alone earning enough to pay the common dividend.

A SIGN OF INCREASED PRODUCTION



Every Shipment of Geometric Threading Machines Means Increased Production and Decreased Costs in the Shops Where They Are Consigned.

Small threaded parts are correctly duplicated in shortest possible time. These machines thread work which cannot be handled on the ordinary Screw Machine or produced economically in any other manner.

There are three sizes—½-inch, ¾-inch and 1½-inch. The threaded diameters range from ⅛-inch to 1½-inch inclusive.

Make Screw Thread Cutting the most satisfactory operation in your plant.

THE GEOMETRIC TOOL COMPANY
NEW HAVEN CONNECTICUT

Canadian Agents:

Williams & Wilson, Ltd., Montreal. The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg, St. John, N.B., Halifax, N.S.

Canadian Fairbanks-Morse Co., Ltd., Manitoba, Saskatchewan, Alberta.

If interested tear out this page and place with letters to be answered.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$42 40
Lake Superior, charcoal, Chicago	57 00
Standard low phos., Philadelphia	50 00
Bessemer, Pittsburgh	43 00
Basic, Valley furnace	42 90
Toronto price:—	
Silicon, 2.25% to 2.75%	52 00
No. 2 Foundry, 1.75 to 2.25%	50 00

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	$ 5 75
Steel bars, base, Toronto	5 75
Iron bars, base, Montreal	5 75
Steel bars, base, Montreal	5 75
Reinforcing bars, base	5 75
Steel hoops	7 00
Norway iron	11 00
Tire steel	5 75
Spring steel	10 00
Band steel, No. 10 gauge and 3-16 in. base	6 10
Chequered floor plate, 3-16 in.	8 50
Chequered floor plate, ¼ in.	8 10
Bessemer rails, heavy, at mill	....
Steel bars, Pittsburgh	3 00-4 00
Tank plates, Pittsburgh	4 00
Structural shapes, Pittsburgh	3 00
Steel hoops, Pittsburgh	3 50-3 75
F.O.B., Toronto Warehouse	
Small shapes	5 75
F.O.B. Chicago Warehouse	
Steel bars	3 62
Structural shapes	3 72
Plates	3 67 to 5 50
Small shapes under 3"	3 62

FREIGHT RATES

Per 100 Pounds.

Pittsburgh to Following Points

	C.L.	L.C.L.
Montreal	58½	73
St. John, N.B.	84½	106½
Halifax	86	108
Toronto	38	54
Guelph	38	54
London	38	54
Windsor	35	50½

METALS

	Gross. Montreal	Toronto
Lake copper	$25 00	$23 50
Electric copper	24 00	24 00
Castings, copper	23 50	24 00
Tin	54 00	55 00
Spelter	9 00	10 50
Lead	9 50	9 50
Antimony	9 50	12 00
Aluminum	36 00	37 00

Prices per 100 lbs.

PLATES

Plates, 3-16 in.	$ 7 25	$ 7 35
Plates, ¼ up	6 50	6 60

PIPE—WROUGHT

Standard Buttweld Pipe

Per 100 Ft.

	Steel Blk.	Steel Galv.	Gen. Wrought Iron Blk.	Gen. Wrought Iron Galv.
⅛	$ 6 50	$ 8 50	$.....	$.....
¼	5 31	7 41	5 91	8 01
⅜	5 31	7 41	5 91	8 01
½	7 10	8 63	7 95	9 48
¾	8 80	10 87	9 95	12 02
1	13 01	16 07	14 71	17 77
1¼	17 60	21 74	19 90	24 04
1½	21 04	25 99	23 79	28 74
2	28 31	34 97	32 01	38 67
2½	44 75	55 28	....	....
3	58 52	72 29	....	....
3½	74 06	90 62	....	....
4	87 75	107 37	....	....

Standard Lapweld Pipe

Per 100 Ft.

	Steel Blk.	Steel Galv.	Gen. Wrought Iron Blk.	Gen. Wrought Iron Galv.
2	$32 01	$ 38 67	$35 71	$42 37
2½	48 26	58 79	54 11	64 64
3	63 11	76 88	70 76	84 53
3½	75 90	92 46	85 10	101 66
4	89 93	107 55	100 83	120 45
4½	1 05	1 29	1 30	1 54
5	1 22	1 50	1 52	1 80
6	1 58	1 95	1 97	2 33
7	2 06	2 53	2 53	3 01
8L	2 16	2 66	2 66	3 16
8	2 49	3 07	3 07	3 64
9	2 98	3 67	3 67	4 36
10L	2 77	3 41	3 41	4 05
10	3 56	4 39	4 39	5 21

Prices—Ontario, Quebec and Maritime Provinces

WROUGHT NIPPLES

4" and under, 60%.
4½" and larger, 50%.
4" and under, running thread, 30%.
Standard couplings, 4-in. and under, 30%.
Do., 4½-in. and larger, 10%.

OLD MATERIAL

Dealers' Average Buying Prices.

	Per 100 Pounds. Montreal	Toronto
Copper, light	$15 00	$14 00
Copper, crucible	18 00	18 00
Copper, heavy	18 00	18 00
Copper wire	18 00	18 00
No. 1 machine composition	17 00	17 00
New brass cuttings	11 00	11 75
Red brass turnings	14 50	15 75
Yellow brass turninbs	9 00	9 50
Light brass	7 00	7 00
Medium brass	8 00	7 75
Scrap zinc	6 50	6 00
Heavy lead	7 50	7 75
Tea lead	4 50	5 00
Aluminum	19 00	20 00

	Per Ton	Gross
Heavy melting steel	20 00	18 00
Boiler plate	15 50	15 00
Axles (wrought iron)	30 00	20 00
Rails (scrap	23 00	18 00
Malleable scrap	26 00	25 00
No. 1 machine east iron	32 00	33 00
Pipe, wrought	12 00	12 00
Car wheel	33 00	33 00
Steel axles	25 00	20 00
Mach. shop turnings	11 00	11 00
Stove plate	26 50	25 00
Cast boring	14 00	14 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, 7-16 and up	+10
Carriage bolts, ⅜-in. and less	Net
Coach and lag screws	—15
Stove bolts	55
Wrought washers	—25
Elevator bolts	+10
Machine bolts, 7-16 and over	+10
Machine bolts, ⅜-in. and less	+10
Blank bolts	Net
Bolt ends	Net
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	+25
Machine screws, fl. and rd. hd., brass	**net**
Machine screws, o. and fil. hd., brass	**net**
Nuts, square, blank	+25 add $2 00
Nuts, square, tapped	add 2 25
Nuts, hex., blank	add 2 50
Nuts, hex., tapped	add 3 00
Copper rivets and burrs, list less	15
Burrs only, list plus	25
Iron rivets and burrs	40 and 5
Boiler rivets, base ¾" and larger	$8 50
Structural rivets, as above	8 40
Wood screws, O. & R., bright	75
Wood screws, flat, bright	77½
Wood screws, flat, brass	55
Wood screws, O. & R., brass	55½
Wood screws, flat, bronze	50
Wood screws, O. & R., bronze	47½

MILLED PRODUCTS

(Prices on unbroken packages)

	Per Cent
Set screws	—20% 25 and 5
Sq. and hex. hd. cap screws	12½
Rd. and fil. hd. cap screws	plus 25
Flat but. hd. cap screws	plus 50
Fin. and semi-fin. nuts up to 1-in.	12½
Fin. and Semi-fin. nuts, over 1 in., up to 1½-in.	—5
Fin. and Semi-fin. nuts over 1½ in., up to 2-in.	+12½
Studs	+5
Taper pins	—12½
Coupling bolts	+40
Planer head bolts, without fillet, list	+45
Planer head bolts, with fillet, list plus 10 and	+55
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	+60
Collar screws	list plus 20, 30
Thumb screws	40
Thumb nuts	75
Patch bolts	add +85
Cold pressed nuts to 1½ in.	add $1 00
Cold pressed nuts over 1½ in.	add 2 00

BILLETS

	Per gross ton
Bessemer billets	$60 00
Open-hearth billets	60 00
O.H. sheet bars	76 00
Forging billets	56 00-75 00
Wire rods	52 00-70 00

Government prices.

F.O.B. Pittsburgh.

NAILS AND SPIKES

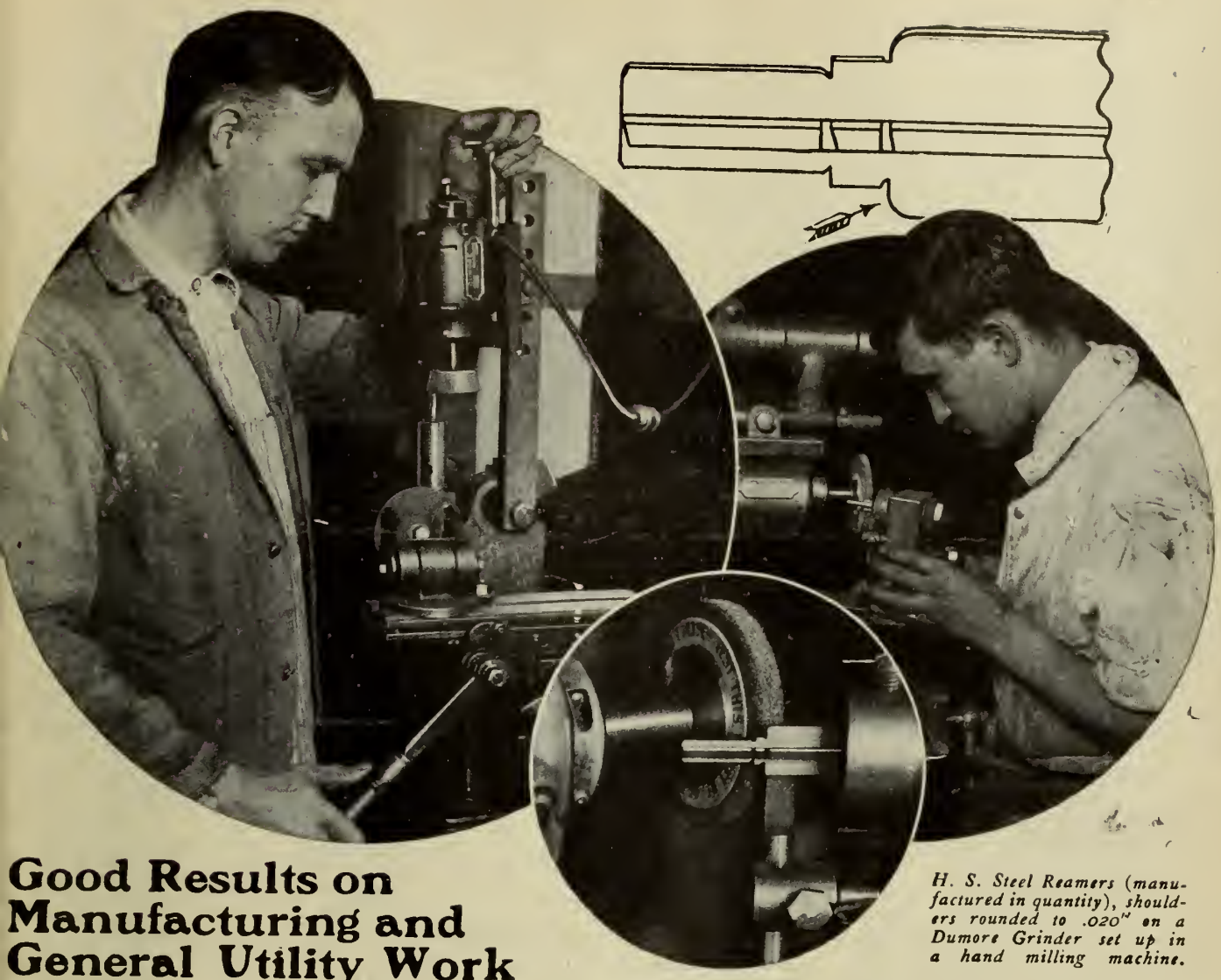
Wire nails, base	$6 10
Cut nails, base	7 00
Miscellaneous wire nails	50%

ROPE AND PACKINGS

Plumbers' oakum, per lb.	0 10¼
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 35½
British Manila rope	0 28
New Zealand hemp	0 28

POLISHED DRILL ROD

Discount off list, Montreal and Toronto	net



H. S. Steel Reamers (manufactured in quantity), shoulders rounded to .020" on a Dumore Grinder set up in a hand milling machine.

Good Results on Manufacturing and General Utility Work

Dumore Grinders are never idle at the Bilton Machine Tool Company, (Bridgeport, Conn.) plant. Their convenience and adaptability make them as useful for special jobs as on the standardized operations of routine work. Dependably accurate and almost fool-proof, they rarely need repairs and can be counted on to do excellent work of wide variety at extremely low operating costs.

The large photograph shows the Dumore Grinder used for sharpening the end teeth on milling cutters—the others illustrate a unique set up of both grinder and work on a manufacturing job.

Ask us about Dumore Grinders and the shops that use them. You will be amazed at their wide application and general popularity on all classes of work.

WISCONSIN ELECTRIC COMPANY
2927 Sixteenth Street **RACINE, WISCONSIN**

DUMORE HIGH SPEED GRINDERS

If interested tear out this page and place with letters to be answered.

MISCELLANEOUS

Solder, strictly	$ 0 35
Solder, guaranteed	0 39
Soldering coppers, lb.	0 62½
White lead, pure, cwt.	20 35
Red dry lead, 100-lb. kegs, per cwt.	16 00
Gasoline, per gal., bulk	0 38
Pure turp., single bbls., gal.	3 15
Linseed oil, raw, single bbls.	2 37
Linseed oil, boiled, single bbls.	2 40
Wood alcohol, per gal.	4 00
Whiting, plain, per 100 lbs.	3 00

CARBON DRILLS AND REAMERS

S.S. drills, wire sizes	32½
Can. carbon cutters, plus	20
Standard drills, all sizes	32½
3-fluted drills, plus	10
Jobbers' and letter sizes	32½
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	50
Sleeves	50
Taper pin reamers	25 off
Drills and countersinks	net
Bridge reamers	50
Centre reamers	10
Chucking reamers	net
Hand reamers	10
High speed drills, list plus	10 to 30
Can. high speed cutters, net to plus	10
American	plus 40

COLD ROLLED STEEL

[At warehouse]

Rounds and squares	$7 base
Hexagons and flats	$7.75 base

IRON PIPE FITTINGS

	Black	Galv.
Class A	70	85
Class B	30	40
Class C	20	30

Cast iron fittings, 5%; malleable bushings, 22½%; cast bushings, 22½%; unions, 37½%; plugs, 20% off list.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$12 00	12 10
Sheets, Blue ann., No. 10	9 50	9 60
Canada plates, dull, 52 sheets	13 00	13 00
Can. plates, all bright	14 00	.....
Apollo brand, 10¾ oz. galvanized	....	....
Queen's Head, 28 B.W.G.	13 50	.....
Fleur-de-Lis, 28 B.W.G.	13 00	.....
Gorbal's Best, No. 28	....	....
Colborne Crown, No. 28.	....	....
Premier, No. 28, U.S.	11 50	12 60
Premier, 10¾-oz.	11 50	13 00
Zinc sheets	16 50	20 00

PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13.00; 5-16, $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅞ in., $9.20; ¾ in., $9.30; ⅝ in., $9.50; 1 in., $9.10; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $13.00; 5-16 in., $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.50; ¾ in., $9.30.

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

BOILER TUBES.

Size.	Seamless	Lapwelded
1 in.	$27 00	$.....
1¼ in.	29 50	.....
1½ in.	31 50	29 50
1¾ in.	31 50	30 00
2 in.	35 00	30 00
2¼ in.	35 00	29 00
2½ in.	42 00	37 00
3 in.	50 00	48 00
3¼ in.	.. ..	48 50
3½ in.	63 00	51 50
4 in.	85 00	65 50

Prices per 100 ft., Montreal and Toronto

OILS AND COMPOUNDS.

Castor oil, per lb.	
Royalite, per gal., bulk	27½
Palacine	30½
Machine oil, per gal.	54½
Black oil, per gal.	28
Cylinder oil, Capital	82½
Petroleum fuel oil, bbls., net	18

BELTING—No 1 OAK TANNED

Extra heavy, single and double	6½
Standard	6½
Cut leather lacing, No. 1	2 00
Leather in side	2 40 3 00

TAPES

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	$4 60
Polishing wheels, bull-neck	2 00
Emery in kegs, Turkish	09
Pumice, ground	06
Emery glue	30
Tripoli composition	09
Crocus composition	12
Emery composition	11
Rouge, silver	60
Rouge, powder, nickel	45

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	.08½
Grits, 80 and finer	.6

BRASS—Warehouse Price

Brass rods, base ½ in. to 1 in. rod	0 34
Brass sheets, 24 gauge and heavier, base	$0 42
Brass tubing, seamless	0 46
Copper tubing, seamless	0 48

WASTE

XXX Extra	.24	Atlas	.20
Peerless	.22½	X Empire	.19½
Grand	.22½	Ideal	.19
Superior	.22½	X Press	.17½
X L C R	.21		

Colored

Lion	.17	Popular	.13
Standard	.15	Keen	.11
No. 1	.15		

Wool Packing

Arrow	.35	Anvil	.22
Axle	.28	Anchor	.17

Washed Wipers

Select White	.20	Dark colored	.09
Mixed colored	.10		

This list subject to trade discount for quantity.

RUBBER BELTING

Standard ... 10% Best grades... 15%

ANODES

Nickel	.55 to .60
Copper	.38 to .40
Tin	.70 to .70
Zinc	.16 to .17

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	$42 50	$43 00
Copper wire, list plus 10..		
Plain sheets, 14 oz., 14x60 in.	49 00	48 00
Copper sheet, tinned, 14x60, 14 oz.	52 00	48 00
Copper sheet, planished, 16 oz. base	56 00	55 00
Braziers', in sheets, 6 x 4 base	48 00	46 00

LEAD SHEETS

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$11 50	$14 50
Sheets, 3½ lbs. sq. ft.	11 25	14 00
Sheets, 4 to 6 lbs. sq. ft.	11 00	13 50

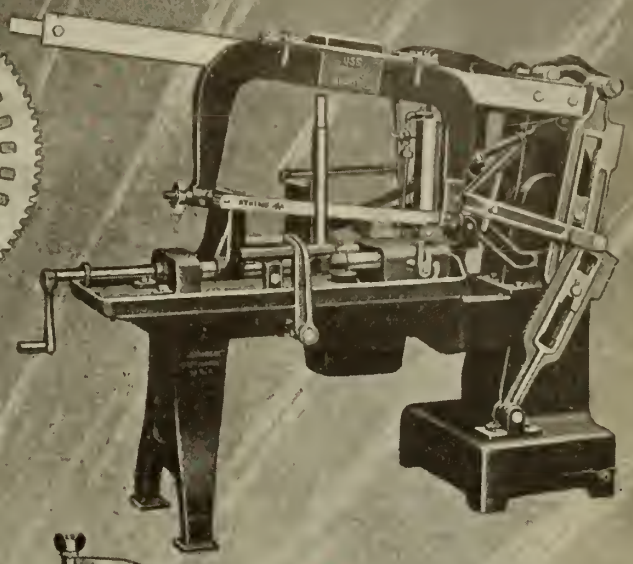
Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS

Acid, boracic	$ .23
Acid, hydrochloric	.04
Acid, nitric	.11
Acid, sulphuric	.04
Ammonia, aqua	.15
Ammonium, carbonate	.2
Ammonium, chloride	.22
Ammonium hydrosulphuret	.75
Ammonium sulphate	.30
Arsenic, white	.14
Copper, carbonate, annhy	.41
Copper, sulphate	.15
Cobalt, sulphate	.20
Iron perchloride	.62
Lead acetate	.30
Nickel ammonium sulphate	.20
Nickel carbonate	.32
Nickel sulphate	.22
Potassium sulphide (substitute)	.42
Silver chloride (per oz.)	1.30
Silver nitrate (per oz.)	1.25
Sodium bisulphate	.14
Sodium carbonate crystals	.06
Sodium cyanide, 127-130%	.38
Sodium hyposulphite per 100 lbs	8.00
Sodium phosphate	.15
Tin chloride	.80
Zinc chloride, C.P.	.30
Zinc sulphate	.10

Prices per lb. unless otherwise stated

ATKINS STERLING QUALITY SAWS



O'er Land and Sea
North South East West

Atkins Sterling Quality Saws

are noted for their efficiency. Their use will increase your production.

Ask for new literature describing Atkins Kwik Kut Power Hack Saw and Metal Cutting Band Saw Machines, Circular Metal Cutting Saws, AAA Hack Saw Blades and Frames, etc.

"A Better Saw For Every Use"

Write for Catalog

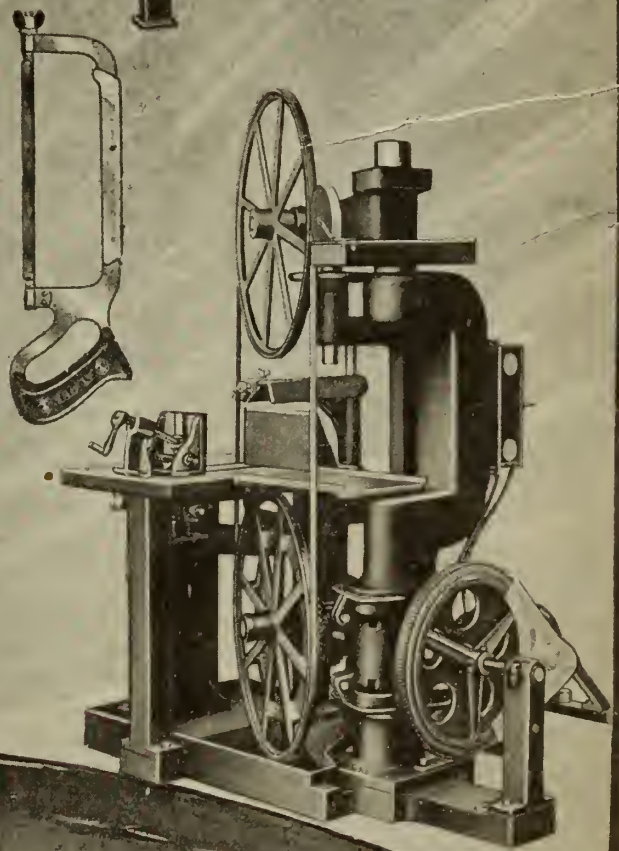
E. C. Atkins & Co.

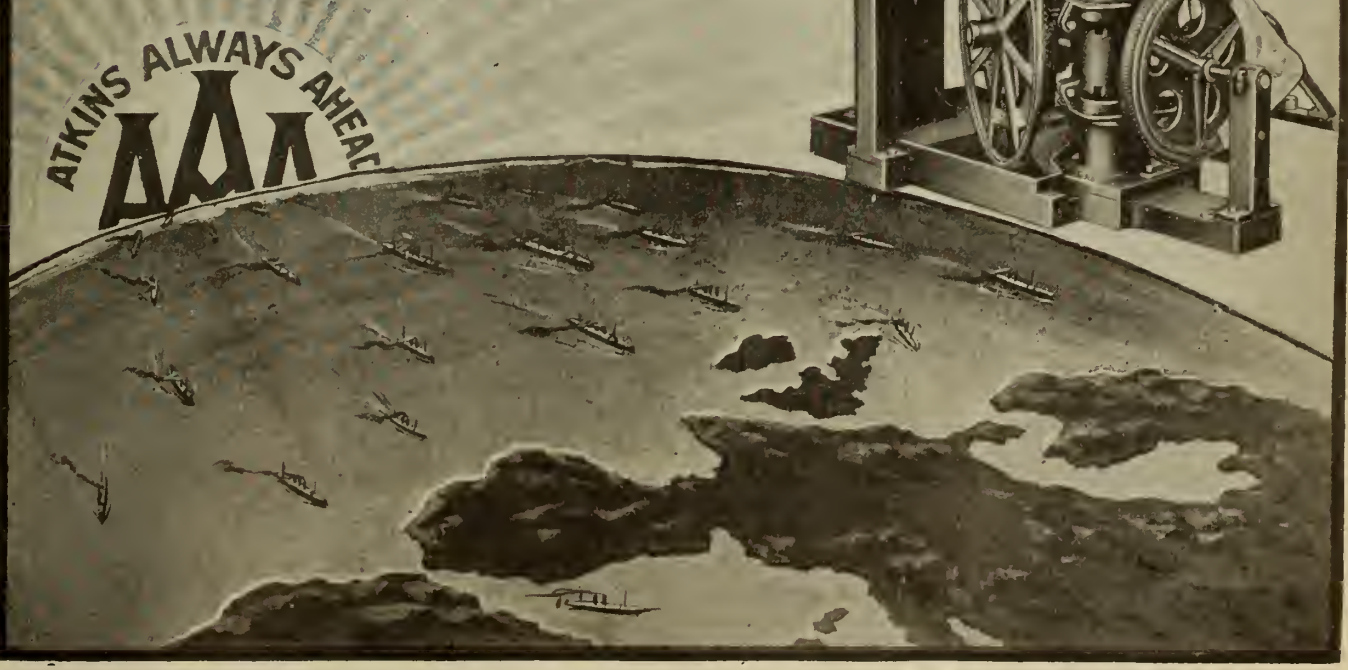
Established 1857

"The Sterling Quality Saw People"

Factory: HAMILTON, ONT.

Branch: VANCOUVER, B. C.





INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS PERSONAL AND TRADE NOTES

TRADE GOSSIP

Opened New Stations.—L'Air Liquide Society have opened distribution depots for oxygen and dissolved acetylene at Quebec and Ottawa, in addition to those already established at Windsor, Ont., St. John's, Nfld., and Sydney, N.S.

Lost an Eye.—David Keith, a machinist in the employ of the Marsh Engineering Works at Belleville, was hammering a piece of steel when a piece broke off, penetrating his left eye, destroying the sight. The injured optic had to be removed.

Going Overseas.—The British Government Trade Commissioner in Ontario, F. W. Field, will leave Toronto on October 8, on an official visit to the United Kingdom to confer with the Department of Overseas Trade, London, Chambers of Commerce, and manufacturers and merchants throughout the British Isles. He will be overseas three months or more.

Meeting in Montreal.—Two conventions are scheduled to be held in Montreal. They are the Railway Car Manufacturers' Association, and the Canadian Ticket Agents' Association will also hold their 34th annual meeting here. The first convention will include many of the leading car-building companies of the United States and Canada.

Secured Contracts.—The MacKinnon Steel Co., Sherbrooke, Que., has secured the following contracts: Steel for school at Glace Bay, N.S., J. L. Northam, architect, Sydney, N.S. Bate McMahon & Co., Truro, N.S., general contractors. Steel for Baptist Temple, Halifax, N.S., S. L. Dumaresque, Halifax, N.S., architect. Rhodes, Curry, Limited, Amherst, N.S., general contractors. Steel for Canadian Bank of Commerce, Chambly, Que. General contractors—Dominion Realty Co., Toronto, Ont.

Contractors are Changing.—The attitude of contractors toward calls for tenders for the construction of public works during the past month leads Government officials at Ottawa to surmise that the peak in building costs has been passed. For some time past many projected works have not been undertaken because of the reluctance of contractors to tender for them in view of the uncertain outlook with respect to the cost of labor and material. Some who tendered wished to insert clauses in the contract to protect them from loss due to increased expenses of operation. Most asked prices in excess of the estimated cost. During the last month, however, the normal number of tenders for contracts has been received, and in some cases the prices asked have been less than those estimated.

Work to Proceed.—During the conference between the works' committee and R. H. Jeferess, representing the Firestone Tire and Rubber Co., over the purchase of a strip of land on Kenilworth Avenue, Hamilton, one of the aldermen asked Mr. Jeferess if there was any truth in the rumor that the Firestone company would sell out, the story having been given rise by the inactivity at the company's plant at the present time. Mr. Jeferess replied that this was far from the truth. In addition to the value of the property which had been purchased the company had over $400,000 on the ground. The delay had been occasioned by the steel shortage. The company was going ahead with construction operations with what material was on hand immediately, using day labor until the steel situation becomes normal again. Thousands of dollars' worth of machinery are stored in the buildings of the Canadian Cartridge Company, and it is hoped that the new plant will be turning out tires early in the summer of 1921.

PERSONAL

Mr. Armstrong, the new manager of the Northern Bolt, Screw and Wire Co., Owen Sound, arrived in that city this week and has taken over his duties in succession to Mr. W. L. Nelson, who resigned recently to go to Detroit. Mr. Armstrong comes from Montreal with the best of recommendations.

E. J. Jeffries, of the Canada Steel Company, Hamilton, Ont., was elected president of the Association of Iron and Steel Electrical Engineers at the annual dinner held at the Hotel Pennsylvania in Pittsburgh. He made a short address in accepting the office left vacant by the retiring president, B. W. Wilson, Carnegie Steel Company, Youngstown.

Sydney Record: Rumors linking up the name of Alex. Johnston, Deputy Minister of Marine and Fisheries, with an important executive position with the Dominion Steel Corporation are not correct. While Mr. Johnston has been in the city for several days, his visit has been purely a private trip. Though he has made no statement for publication, The Record understands on good authority that he will not join Dominion Steel. He will return to Ottawa in the course of a few days.

FIRMS THAT ARE ASKING FOR TRADE OPENINGS WITH CANADA

Firms interested in the following lines can obtain information by communicating with this paper and mentioning key numbers:

1916—Machinery, Sheet Metal Work—A Cape Town manufacturer asks for catalogues, prices and detailed information on all the latest sheet metal work machinery.

1917—Machinery and Boilers—A commission house in Trinidad with good references wishes to secure an agency for machinery and boilers. Special arrangements have been made to handle these lines.

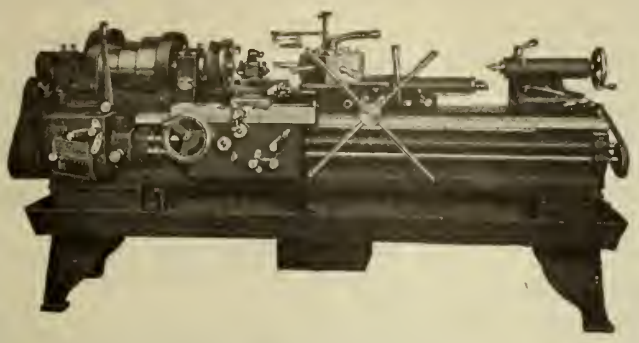
1919—Galvanized Wire Nails—Scotch importer who is willing to take ten tons or more at a time desires to get in touch with Canadian manufacturers in a positon to export galvanized wire nails, and with whom he could deal direct. This importer does not desire to deal through a London agent.

1920—Wire Nails—Scotch nail company will be in the market for wire nails at a later date.

1921—Cut Nails—A London company already handling Canadian goods reports a large demand for cut nails for building purposes, and would be glad to hear from Canadian manufacturers who can fill orders, so that specifications and other details can be furnished.

1924—A Cape Town metal goods manufacturer makes enquiry for supply of black steel sheets 290 gauge, in three sizes, 24¾ x 99 in., 25 x 102 in., 26 x 104 in.

1926—A Buenos Aires firm of manufacture representatives, specializing in railway material and iron and steel would like to be placed in communication with a manufacturer of black varnished, galvanized and barbed wire.



Garlock-Walker Machinery Co.'s

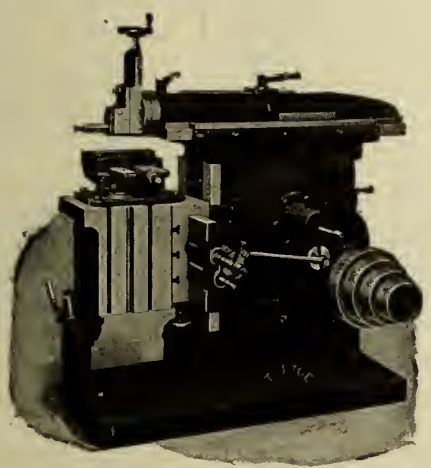
List of
New and Used Machinery

Lathes

7″ Cataract Precision.
12″ x 8 LeBlond Tool Room.
18 x 8 Rae, Q.C.G.
18 x 8 Milwaukee, Q.C.F.
24 x 10 Milwaukee, Q.C.F.
20 x 36 x 12 C.M.C. Gap, Q.C.G.
20 x 40 x 12 Rae Gap.
22 x 40 x 16 McDougall Gap.
38 x 12′ Bertram.
5′ x 9″ Fitchburg "Lo Swing."
30 x 12 Blaisdell (Raising Blocks).
36 x 18 Putnam.
No. 4 Millholland Turrets, 1⅝″x10″.
16″, 18″ and 24″ Davis Turrets.

Grinders

8 x 36 Fitchburg (Cylindrical).
LeBlond Universal.
Globe Universal.
Landis No. 4 Universal.
Landis Plain.
No. 1 Steel Products Gauge Grinder.
Pedestal Emery Grinders.
No. 2 Brown & Sharpe, plain cylindrical.
Valve Grinding Machine, 3 spindle.
Gardner Disc Grinder.
Surface Grinders, Diamond, Table 84 x 30.



Automatic Screw Machines

Wells.
Prentice.
Warner & Swasey.
National Acme Automatics.
Cleveland Automatics.
Brown & Sharpe Automatics.
Various Capacities.

Drills

20″ Buffalo.
20″ Champion.
No. 1 Burke Bench.
20″ Sibley.
No. 314 Baker.
D 14 Colburn.
D 8 Colburn.
4 Spindle Woodward.
National Acme Horizontal.
Reed-Prentice Radials, 3′ and 4′, plain box table.
Dresses, full universal, 5′ arm, cone drive.

Planers

30 x 30 x 8′ Pond (Savage).
30 x 30 x 10′ Pond (Hill).
30 x 30 x 11′ London (Climax).
30 x 30 x 12′ Putnam (Savage).
27 x 27 x 8′ Woodward-Powell (Savage).
26 x 26 x 8′ Gray (Savage).
24 x 24 x 6 Powell (Savage).

Miscellaneous

No. 10 Racine Power Hack Saw, 8″ x 8″.
No. 80B Grant Noiseless Riveting Machine.
Canton Cranes, capacity 1 and 2 tons.
Vacuum Pumps.
Hydraulic Rocking Press and Pump.
Lennox Rotary Bevel Shear.
Dividing Head for Milling Machine.
Plain Vise for Milling Machine.

A few Woodworking Machines

No. 200—Knife Grinder.

No. 25, American Edging and Ripping Saw.
No. 3, American Double Cut-Off Saw.
No. 30, Universal Saw Bench.
No. 9, American Universal Knife Grinders.
No. 26, American 10″ Outside Moulder.
No. 4½, American 36″ Cabinet Surfacer.
No. 507, C.M.C. Hollow Chisel Mortiser.
No. 438, Arm Sander.
Ballantyne 2-Spindle Shaper.
American No. 2½ Tenoner.

No. 25—Edging Saw.

Mr. H. W. Welsh, former manager in Sherbrooke, Que., for the E. & T. Fairbanks & Co., Limited, and latterly manager of the scale department of the Canadian Fairbanks-Morse Co., Limited, Montreal, Que., has joined the organization of the MacKinnon Steel Co., Limited, Sherbrooke, Que., as manager, and has already assumed his duties.

MARINE

Windsor.—Capt. Jacques LaFramboise, aged 80, one of the few remaining old-time Great Lakes mariners, died at his home in Amherstburg. For more than half a century he sailed the lakes, retiring ten years ago. Capt. LaFramboise was a native son of Essex County, having been born on the banks of the River Canard. He started as a deck hand on a sailing schooner carrying wood from Amherstburg to Detroit, and later became known as an expert sailboat navigator.

Toronto.—Liquidation of the Dominion Shipbuilding & Repair Co. has been delayed by doubt as to what is to be done with two boats which are under construction for the Government. It is probable that another firm of contractors will be asked to complete them in the yards of the defunct company. In the meantime negotiations for the disposal of the property are being held up.

INCORPORATIONS

Incorporation is granted to the Robert Hicks Coal and Towing Co., Ltd., of Peterborough.

Notice is received of the incorporation of the Mercantile Corporation, Ltd., for the purpose of manufacture and dealing in all kinds of railway, marine and foundry equipment. Authorized capital, $200,000, divided into 2,000 shares of $100 each. Chief place of business to be the city of Montreal.

The Industrial Equipment Company, Ltd., of the city of Montreal, is incorporated, with a capital stock of $20,000, divided into 200 shares of $100 each. The company will carry on business as manufacturers and dealers in all kinds of railway, marine, mining and foundry apparatus and equipment.

Incorporation is granted the A rtight Valve Co., of Montreal, for the purpose of "carrying on the trades or business of iron masters, steel makers and iron founders in all their respective branches to deal in and manufacture iron, steel and all other materials from the ore to the finished products thereof, and also to manufacture and deal in all articles, goods, wares and merchandise in which iron or steel or any other metal is or may be used."

CATALOGUES

The Gisholt Machine Co., Madison Wis., have issued what to our mind can be considered a book and catalogue de luxe. In these days of the high cost of paper, any firm who will issue a catalogue such as they have are to be congratulated. It measures 16 inches by 12 inches, and is bound in very attractive style. A neat forewording explains why the book was prepared.

They next show by various photographs of real merit, portions of their plant, and the system of manufacture as adopted by the various departments. Next follow examples of their varied lines, including even the chucks and cutters.

The preparation of this book has been watched with great care. Over 150 illustrations are shown, each one of interest To thoes who are really interested we suggest their writing for a copy, but as the expense attached to such a book must be enormous, we would say that in all fairness to the concern, do not ask for one out of mere idle curiosity.

SIGNS OF PROGRESS

Davis & Fraser, Grafton Street East, Charlottetown, P.E.I., are contemplating an addition to their cold storage plant, costing $25,000.

The Imperial Steel & Wire Co., Collingwood, Ont., have begun excavating for their proposed new factory. Lieut.-Col. J. A. Currie is president of the company.

The Y.W.C.A., Edmonton, plans to erect a large new building in the spring.

Tenders will be received until twelve o'clock noon, October 12, 1920, by R. C. Desrochers, secretary Department of Public Works, Ottawa, for the construction of additions to the post office, Galt, Ont. Plans and specifications may be seen at: the caretaker, post office, Galt, office of the chief architect, Department of Public Works, Ottawa, and Superintendent of the Dominion Bldgs., Postal Station "F," Toronto.

Plans for the erection of a hotel on the Hamilton-Toronto Highway, near Bronte, are being made by Fong Young, a Hamilton restaurant proprietor.

With the idea of installing a 400-ton pulp mill, with four saw mill units of 50,000 feet per day capacity, to exploit the Labrador timber reserve, American capital has been enlisted in a new company, known as the Southern Labrador Pulp & Paper Co.

London, Ont., is considering the erection of a new city hall. City Clerk, S. Baker.

The I.O.O.F., London, Ont., have purchased the Walker House and will remodel same into temple. The cost is estimated at $15,000.

Tenders are being received and contract will be awarded shortly for the proposed children's hospital to be erected at London, Ont.

The contract for erection of a factory costing $17,000, for the Mongolia Metal Co., Montreal, has been given to the Anglin-Norcross Co., Ltd., 65 Victoria Street.

Montreal is assured of a 1,000-room hotel, as a result of negotiations between Frank A. Dudley, president of the United Hotels Co. of America, and a group of transport and industrial interests. The Mount Royal Hotel Co., Ltd., Montreal, are to construct it with a total capital of $10,000,000.

The Cleveland Tractor Co. is considering erecting a warehouse on Ottawa St., Regina, Sask.

The Dominion Government may erect an armoury at Sarnia shortly. Secretary Public Works Dept., Ottawa, R. C. Desrochers.

The contract for erecting a bank, to cost $60,000, for Bank of Nova Scotia, at Sydney, N.S., has been awarded the Carswell Construction Co., 58 Wellington St. E., Toronto.

The erection of a large printing plant at Three Rivers, Que., is being contemplated by La Cie, "Le Breu Public," 3 Hait St. (Jos. Barnard, Manager, 17-19 St. Pierre St.)

The John Inglis Co., Toronto, Ont., plans to extend its plant on Strachan Avenue.

The Hôme Bank has purchased a site for a new banking building at the northwest corner of Bloor Street and Avenue Road, Toronto.

The Fisher Body Co., Walkerville, Ont., have awarded the contract for their new factory costing $175,000 to H. G. Christmas, 31 Stevens Blvd., Detroit, Mich.

NO WAY TO GET MUNITION ORDER

Judge Makes it Plain That Family Influence Should Not Have Been Used

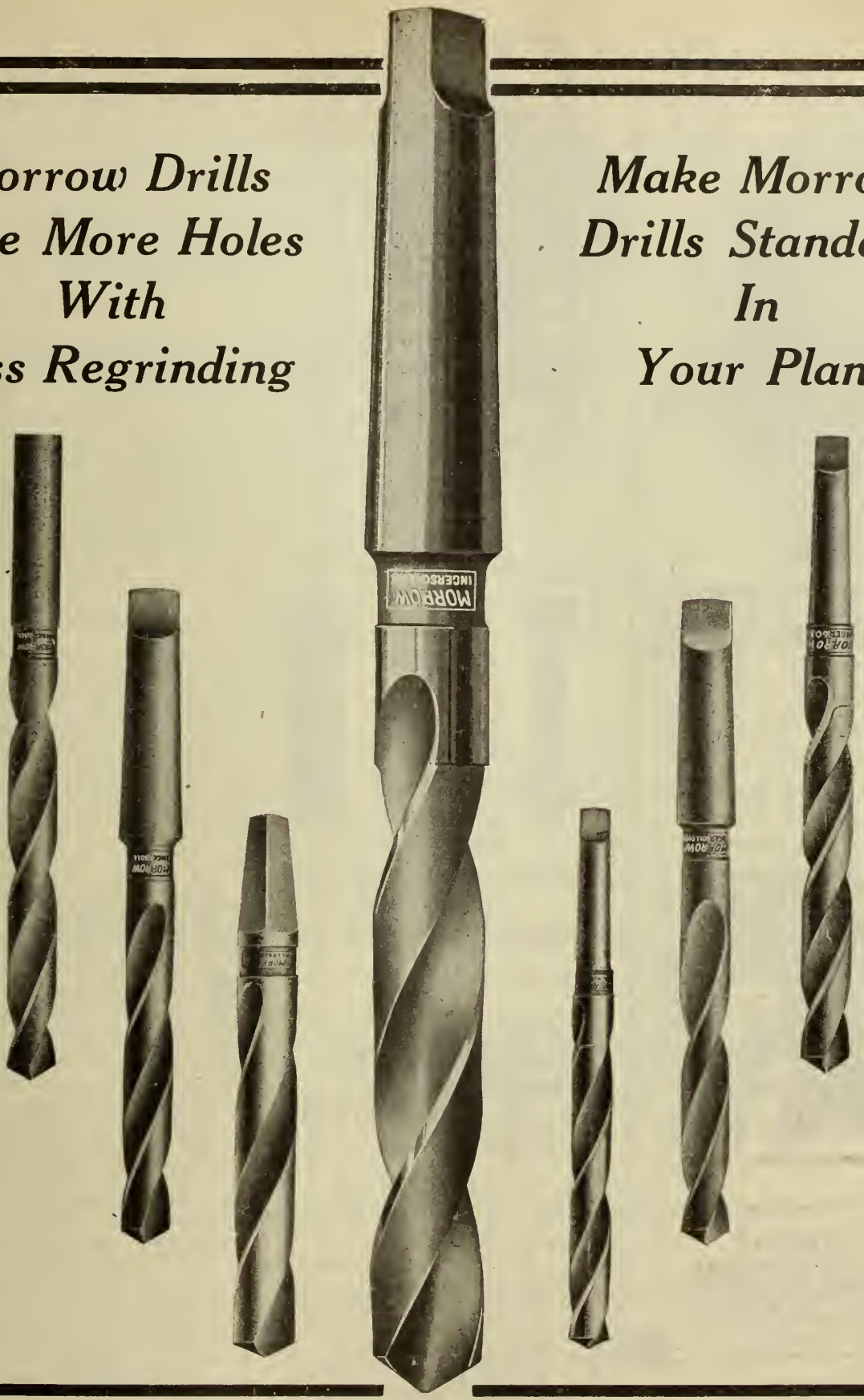
Mr. Justice Kelly dismissed without costs the suit brought by Major R. R. Carr-Harris against the Canadian General Electric Co. The amount involved was $63,000 and represented a claim for commission on munition orders secured for the company in England during the war. Major Carr-Harris based his claim for commission upon orders secured through his efforts with Lord Buckmaster, who is a relation by marriage.

In dismissing the action Mr. Justice Kelly scored the securing of any contracts in this manner. "It is intended that one of the parties shall use his relationship or familiarity to procure benefits and this would be subversive to public good and tend to corrupt the public service, particularly in war-time, when the utmost necessity existed of doing things rightly, legally and properly in the national service," says Mr. Justice Kelly.

In reviewing the evidence his Lord-

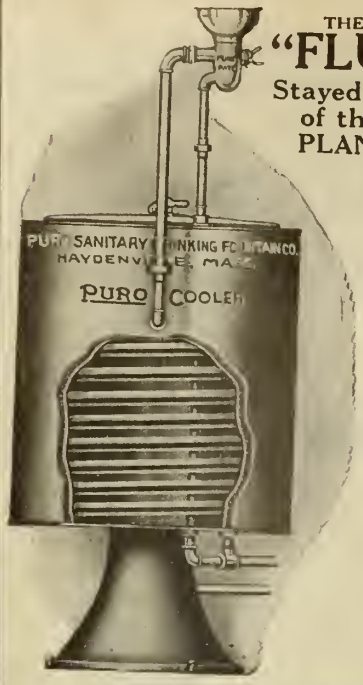
Morrow Drills Give More Holes With Less Regrinding

Make Morrow Drills Standard In Your Plant



MORROW

INGERSOLL CANADA



THE "FLU" Stayed out of this PLANT

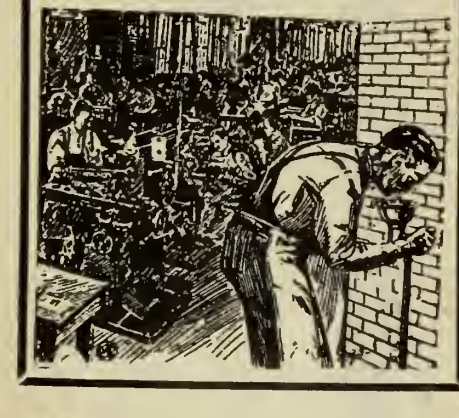
PURO SANITARY DRINKING FOUNTAIN

(MADE IN CANADA)

The only fountain with a bowl that prevents lips touching the bubbler paid its moderate cost over and over in all those well-ordered plants whose precautionary measures successfully barred the Spanish influenza. PURO saves lives, time and water. Write

Puro Sanitary Drinking Fountain Co.

888F St. Andre St., Montreal, P.Q.



Oil Tempered Steel Springs

—for every purpose and the best for each use.

Special styles of all kinds to order.

THE CLEVELAND WIRE SPRING COMPANY

Cleveland, Ohio U.S.A.

BOLTS AND RIVETS

We are equipped to fill the requirements of the Marine trade promptly. Square head, hexagon head and all kinds of Machine, Deck, Carriage Bolts and Rivets.

QUALITY PRODUCTS

LONDON BOLT & HINGE WOR

LONDON, CANADA

THE TUBE COMPANY OF CANADA LIMITED

Steel Tubing

for all purposes

Electric and Oxy-Acetylene Welded

Also

Butt Seam Tubing

Hot or cold rolled, in sizes ⅜ to 2 inches outside diameter, from 16 to 22-gauge.

We furnish any shape — Rounds, Squares, Hexagons, Ovals and Special Shapes to customers' specifications.

Expert advice given on all Steel Tubing Problems.

The Tube Company of Canada

233 Dufferin St. TORONTO, ONT

BLACK DIAMOND OVENS

OVENS

Japanning and Varnishing Ovens heated by Gas, Electricity, Steam or Coal. Kernchen Siphonage Ventilators, Bakers' Ovens, trucks, casters etc Write for Booklet.

Brantford Oven & Rack Co. Ltd.

Brantford, Canada

BLACK DIAMOND OVENS

MACHINE TOOLS for Shipbuilders & Iron & Steel Works

BERTRAMS LIMITED

SCIENNES EDINBURGH

ship says that in his opinion Lord Buckmaster did not favor this method of doing business, had refused to communicate with any member of the government, and had discouraged further conversation on the matter. He found that Mr. Milne, of the C.G.E., who had gone to England with Major Carr-Harris, was the man who understood the business, of which Major Carr-Harris knew nothing. The case, in his Lordship's opinion, came within the species of contract which should be discouraged or held invalid.

The Harbor Commission have an expert engaged in making a report on the freight charges on all goods, both rail and water-borne, that enter and leave Toronto. The industrial section of the commission is also making a similar report dealing with local industries. The idea is to show that a great saving will be made in transportation charges, and finally in the cost of goods, by having direct water-borne shipments to and from the city.

A peculiar incident took place when an ocean going vessel for the first time since the completion of the Quebec bridge had to step one of her masts in order to pass under the structure. The vessel was the Grand Duchess Maria Mikoldevna, a full rigged, three masted sailing ship, and the first of its type to visit Montreal for a long period. The vessel belongs to the Russian Volunteer Fleet.

Owing to the Seamen's Union calling out the crews of all Canadian vessels in harbor, to enforce their demands for increase in wages that amount to 25 per cent., seven Canadian ships are tied up in Fort William harbor. There is no indication as to how long the strike will last as the whole walk out is operated from headquarters in Toronto.

Although no deposits of anthracite or bituminous coal have been found in Ontario, the province has considerable beds of lignite. This substance is more fibrous than common coal, and though it can be used as fuel, its heating power is much inferior. It also has an exceptional amount of soot and ashes. What we have been needing is some cheap method of converting it into marketable fuel. According to report this method has been found and a plant erected in the State of Victoria, Australia. It was designed and built by Roy N. Buell, of San Francisco. The means employed reduces the moisture in the lignite from 25 to 40 per cent., and an apparatus is used to draw the soot and dirt out by suction. Under test the boiler efficiency of the fuel was 80 per cent. and the furnace 78 per cent. If the process operates successfully, as claimed, the new invention will mean much to the manufacturers of the United States and Ontario.

MONSTER FLOATING DOCK

One of the largest floating docks in the world has been towed from the east coast of Scotland to a shipyard in Holland which is under British control. It was built during the war, and when completed was at once commandeered by the Admiralty for use at a naval base. Ships of ten thousand tons can be raised in this dock, which proved extremely useful in the rapid repair of vessels at the base. It is five hundred feet long and seventy-five feet wide inside, and it is built in three sections, each of which can be made a complete box dock. With this arrangement any two sections can lift the third out of the water when painting or repairing has to be carried out. The three sections are bolted together to make a complete dock. Three powerful ocean tugs were required to take the dock across to Holland, and in spiet of bad weather the voyage was safely accomplished. Within three days of its arrival the dock successfully lifted a ship, and since then it has been continously engaged.

Word has been received that Sir Walter Runciman, who recently sold the Moor Line, has formed the Runciman Steam Navigation Co., with a capitalization of one million pounds.

The Donnelly Salvage & Wrecking Co. have succeeded in raising the steel steamer "Vinemount," sunk at Cascade Point, Soulanges Canal. The vessel will go into dry dock at Kingston for repairs.

DOMINION CHUCKS

STEEL OR CAST-IRON BODY
BUILT FOR HEAVY DUTY

All Screws Are Reversible

SCREWS are made of the best grade steel. Both ends are broached and are heat treated after machining. They are reversible, so that either end may be used, are large enough in diameter to stand the torsional strains applied by operator when setting up his work. They are made to give the best service—and may be depended upon to stand up under the hardest usage.

DOMINION STEEL PRODUCTS CO. LIMITED
Engineers • Manufacturers
BRANTFORD, CANADA

PATENTS
Fetherstonhaugh & Co.,
The old established firm. Patents everywhere. Head office, Royal Bank Bldg., Toronto. Ottawa office, 5 Elgin St. Offices throughout Canada. Booklet Free.

OILGAS
INDUSTRIAL FURNACES
Will Save 50% of the Fuel Used by Ordinary Furnaces

Double the capacity of your ordinary furnaces with the same oil consumption. This is a record that has been established by Oilgas Industrial Furnaces in many of Canada's prominent manufactories. There is an Oilgas Furnace for every process requiring heat. Investigate.

BULLETIN ON REQUEST

General Combustion Co.,
of Canada, Limited
619-623 New Birks Bldg., Montreal

Special Machinery
MADE TO ORDER

Mill Machinery, Engine Work
Grey Iron and Brass Castings

TRY US FOR GENERAL REPAIRS

ALEXANDER FLECK, LIMITED
(Vulcan Iron Works) OTTAWA, ONT.

DROP FORGE DIES
Send us your blueprints and specifications. Entrust your requirements to experienced workmen and up-to-date equipment. Have your dies made in Canada. First-class workmanship guaranteed.
THE KIMBER & HILLIER MFG. CO.,
Thorold Road, St. Catharines, Ont.

PATENTS PROMPTLY SECURED
In all countries. Ask for our Investor's Advisers which will be sent free.
MARION & MARION 364 University St.
Merchants Bank Building, corner St. Catherine St., Montreal, Phone Up. 647, and Washington, D.C., U.S.A.

PATENTS TRADE-MARKS AND DESIGNS
PROCURED IN ALL COUNTRIES
Special Attention Given to Patent Litigation
Pamphlet sent free on application.
RIDOUT & MAYBEE Kent Bldg., Yonge St.
TORONTO, CANADA

Eclipse INTERCHANGEABLE
Counterbores, Core Drills, Connecting Rod Cutters, Countersinks, Inverted Counterbores, Spot Facers, Adjustable Length Holders, And many other Special Tools

Eclipse Counterbore Co. Limited,
Walkerville, Ont.

Classified Opportunities

FACTORY EXECUTIVE WANTED

We have an opening for a man at present as Assistant Superintendent of large plant in Canada. Desire Canadian and a Technical Education would be beneficial, but not absolutely necessary. If you feel you have made good and your record will stand investigation it may pay you to get in touch with us. Should have general knowledge of manufacture of mechanical lines. We are looking for a real man of proven ability, who could take full charge when necessary. No others considered. State experience, age, present connection and approximate salary desired. Negotiations confidential.
Box 711, Canadian Machinery.

CLOSING TIME—

Advertisements for this section must be in our composing room at noon on Tuesday prior to day of issue.

In order that the announcements of your wants, machinery for sale, etc., etc., shall not be delayed please try to have them in our office with the Tuesday morning mail.

CANADIAN MACHINERY

Used Machinery Bargains

3—3 x 36 Jones & Lamson Flat Head Turret Lathes, geared feed.
2—2 x 24 Jones & Lamson Flat Head Turret Lathes, geared feed.
3—Chasing Attachments for Jones & Lamson Turret Lathes.
1—18" x 8' Cincinnati Lathe.
1—21" x 8' LeBlond Lathe.
1—24" x 10' Milwaukee Lathe.
1—26" x 10' C.M.C. Lathe.
1—18" x 8' Mueller Lathe.
1—10,000 lb. Tinius Olson Testing Machine.
1—No. 25 Foote Burt Drill Press.

CHARLES P. ARCHIBALD & CO.
MACHINERY and SUPPLIES
285 Beaver Hall Hill **Montreal**

HELP WANTED

ELECTRICAL MACHINIST WANTED—MUST be experienced bench and machine hand on small and delicate work. Knowledge of electrical circuits and connections essential. Apply Hydro-Electric Power Commission of Ontario, Employees Relations Department, 190 University Ave., Toronto.

WANTED—MACHINE SHOP FOREMAN FOR small shop manufacturing pumps, windmills and cylinders. Must be a man of thorough experience. Give full details first letter. Box No. 709, Canadian Machinery. (c14m)

POSITION WANTED

FACTORY MANAGER POSSESSING BROAD business training, thorough knowledge of French and English, conversant with efficiency methods, thoroughly experienced in employment and production problems, able to handle men advantageously, wishes to connect with growing concern manufacturing small parts, located in Province of Quebec. Best of references. Address Box No. 712, Canadian Machinery.

MECHANICAL ENGINEER WITH BROAD DEsigning and construction experience desires responsible position as assistant engineer or machine designer. First-class references available. Further particulars Box 708, Canadian Machinery. (c14m)

MACHINE WORK WANTED

MACHINE WORK WANTED FOR LATHES, shapers, milling machine and planer, etc. Hourly or contract basis. Prompt delivery. W. H. Sumbling Machinery Co., Toronto. (ctfm)

HARDWARE AT
REDUCED PRICES.
VALVES
PIPE & RAILING FITTINGS
IRON BARS
MACHINE BOLTS
BABBITT.

WRITE FOR LISTS.

Port Arthur Shipbuilding Co.

PORT ARTHUR, ONT.

Say you saw it in Canadian Machinery

FOR SALE

FIVE TONS, C.R. SCREW-CUTTING STOCK, ¼" round; 10 tons, .300" x 12" Deep Drawing, hot rolled strip steel, pickled and limed—for immediate delivery; 5 tons, .250" x 7", Dead soft, full cold rolled Steel, in transit. Apply The Gray Ball Bearing Company, Limited, Toronto. (c16m)

PLANT WANTED

ENGINEERING WORKS WANTED—PREFERably in Ontario, to produce grading, excavating, road-building machinery. Advertiser will provide designs, patterns, etc., and is prepared to make contract immediately with suitably equipped firm. Replies should be in detail necessary to determine suitability of plant, location and the extent and nature of present manufacturing operations. Principals only dealt with. Box 710, Canadian Machinery.

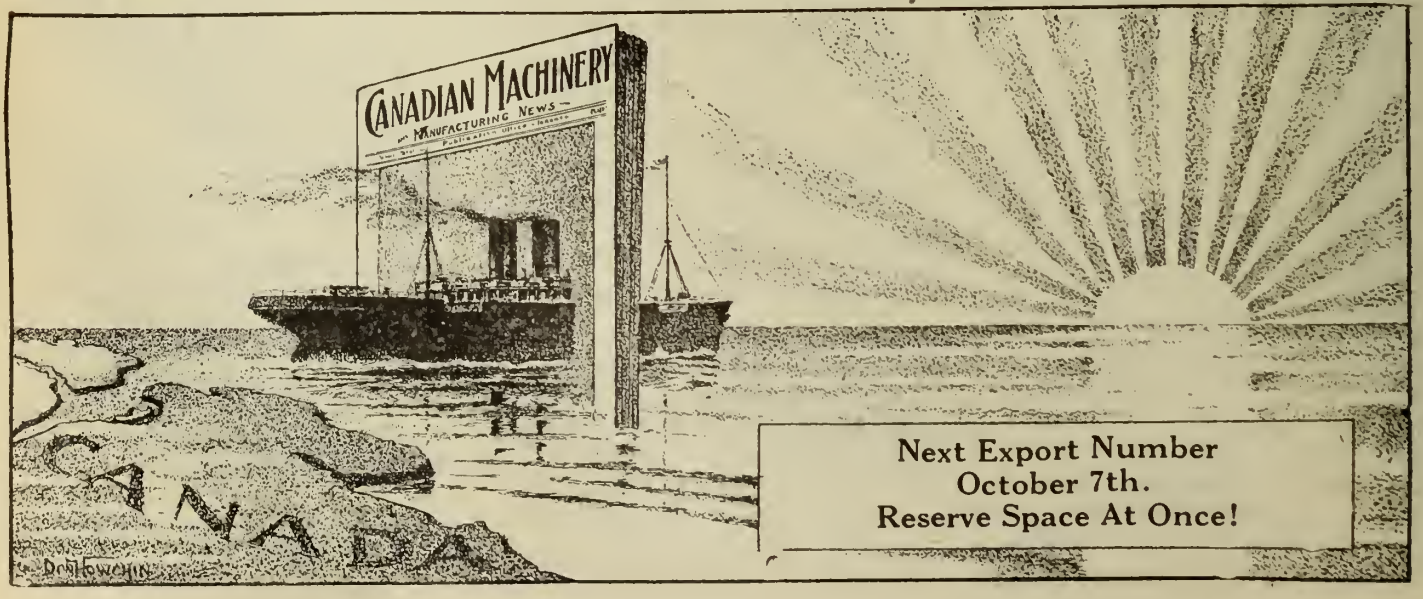
MACHINERY WANTED

WANTED — TESTING MACHINE, FORTY thousand pounds capacity or larger, in good order with all accessories. State price, where located, and how long used. Box 713, Canadian Machinery.

PATTERNS

TORONTO PATTERN WORKS, 65 JARVIS Street, Toronto. Patterns in wood and metal for all kinds of machinery. (ctfm)

BRANTFORD PATTERN WORKS ARE PREpared to make up patterns of any kind—including marine works—to sketches, blue prints or sample castings. Prompt, efficient service. Bell 'Phone 631; Machine 'Phone 733. Brantford Pattern Works, 49 George St., Brantford, Ont. (ctfm)



Classified Opportunities

MACGOVERN & COMPANY INCORPORATED POWER MACHINERY

D. C. GENERATORS
250 Volts

K.W.	Make	Speed	Type
2.5	GENERAL ELECTRIC	1900	IB
4	STURTEVANT	160	MP-8
9	GENERAL ELECTRIC	750	
10	GENERAL ELECTRIC	1800	ACH
25	BULLOCK ELECTRIC	1050	MP
25	FORT WAYNE	875	MP
35	WESTINGHOUSE	1050	S
35	SPRAGUE-LUNDELL	785	
42	MILWAUKEE	1100	B-30
50	GENERAL ELECTRIC	870	MP
50	WESTERN ELECTRIC	280	L-4-K
50	BULLOCK	750	
56	WESTINGHOUSE	800	
60	GENERAL ELECTRIC	900	
75	WESTERN ELECTRIC	575	L-3
75	BULLOCK	830	H-4
75	GENERAL ELECTRIC	850	L
85	GENERAL ELECTRIC	750	
90	GENERAL ELECTRIC	750	CL
100	JEFFREY	550	
100	SPRAGUE	900	C
100	GENERAL ELECTRIC	270	MP
125	MILWAUKEE ELECTRIC CO	450	A-130
135	SPRAGUE	500	
150	FT. WAYNE	550	MPL
160	GENERAL ELECTRIC	160	MP
187	WESTINGHOUSE	695	HS
200	CROCKER-WHEELER	900	
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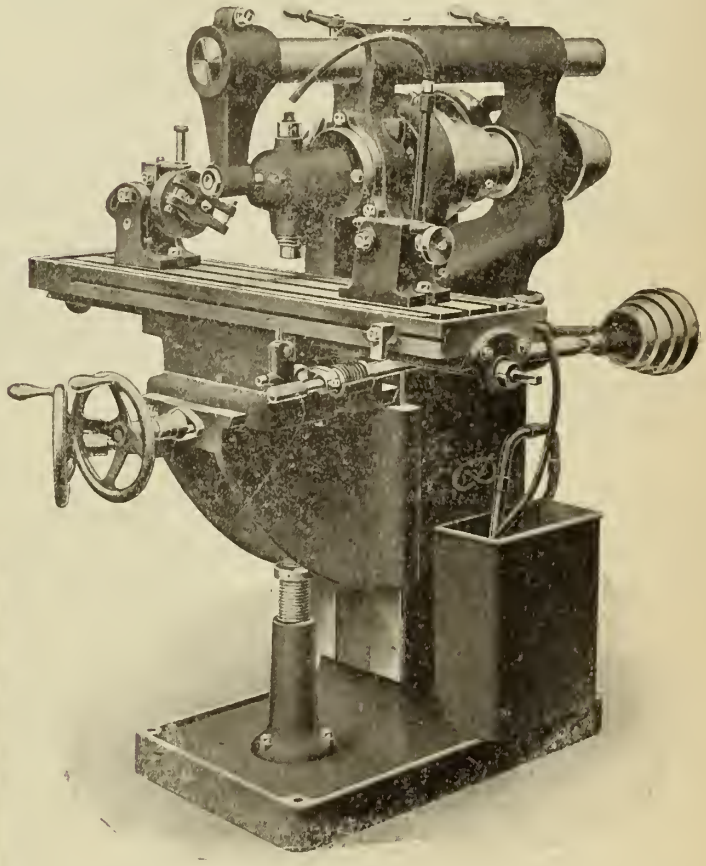

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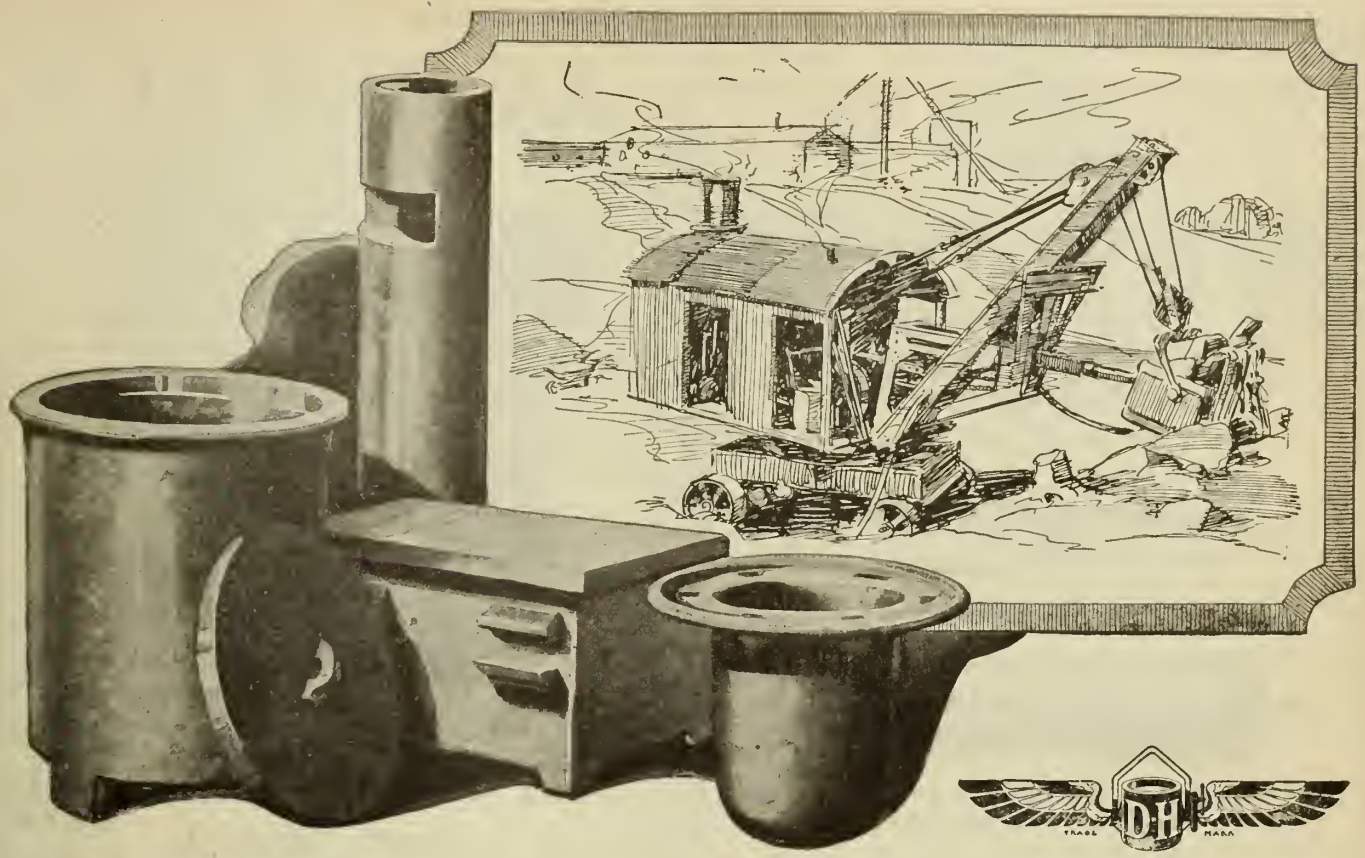

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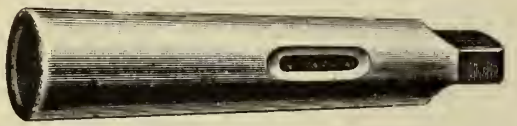

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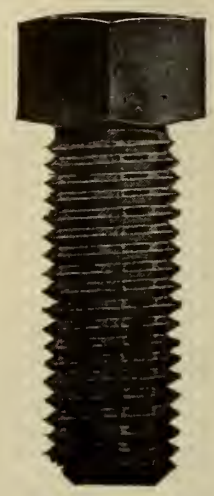

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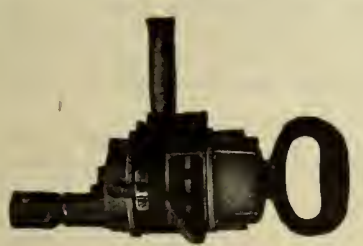

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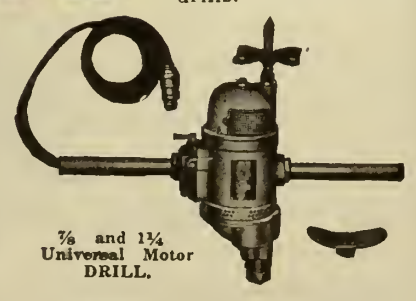
Try a few of our Electric Drills and Grinders and you'll send us an order for more. Our guarantee protects you.



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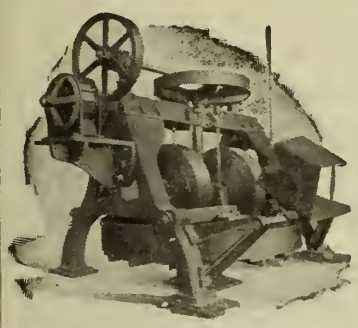

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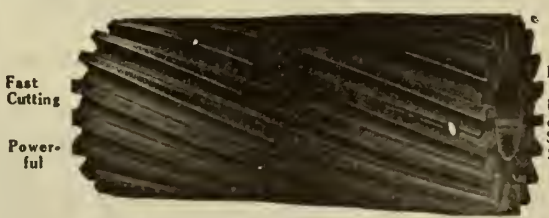

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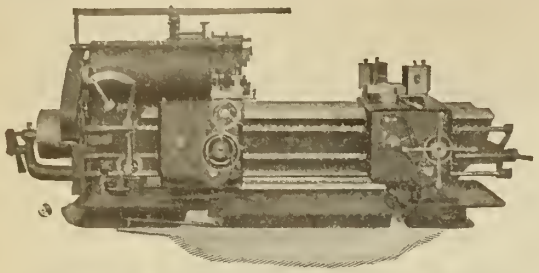

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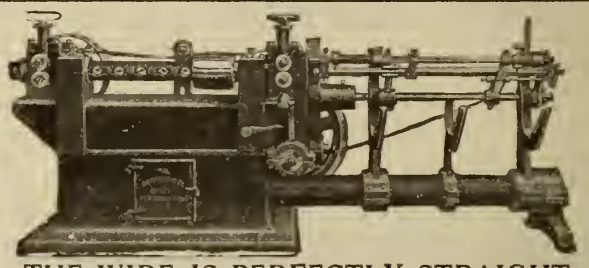

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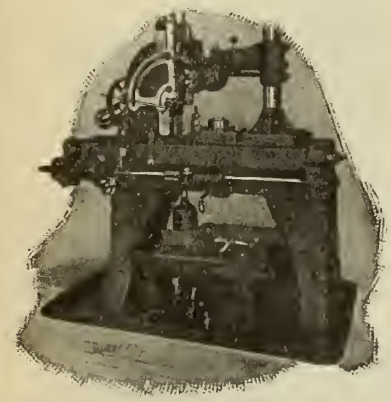

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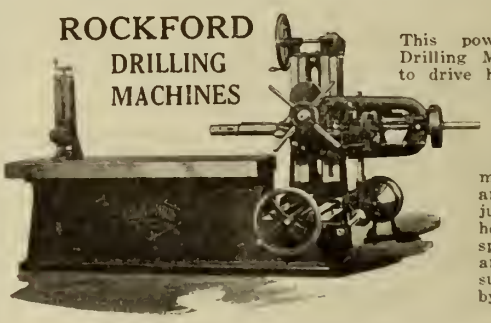

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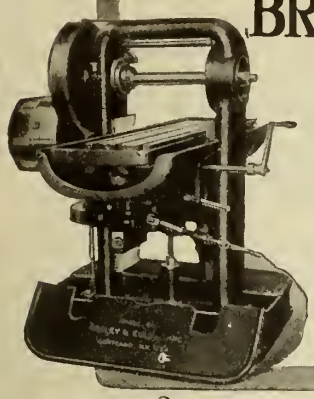

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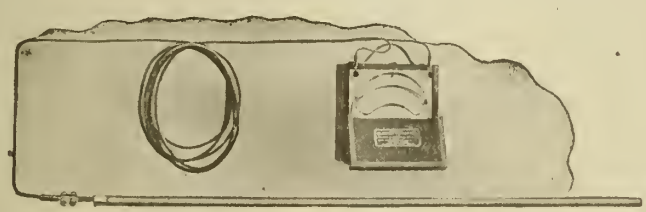

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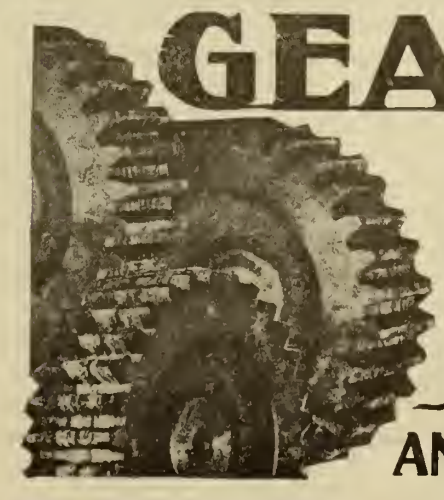

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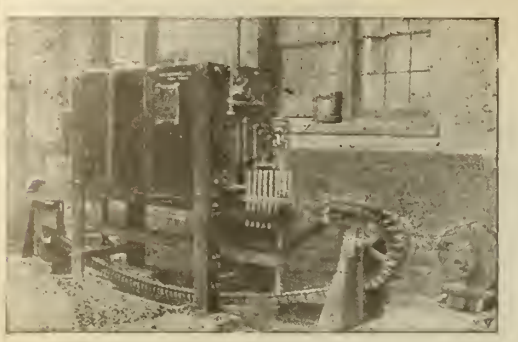

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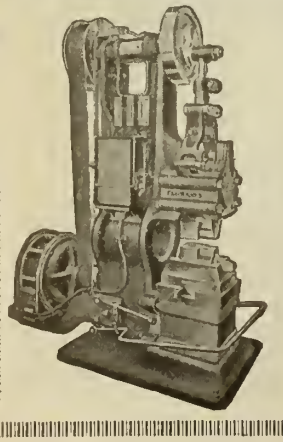

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CASTINGS, ALUMINUM, BRASS, BRONZE, COPPER AND GUN METAL
Algoma Steel Corp., Sault Ste. Marie.
Franklin Mfg. Co., Syracuse, N.Y.
Can. Metal Co., Toronto, Ont.

CASTINGS, DIE CAST
Can. Metal Co., Toronto, Ont.
Franklin Mfg. Co., Syracuse, N.Y.
Fisher Motor Co., Ltd., Orilla, Ont.
Tallman Brass & Metals Ltd., Hamilton, Ont.

CASTINGS, STEEL—ALL KINDS
Canada Electric Castings, Ltd., Orilla, Ont.
Dominion Foundries & Steel Ltd., Hamilton, Ont.
Electric Steel & Metals Co., Welland.
Mesta Machine Co., Pittsburgh, Pa.

CASTINGS, ELECTRIC AND ALLOY STEEL
Can. Elec. Castings Co., Ltd., Orilla, Ont.
Dominion Foundries & Steel Ltd., Hamilton, Ont.

CARRIERS COUPLING BOLTS
John Morrow Screw & Nut Co., Ingersoll.
Alexander Fleck Ltd., Ottawa.
Tallman Brass & Metal Co., Hamilton

CASTINGS, BENCH LEG
Brown & Sharpe Mfg. Co., Providence. R.I.

CASTINGS, BRASS AND IRON
Algoma Steel Corp., Sault Ste. Marie
International Machinery and Supply Co., Ltd., Montreal, Que.

CASTINGS, BUILDING
Katie Foundry, Galt, Ont.

CASTINGS, GRAY IRON
Bernard Industrial Co., A., Fortierville, Q.
Brown & Sharpe Mfg. Co., Providence, R.I.
Brown, Boggs Co., Ltd., Hamilton.
Can. Elec. Castings Co., Ltd., Orilla, Ont.
Alexander Fleck, Ltd., Ottawa.
Gardner & Son, Roht., Montreal.
Hull Iron & Steel Foundries, Ltd., Hull
Interantional Malleable Iron Co., Guelph
Kennedy & Sons, Ltd., Wm., Owen Sound.
Katie Foundry, Ltd., Galt, Ont.
Hamilton Co., Wm., Peterboro.
McFarlane Engineering Ltd., G. W., Paris, Ont.

CASTINGS, PLUMBERS'
Katie Foundry, Galt, Ont.

CASTINGS, NICHROME
Can. Driver-Harris Co., Ltd., Walkerville

CASTINGS, HARDWARE
Katie Foundry, Galt, Ont.

CASTINGS, STEEL CHROME AND MANGANESE STEEL
Thos. Davidson Mfg. Co., Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Hull Iron & Steel Foundries, Ltd., Hull.
Kennedy & Sons, Ltd., Owen Sound.

CASTINGS, MALLEABLE
International Malleable Iron Co., Guelph

CASTINGS, NICKEL STEEL
Hull Iron & Steel Foundries, Ltd., Hull.

CEMENT MACHINERY
Can. Fairbanks-Morse Co., Ltd., Montreal
Gardner, Robt., & Son, Montreal.

CEMENT HANDLING MACHINERY
Can. Link-Belt Co., Toronto, Ont.

CEMENT TOOLS
Atkins & Co., E. C., Hamilton, Ont.

CENTERING MACHINES
Victoria Foundry Co., Ottawa, Ont.

CENTRE REAMERS
Bertram & Sons Co., John, Dundas.
Butterfield & Co., Inc., Rock Island, Que.
Gardner, Robt. & Son, Montreal.
Morrow Screw & Nut Co., J., Ingersoll.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co., of Canada, Galt, Ont.

CHAIN, WELDED COIL
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

CHAIN BLOCKS
Aikenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Ford Chain Block & Mfg. Co., Phila., Pa.
Garlock-Walker Machinery Co., Toronto.
Lyman Tube & Supply Co., Montreal, Q.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Oliver, Engineering Co., Montreal.
Rice Lewis & Son, Toronto, Ont.
Jones & Glassco, Montreal, Que.

CHAINS, AGRICULTURAL
Can. Link-Belt Co., Ltd., Toronto, Ont.
Morse Chain Co., Ithaca, New York.
Renold of Canada, Ltd., Montreal.

CHAINS, AUTOMOBILE ENGINE
Can. Link-Belt Co., Ltd., Toronto, Ont.
Morse Chain Co., Ithaca, N.Y.
Renold of Canada, Ltd., Montreal.

CHAINS, BICYCLE, DRIVE AND BLOCK
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold of Canada, Ltd., Montreal.

CHAINS, FOR ELEVATORS AND CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Lyman Tube & Supply Co., Montreal.
Morse Chain Co., Ithaca, N.Y.
Petrie, Ltd., H. W., Toronto.
Renold of Canada. Ltd., Montreal.
Williams Mchy. Co., A. R., Toronto, Ont.

CHAIN, MALLEABLE, DETACHABLE AND RIVETED
Can. Link-Belt Co., Toronto, Ont.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

CHAINS, POWER TRANSMISSION
Can. Link-Belt Co., Ltd., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N. Y.
Glasgow, N.S.
Renold of Canada, Ltd., Montreal.

CHAINS, SPROCKET WHEEL
Can. Link Belt Co., Ltd., Toronto, Ont.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.

CHAIN DRIVES
Can. Link-Belt Co., Ltd, Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold of Canada. Ltd., Montreal.

CHASERS
National Acme Co., Cleveland, Ohio.
Taylor, J. A. M., 318 Stair Bldg., Toronto, Ont.

CHEMISTS
Toronto Testing Labatory, Ltd., Toronto.

CHUCKS, AERO, AUTOMATIC
Garvin Machine Co., New York.

CHUCKS, COLLET, AIR
Petrie, Ltd., H. W., Toronto.
Williams Mchy. Co., A. R., Toronto.

CHUCKS, DRILL, LATHE AND UNIVERSAL
Aikenhead Hardware Co., Toronto, Ont.
Bertram & Sons Co., John, Dundas.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Ltd., Brantford
Foss Mchy. & Sply Co., Montreal.
Gardner, Robt. & Son, Montreal.
Garlock-Walker Machinery Co., Toronto.
Gisholt Machine Co., Madison, Wis.
Herbert, Ltd., Alfred, Toronto, Ont.
Jacobs Mfg. Co., Hartford, Conn.
Ker & Goodwin Machine Co., Ltd.
Rice Lewis & Son, Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

CHUCKS, DRILL, AUTOMATIC AND KEYLESS
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener.
McCrosky Tool Corp., Meadville, Pa., U. S. A.
Strelinger, Chas. A. Co., Windsor, Ont.

CHUCKS, FRICTION AND TAP
Victor Tool Co., Waynesboro, Pa.

CHUCKS, MAGNETIC
Heald Machine Co., Worcester, Mass.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co., Ltd., A. R., Montreal

CHUCKS, RING WHEEL
Ford-Smith Mach Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.

CHUCKING MACHINES
Brown & Sharpe Mfg. Co., Providence, R.I.
Garvin Machine Co., New York.
Gisholt Machine Co., Madison, Wis.
National Acme Co., Windsor, Vt.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Warner & Swasey Co., Cleveland, O.
Williams Mchy. Co., A. R., Toronto, Ont.

CIRCULATING SYSTEMS FOR LUBRICATING OIL
Bowser Co., Ltd., S. F., Toronto, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

CLAY FIRE.
Elk Fire Brick Co., Can., Ltd., Hamilton, Ont.

CLEANERS, METER, WASTE, GENERAL
Oakley Chemical Co., New York, N.Y.

CLEANING COMPOUND
Oakley Chemical Co., New York, N.Y.

CLOCK SPRINGS
The Dunbar Brothers Co., Bristol, Conn

CLOCKS, WATCHMAN, PORTABLE
Gisholt Machine Co., Madison, Wis.

CLOSETS
Crane, Ltd., Montreal, Que

CLUTCHES, CHAIN
Wright Mfg. Co., Lisbon, Ohio.

CLUTCHES, FRICTION AND PULLEY
Bernard Industrial Co., A., Fortierville, Que.
Can. Link-Belt Co., Ltd., Toronto, Ont.
Carlyle Johnson Mach. Co., Manchester, Conn.
Positive Clutch & Pulley Wks., Aurora, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.

COAL CRUSHERS
Can. Link-Belt Co., Ltd., Toronto, Ont.

COAL HANDLING MACHINERY
Brown Hoisting Machinery Co., Cleveland, Ohio.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Ltd., Toronto, Ont.
Dominion Bridge Co., Montreal, Que.
MacGovern & Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Nova Scotia Steel & Coal Co., New

COLD ROLLED STRIP, ALL METAL COLLARS, SHAFTING
Can. Driver-Harris Co., Ltd., Walkerville.
Williams & Co., J. H., Brooklyn, N.Y.

COLLECTORS, PNEUMATIC
Can. Blower & Forge Co., Kitchener
Sturtevant Co., B. F., Galt, Ont.

COMPOSITION INGOT
Canada Metal Co., Toronto.

COMPOUNDS, CUTTING AND GRINDING, DRAWING STAMPING
Oakley Chemical Co., New York, N.Y.

COMPRESSORS, AIR
Atkins & Co., E. C., Hamilton. Ont.
Can. Ingersoll-Rand Co., Sherbrooke.
Cleveland Pneumatic Tool Co., Toronto.
Curtis Pneumatic Machy. Co., St. Louis
Garlock-Walker Machinery Co., Toronto.
Holden Co., Ltd., Montreal, Que.
MacGovern & Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto.
Superior Machinery Co., London, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

CONDENSERS
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
MacGovern & Co., Montreal, Que.

CONDUITS
Northern Electric Co., Ltd., Montreal. Que.

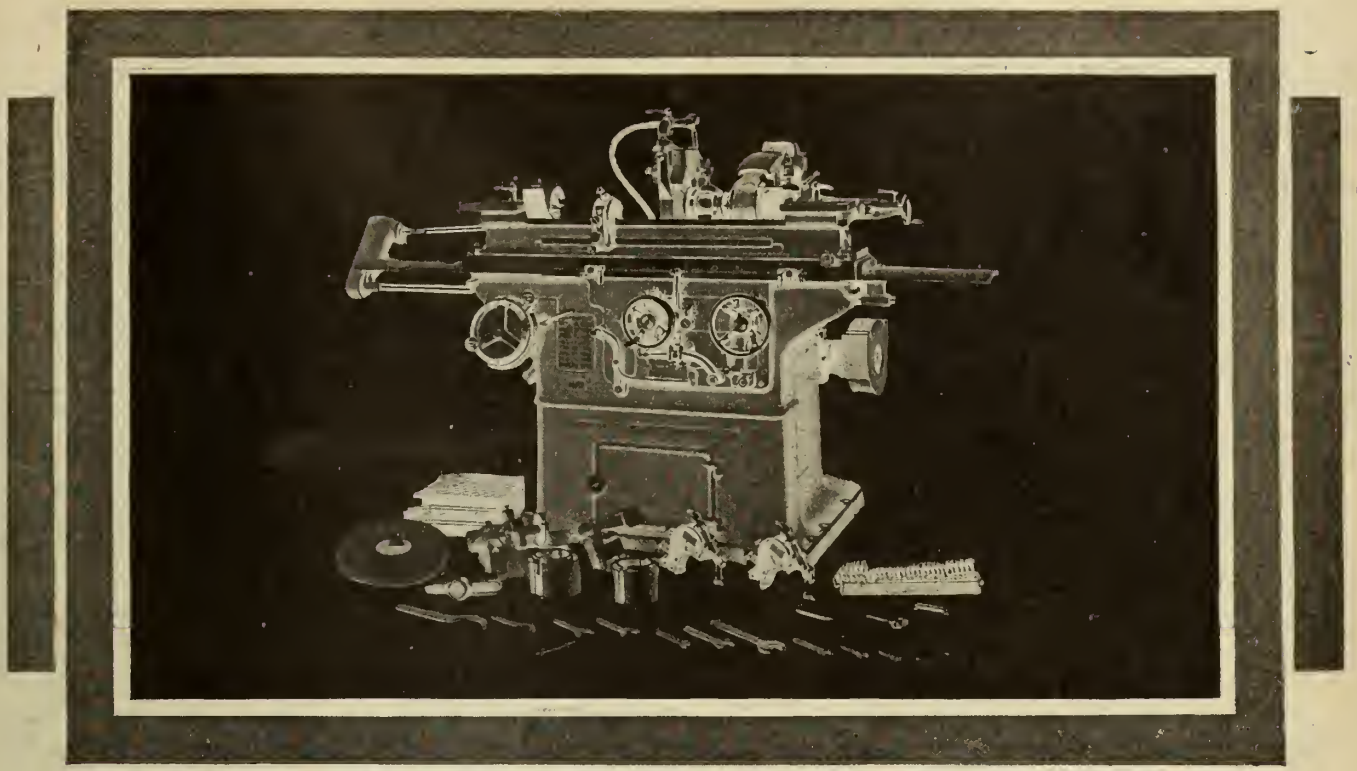
CONNECTING RODS
Canada Found's & Forgings, Ltd., Welland, Ont.

CONNECTING ROD CUTTERS INTERCHANGEABLE
Eclipse Counter bore Co., Ltd., Walkerville, Ont.

CONTRACT WORK
Brown Engineering Corp., Toronto.
Ford-Smith Machine Co., Hamilton. Ont.
Globe Engineering Co., Hamilton. Ont.
Katie Foundry, Ltd., Galt, Ont.
Victoria Foundry Co., Ottawa.

CONTROLLERS, MAGNETIC BRAKES, ELECTRIC WINCHES, MONO RAIL HOISTS
Volta Mfg. Co., Welland. Ont.

CONTROLLERS AND STARTERS
Williams Mach'y. Co., A. R., Toronto.



Let Brown & Sharpe Plain Grinding Machines

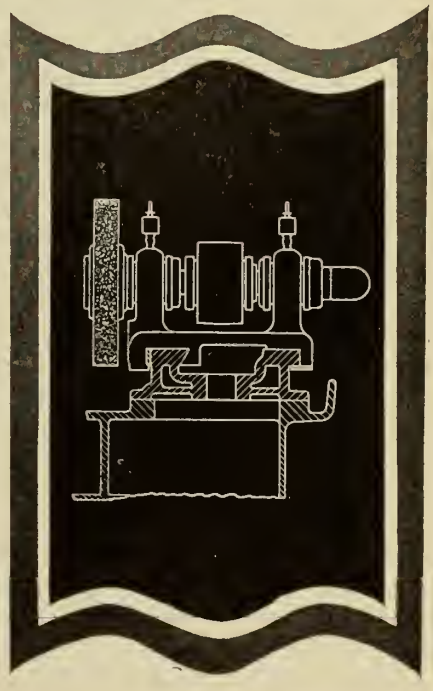
Maintain Your Standards of Accuracy

The rigid wheel spindle support with solid walls of base extending to floor, insures absence of vibration which would impair accuracy.

The location of wheel on end of spindle facilitates the removing and changing—a great asset in production where the same machine must be used for varied set-ups.

The spindle pulleys are easily and quickly changed — one nut being the only adjustment necessary.

These and other features are vital factors to the manufacturer who must maintain a high degree of accuracy.



Brown & Sharpe Mfg. Co.

Providence, R.I., U.S.A.

Canadian Representative: Canadian Fairbanks-Morse Co., Ltd.

CONTROLLING INSTRUMENTS
Taylor Instrument Co., Rochester, N.Y.

CONVERTERS, ROTARY
MacGovern & Co., Montreal, Que.
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.

COOLERS, WITH DRINKING FOUNTAINS
Puro Sanitary Drinking Fountain Co. Haydenville, Mass.

COPING MACHINES
Bertram & Sons Co., John, Dundas, Ont.
Dom. Steel Products Co., Ltd., Brantford
Garlock-Walker Machinery Co., Toronto.
Niles-Bement-Pond Co., New York.
Can. Blower & Forge Co., Kitchener.

COPPER, BUS BAR, SHEET, PLATES, RODS
British Smelting & Refining Co., Ltd., Montreal, Que.
Brown's Copper and Brass Rolling Mills, New Toronto.

CORE OIL
Swan & Finch, Inc., 165 Broadway.

COUNTERBORES AND COUNTERSINKS
Aikenhead Hardware Co., Toronto, Ont.
Cleveland Twist Drill Co., Cleveland.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
McCrosky Tool Corp., Meadville, Pa., U. S. A.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.

COUNTERSINKS, INTERCHANGEABLE
Eclipse Counterbore Co., Ltd., Walkerville, Ont.

COUNTERBORES, INVERTED, INTERCHANGEABLE
Eclipse Counterbore Co., Ltd., Walkerville, Ont.

COUNTERSHAFTS
Almond Mfg. Co., Ashburnham, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Baird Machine Co., Bridgeport, Conn.
Ford-Smith Machine Co., Hamilton, Ont.
Foster Machine Co., Elkhart, Ind.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co., Ltd., A. R., Montreal
Williams Mchy Co., A. R., Toronto.

COUPLINGS, FRICTION
Bernard Industrial Co., The A., Fortierville, Que.
Can. Link-Belt Co., Ltd., Toronto, Ont.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto.

COUPLINGS, RAPID HOSE
Ont. Machinery & Supply Co., Ltd., Montreal, Que.

COILING MACHINERY, WIRE AND SPRING
Garlock-Walker Machinery Co., Toronto.

BUCKET
Hanna & Co., M. A., Cleveland, O.

COUPLINGS, PLAIN, FLEXIBLE AND CUT OFF
Cleveland Pneumatic Tool Co. of Canada, Toronto.

CRANES, OVERHEAD, HAND AND
Gardner, Robt. & Son, Montreal.
Independent Pneumatic Tool Co., Chicago

CRANES, LOCOMOTIVE
Can. Link-Belt Co., Ltd., Toronto, Ont.
Northern Crane Works, Walkerville.

ELECTRIC
Volta Manufacturing Co., Welland, Ont.

CUPS, OIL
Can. Winkley Co., Ltd., Windsor, Ont.

COVERS, OIL HOLE
Can. Winkley Co., Ltd., Windsor, Ont.

CRANES, GRAVITY
Brown Hoisting Machinery Co., Cleveland, Ohio.
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.

CRANE RUNWAYS
MacKinnon Steel Co., Sherbrooke, Que.

CRANES, JIB
Brown Hoisting Machinery Co., Cleveland, Ohio.

CRANES, LOCOMOTIVE
Brown Hoisting Machinery Co., Cleveland, Ohio.
Holden Co., Ltd., Montreal, Que.

CRANES, GOLLIATH, PNEUMATIC AND PORTABLE
Brown Hoisting Machinery Co., Cleveland, Ohio.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Morris Crane and Hoist Co., Herbert Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Petrie, Ltd., H. W., Toronto.

CRANES, PILLAR
Brown Hoisting Machinery Co., Cleveland, Ohio.

CRANES, PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Brown Hoisting Machinery Co., Cleveland, Ohio.
Can. Link-Belt Co., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Rice Lewis & Son, Toronto, Ont.
Petrie, Ltd., H. W., Toronto.
Williams Mchy. Co., A. R. Toronto, Ont.

CRANES, TRAVELLING, ELECTRIC AND HAND POWER
Brown Hoisting Machinery Co., Cleveland, Ohio.
Can. Link-Belt Co., Toronto, Ont.
Curtis Pneumatic Machy. Co., St. Louis.
Dominion Bridge Co., Montreal.
Hepburn, John T., Ltd., Toronto.
Lyman Tube & Supply Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Niles-Bement-Pond Co., New York.
Northern Crane Works, Walkerville.
Oliver Engineering Co., Montreal.

CRANK SHAFTS
Can. Founds & Forgings Ltd., Welland
Williams & Co., J. H., Brooklyn, N.Y.

CRANK PIN TURNING MACHINE
Herbert, Ltd., Alfred, Toronto, Ont.

CRIMPS, LEATHER
Graton & Knight Mfg. Co., Worcester, Mass.

CRUSHERS
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Elec. Steel & Metals, Welland, Ont.

CUPOLAS
Can. Blower & Forge Co., Kitchener.
Northern Crane Works, Walkerville.

CURB PUMPS FOR OIL, GASOLINE
Bowser Co., Ltd., S. F., Toronto, Ont.

CURRENT TRANSFORMERS
Volta Manufacturing Co., Welland, Ont.

CUT-OFF COUPLINGS, FRICTION
Petrie, Ltd., H. W., Toronto.

CUTTERS, BOLT
See Bolt Cutters.

CUTTERS, GEARS
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Fellows Gear Shaper Co., Springfield, Vt.

CUTTERS, FLUE
Cleveland Pneumatic Tool Co., Toronto

CUTTER HEADS
Oliver Machinery Co., Grand Rapids, Mich.

CUTTERS, PIPE (See Pipe Cutters)

CUTTERS, HIGH SPEED
Madison Mfg. Co., Madison, Wis.

CUTTERS, MILLING
Butterfield & Co., Rock Island, Que.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Cleveland Twist Drill Co., Cleveland.
Foss Mchy. & Sply. Co., G. E., Montreal.
Garvin Machine Co., New York.
Ingersoll Machine Co., Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Toronto, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Whitney Mfg. Co., Hartford, Conn.
Will Twist Drill Co., Walkerville, Ont.

CUTTER RELIEVING MACHINES
Cleveland Milling Machine Co., Cleveland

CUTTING-OFF MACHINES
Armstrong Bros., Tool Co., Chicago.
Atkins & Co., E. C., Hamilton, Ont.
Bertram & Sons Co., John, Dundas.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal
G. E. Foss Mchy. & Sply. Co., Montreal.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield, Mass.
Kennedy & Sons, Wm., Owen Sound
Lyman Tube & Supply Co., Montreal, Que.
Niles-Bement-Pond Co., New York.
Prest-O-Lite Co., Inc., Toronto, Ont.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Williams Tool Corp. of Canada, Ltd., Brantford, Ont.
Wells Bros., of Can., Galt, Ont.
Williams Mchy. Co., A. R., Toronto, Ont.

CUTTING COMPOUND AND CUTTING OIL
Cataract Refining Co., Ltd., Toronto.
Swan & Finch, Inc., New York.

CUTTING OIL, RECLAIMING SYSTEM
Bowser Co., Ltd., S. F., Toronto, Ont.

CUTTING AND WELDING PLANTS
Davis-Bournonville Co., Jersey City, N.J.
Prest-O-Lite Co., Inc., Toronto, Ont.

CYANIDE AND LEAD BATH POTS
Swedish Crucible Steel Co., Windsor.

CYLINDERS, AIR
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Ford-Smith Machine Co., Hamilton, Ont.

REHUMIDIFYING
B. F. Sturtevant Co., Galt, Ont.

DERRICKS
Aikenhead Hardware Co., Toronto, Ont.
Dominion Bridge Co., Montreal.
Hepburn Co., Ltd., J. T., Toronto, Ont.
Morris Crane & Hoist Co., Sherbrook.

DIAMOND (BORTZ)
Furniss, Clarke & Co., Montreal, Que.

DIAMOND TOOLS
Can. Desmond-Stephan Mfg. Co., Hamilton
Ford-Smith Machine Co., Hamilton, Ont.
Furniss Clark & Co., Montreal, Que.
Joyce-Koebel Co., Inc., New York City
Wheel Trueing Tool Co., Detroit.
Petrie Ltd., H. W., Toronto.

DIAMONDS, CARBON AND BORTZ
Joyce Koebel Co., Inc., New York, N.Y.
Wheel Trueing Tool Co., Detroit.

DIAMONDS, BLACK AND ROUGH
Joyce, Koebel & Co., Inc., New York.
Wheel Trueing Tool Co., Windsor, Ont.

DIE CASTINGS
Fisher Motor Co., Ltd., Orillia, Ont.
Tallman Brass & Metals Ltd., Hamilton, Ont.

DIE HEADS, AUTOMATIC
Greenfield Tap & Die Corp., Greenfield Mass.
Wells Bros. of Can., Galt, Ont.
Petrie, Ltd., H. W., Toronto.

DIES FOR BIT BRACE USE
Butterfield & Co., Rock Island, Que.
Crescent Mchc. Co., Ltd., Montreal, P.Q.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Wells Brothers Co., of Canada, Galt.

DIES AND DIE STOCKS
Ackworthie Ltd., J., Birmingham, Eng.
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Rock Island, Que.
Brown, Boggs Co., Hamilton, Ont.
Crescent Mchc. Co., Ltd., Montreal, P.Q.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardner, Robt. & Son, Montreal.
Herbert Ltd., Alfred, Toronto, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Jones & Lamson, Springfield, Vt.
Landis Machine Co., Waynesboro, Pa.
Marshall, Son & Bunney, Toronto.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Acme Co., Cleveland, Ohio.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Stoll Co., Inc., D. H., Buffalo, N.Y.
Strelinger, Chas. A. Co., Windsor, Ont.
Wells Brothers of Canada, Galt, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

DIES, HAMMERED
Kimber & Hillier Mfg., Co., St. Catharines, Ont.

DIES, DROP FORGE.
Kimber & Hillier Mfg., Co., St. Catharines, Ont.

DIES, METAL STAMPING
Ackworthie Ltd., J., Birmingham, Eng.
Crescent Mchc. Co., Ltd., Montreal, P.Q.
Elliott & Whitehall, Galt, Ont.

DIES, PIPE THREADING
Ackworthie Ltd., J., Birmingham, Eng.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Crescent Mchc. Co., Ltd., Montreal, P.Q.
Landis Machine Co., Waynesboro, Pa.

DIES, THREADING
Ackworthie Ltd., J., Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Crescent Machine Co., Ltd., Montreal.
Greenfield Tap & Die Corp., Greenfield Mass.
Wells Bros. of Can., Galt, Ont.

DIE SINKERS
Ackworthie Ltd., J., Birmingham, Eng.
Garvin Machine Co., New York.
Kimber & Hillier Mfg., Co., St. Catharines, Ont.
Pratt & Whitney Co., Dundas, Ont.
Walcott Lathe Co., Jackson, Mich

DIES FOR MACHINES
Ackworthie Ltd., J., Birmingham, Eng.
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Rock Island, Que.
Firth & Sons, Thos., Montreal, Que.
Landis Machine Co., Waynesboro, Pa
Wells Brothers Co. of Canada, Galt.

DIE HEADS
Greenfield Tap & Die Corp., Greenfield Mass.
Wells Bros. of Canada, Galt, Ont.

DIES, SELF-OPENING
Geometric Tool Co., New Haven.
Herbert, Ltd., Alfred, Toronto, Ont.
Landis Machine Co., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit
Wells Brothers Co. of Can., Galt, Ont
Petrie Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.

DIE FILING MACHINES
Oliver Mach. Co., Grand Rapids, Mich

DIE STEEL, HOT AND COLD WORK
Armstrong-Whitworth of Can., Montreal
Atkins & Co., Ltd., Wm., Sheffield, Eng
Marshall, Son & Bunney, Toronto.
Firth & Sons, Thos., Montreal, Que.

DIES FOR SCREW PLATES
Ackworthie Ltd., J., Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que
Wells Bros. Co. of Can., Galt, Ont.

DIES, SHEET METAL WORKING
Ackworthie Ltd., J., Birmingham, Eng.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada
Globe Engineering Co., Hamilton, Ont.
Stoll Co., D. H., Buffalo, N.Y.

DIES, SCREW AND THREAD
Ackworthie Ltd., J., Birmingham, Eng.
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit.
National-Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros., Co., of Can., Galt, Ont

DISCS, LEATHER, STEEL
Graton & Knight Mfg. Co., Worcester, Mass.

DIRECT CONNECTED UNITS
MacGovern & Co., Montreal, Que.

DRAFT, MECHANICAL
Butterfield & Co., Rock Island, Que.
Can. Blower & Forge Co., Kitchener.
A. B. Jardine & Co., Hespeler, Ont.
Pratt & Whitney Co., Dundas, Ont.
Sturtevant Co., B. F., Galt, Ont.

DRAINAGE FITTINGS
Crane, Ltd., Montreal, Que.

DRAWING INSTRUMENTS
Hughes, Owens Co., Ltd., Montreal, Que.

DRAWING OFFICE SUPPLIES
Hughes, Owens Co., Ltd., Montreal, Que.

DRESSERS, GRINDING AND EMERY WHEEL
Atkins & Co., E. C., Hamilton, Ont.
Can. Desmond-Stephan Mfg. Co., Hamilton
Dominion Abrasive Co., Ltd., Mimico, Ont
Petrie, Ltd., H. W., Toronto.
Wheel Trueing Tool Co., Windsor, Ont.

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Can. Blower & Forge Co., Kitchener.
Canada Machinery Corp., Galt, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machinery Co., Toronto
Garvin Machine Co., New York.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
U. S. Mach. Tool Co., Cincinnati, Ohio.
A. R. Williams Machinery Co., Toronto.

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Atkins & Co., Ltd., Wm., Sheffield, Eng.
Lincoln Electric Co. of Canada, Ltd., Toronto, Ont.
Marshall, Son & Bunney, Toronto.
Swedish Steel & Importing Co., Ltd., Montreal.

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Canada Machinery Corp., Galt, Ont.
Petrie, Ltd., H. W., Toronto.
Silver Mfg. Co., Salem, Ohio.
Strelinger, Chas. A. Co., Windsor, Ont.

DRILLING MACHINES, LOCOMOTIVE AND MULTIPLE SPINDLE
John Bertram & Sons Co., Dundas.
Bilton Mach. Tool Co., Bridgeport, Conn.
Can. Blower & Forge Co., Kitchener, Ont
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal
Garlock-Walker Mach. Co., Toronto.
Garvin Machine Co., New York.
Hoefer Mfg., Co., Freeport, Ill.
Henry & Wright Mfg. Co., Hartford, Conn
A. B. Jardine & Co., Hespeler, Ont.
Landis Tool Co., Waynesboro, Pa.
Nat. Automatic Tool Co., Richmond, Ind.
Niles-Bement-Pond Co., New York.
Rockford Drilling Mach Co., Rockford, Ill
Strelinger, Chas. A. Co., Windsor, Ont.

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Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Herbert, Ltd., Alfred, Toronto, Ont.
Henry & Wright Mfg. Co., Hartford.
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

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Canadian Fairbanks-Morse Co., Montreal
Canadian Machinery Corp., Galt, Ont.
Geo. F. Foss Mch. & S'ply Co., Montreal
Garlock-Walker Mach. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn
Herbert, Ltd., Alfred, Toronto, Ont.
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
United States Mach. Tool Co., Cincinnati
Williams Mchy Co., A. R., Toronto, Ont.

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Can. Blower & Forge Co., Kitchener.
Canada Mach. Corp., Galt, Ont.
Garvin Machine Co., New York.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mach. Co., Toronto, Ont.
Herbert, Ltd., Alfred, Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
A. B. Jardine & Co., Hespeler, Ont.
Landis Tool Co., Waynesboro, Pa.
R. McDougall Co., Galt.
Nat. Automatic Tool Co., Richmond, Ind
Rockford Drilling Mach. Co., Rockford, Ill
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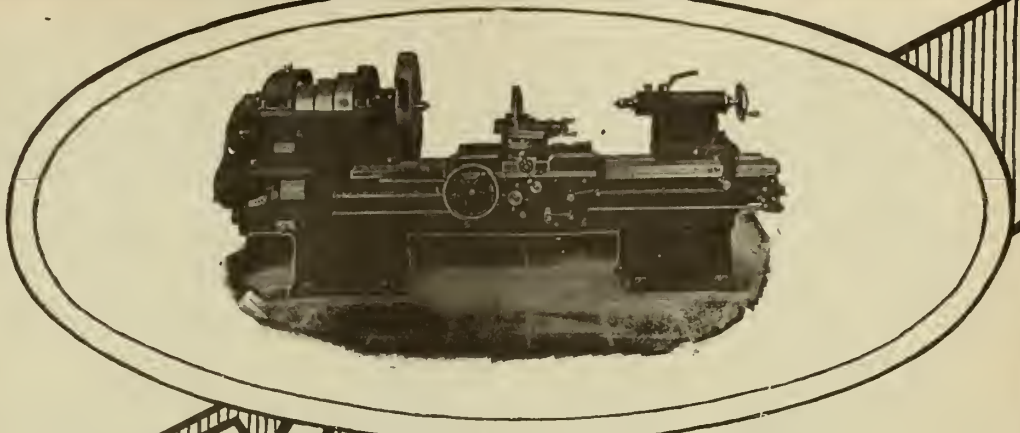

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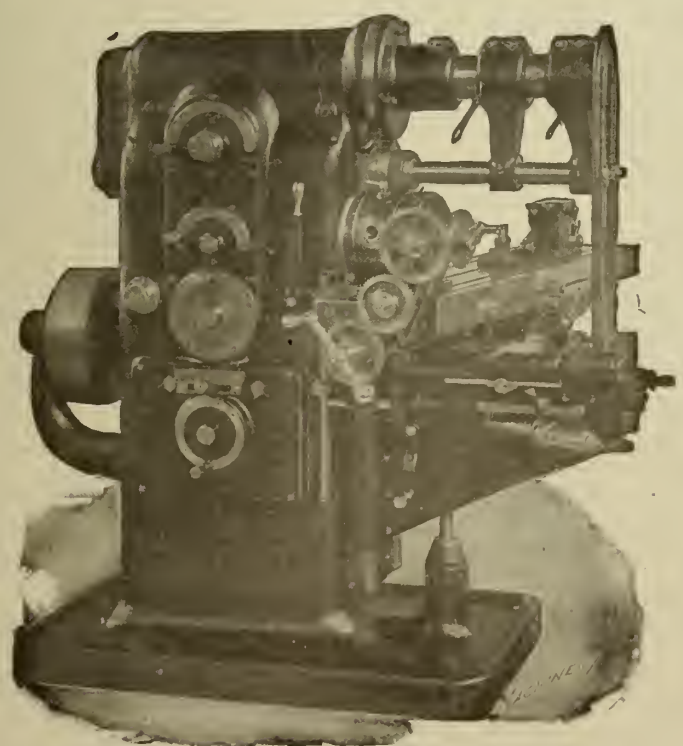

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A. R. Williams Machinery Co., Toronto.

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Garlock-Walker Machinery Co., Toronto.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
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U.S. Electrical Tool Co., Cincinnati, O.

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Strelinger, Chas. A. Co., Windsor, Ont.
Wilkinson & Kompass, Hamilton, Ont.
Wilt Twist Drill Co. of Can., Walkerville

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Cleveland Twist Drill Co., Cleveland.
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Rice Lewis & Son, Toronto, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
Wilt Twist Drill Co., of Can., Walkerville

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Eclipse Counterbore Co., Ltd., Walkerville, Ont.

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Butterfield & Co., Inc., Rock Island, Que.
Marshall, Son & Bunney, Toronto.
John Morrow Screw & Nut Co., Ingersoll

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Pilot Steel & Tool Co., Montreal, Que.
Prest-O-Lite Co., Inc., Toronto, Ont.
Strelinger Co., C. A., Windsor, Ont.
U. S. Electrical Tool Co., Cincinnati, O.
A. R. Williams Mach. Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

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Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford Mass.
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Niles-Bement-Pond Co., New York.
Williams Mchy Co, Ltd., A. R., Montreal
Greenfield Tap & Die Corp., Greenfield. Mass.

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Garlock-Walker Machinery Co., Toronto.
Holden Co., Ltd., Montreal, Que.
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Cleveland Twist Drill Co., Cleveland.
Garlock-Walker Mchy. Co., Toronto, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Mch. Co., New Bedford Mass.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
Wilt Twist Drill Co. of Can., Walkerville.

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A. R. Williams Machy. Co., Toronto.

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Globe Engineering Co.

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Holden Co., Ltd., Montreal, Que.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Wilt Twist Drill Co. of Can., Walkerville.

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Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

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MacKinnon Steel Co., Sherbrooke, Que.

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MacGovern & Co., Montreal Que.
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Northern Electric Co., Ltd., Montreal Que

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Volta Manufacturing Co., Welland, Ont.

EECTRIC FURNACE REGULATORS, WINCHES, ROOF COOLERS AND ELECTRODE HOLDERS
Volta Manufacturing Co., Welland Ont.

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Volta Manufacturing Co., Welland, Ont.

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Sturtevant Co., B. F., Galt, Ont.
Volta Manufacturing Co., Welland, Ont.

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Canada Wire & Iron Goods Co., Hamilton

ELEVATOR WEIGHTS
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Curtis Pneumatic Machy. Co., St. Louis.

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Lyman Tube & Supply Co., Montreal, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Petrie, Ltd., H. W., Toronto.

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Oliver Machinery Co., Grand Rapids, Mich

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Cleveland Pneumatic Tool Co., Toronto.
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Holden Co., Ltd., Montreal, Que.

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EMERY PAPER
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Garvin Machine Co., New York.
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Canada Emery Wheels Co., Hamilton.
Dominion Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Mach. Co., Hamilton, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.
Wilkinson & Kompass, Hamilton, Ont.
Dominion Abrasive Wheel Co., Ltd., Mimico, Ont.

EMERY WHEEL DRESSINGS
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Wheel Trueing Tool Co., Windsor Ont.

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Crane, Ltd., Montreal, Que.

END MILLS
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Canadian Fairbanks-Morse Co., Montreal.
Holden Co., Ltd., Montreal, Que.
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MacGovern & Co., Montreal, Que.
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Wilkinson & Kompass, Hamilton, Ont.

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FIRE CLAY
Elk Fire Brick Co., Can., Ltd., Hamil
General Combustion Co., Ltd., Montreal, Que.

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Canada Machinery Corp., Galt, Ont.
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National Machy. Co., Tiffin, Ohio.
Petrie, Ltd., H. W., Toronto.

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Mechanical Eng'r'g Co., Three Rivers, Q
W. S. Rockwell Co., New York, N.Y
Petrie, Ltd., H. W., Toronto.

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General Combustion Co., Ltd., Montreal.

FURNACES, ELECTRIC
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W. S. Rockwell Co., New York, N.Y.

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FUSE PLUGS AND FUSES
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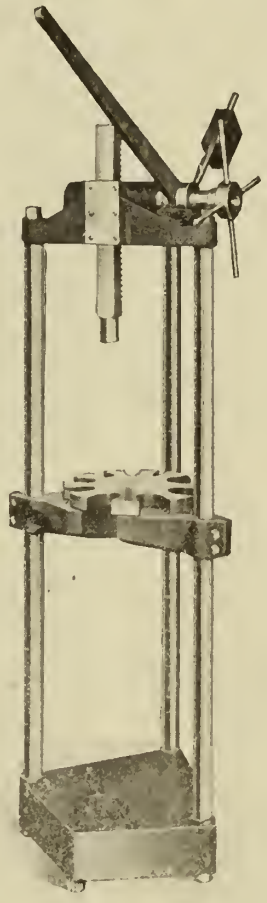
The Powerful "three point" construction permits the maximum of strain with perfect alignment.

The Ratchet Feed with the long leverage giving unexcelled power, together with the automatic release, obtains easy and efficient operation.



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GAUGES, HYDRAULIC
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Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Can., Galt, Ont

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Taylor Instrument Co., Rochester, N.Y.

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Brown Engineering Corp., Toronto, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Crescent Mchc. Co., Ltd., Montreal, Que.
Garvin Machine Co., New York.
C. E. Johanson, Inc., Toronto, Ont.
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Hartford, Conn
Strelinger, Chas. A. Co., Windsor, Ont.
Taylor, J. A. M., 318 Stair Bldg., Toronto
Wells Brothers Co. of Canada, Galt, Ont.

GEAR BLANKS
Can. Steel Foundries, Ltd., Montreal.
Dom. Found. & Steel, Hamilton, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

GEAR BLANKS, CAST
Katie Foundry, Galt, Ont.

GEAR BLANKS, RAWHIDE
Lyman Tube & Supply Co., Montreal, Que.

GEAR BOXES ,REDUCTION
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GEAR SHAPERS AND CUTTERS
Fellows Gear & Shaper Co., Springfield, V.

GEAR-CUTTING MACHINERY
Bilton Mach. Tool Co., Bridgeport, Conn.
Fellows Gear & Shaper Co., Springfield, V.
Garlock-Walker Mchy. Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto.
A. R. Williams Machy. Co., Toronto.

GEAR-TESTING MACHINE
Gisholt Machine Co., Madison, Wis.

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Can. Link-Belt Co., Ltd., Toronto, Ont.
Morse Chain Co., Ithaca, New York.
Renold of Canada Ltd., Montreal.

GEARS, COMPENSATING
Morse Chain Co., Ithaca, New York.
Can. Link-Belt Co., Ltd., Toronto, Ont.

GEARS, CUT, MORTISE, ANGLE, WORM
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Diamond State Fibre Co., Bridgeport, Pa.
Dom. Steel Products Co., Ltd., Brantford.
Dominion Bridge Co., Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Gardner, Robt., & Son, Montreal.
Hamilton Gear & Machine Co., Toronto.
Hull Iron & Steel Found., Ltd., Hull, Q.
Jones & Glassco, Montreal.
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Philadelphia Gear Works, Philadelphia.
Victoria Foundry Co., Ottawa.

GEARS, RAWHIDE
Gardner, Robt., & Son, Montreal.
Grant Gear Works, Boston, Mass.
Hamilton Gear & Machine Co., Toronto.
Hamilton Co., Ltd., Wm., Peterborough,
Jones & Glassco, Montreal.
Lyman Tube & Supply Co., Montreal, Que.
Philadelphia Gear Works, Philadelphia.
A. R. Williams Machy, Co., Toronto.

GENERATORS, GEAR
Fellows Gear & Shaper Co., Springfield, V

GEARS, SILENT CHAIN
Can. Link-Belt Co., Ltd., Toronto, Ont.

GEARS, SPRING
Morse Chain Co., Ithaca, New York.

GEARS, SPUN, BENCH, SPIRAL
Brown & Sharpe Mfg. Co., Providence, R.I.

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GENERATORS, MOTOR
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Holden Co., Ltd., Montreal, Que.

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Rice Lewis & Son, Toronto.

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Morris Crane & Hoist Co., Ltd., Herbert
Niagara Falls, Ont.

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Garlock-Walker Machinery Co., Toronto

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Superior Machinery Co., London, Ont.

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Wisconsin Electric Co., Inc., Racine, Wis
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Ford-Smith Mach. Co., Hamilton, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machinery Co., Toronto.
Holden Co., Ltd., Montreal, Que.
Katie Foundry, Galt, Ont.
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Niles-Bement-Pond Co., New York, N.Y.
Perfect Machine Co., Galt, Ont.
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Williams Mchy Co., A. R., Toronto, Ont.

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Cincinnati Milling Mach. Co., Cincinnati.
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Garvin Machine Co., New York.
Globe Engineering Co., Hamilton, Ont.
Greenfield Machine Co., Greenfield, Mass.
Greenfield Tap & Die Corp., Greenfield, M.
Heald Machine Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.
Manhattan Machine & Tool Co., Grand Rapids, Mich.
Norton Co., Worcester, Mass.
Pratt & Whitney Co., Dundas, Ont.
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Williams Mchy Co., A. R., Toronto, Ont.

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Landis Machine Co., Waynesboro, Pa.
National-Acme Co., Cleveland, Ohio.

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Gardner Machine Co., Beloit, Wis.
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Greenfield Tap & Die Corp., Greenfield.
La Salle Tool Co., La Salle, Ill.
Petrie, Ltd., H. W., Toronto.
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Wells Bros. of Canada, Galt, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

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Heald Machine Co., Worcester, Mass.
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Norton Co., Worcester, Mass.
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Garlock-Walker Machinery Co., Toronto.
Greenfield Machine Co., Greenfield, Mass.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool Co., Chicago
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
United States Elec. Tool Co., Cincinnati
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Cleveland Pneumatic Tool Co., Toronto.
Garlock-Walker Machinery Co., Toronto.
Heald Machine Co., Worcester, Mass.
Independent Pneumatic Tool Co., Chicago
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Manhattan Machine & Tool Co., Grand Rapids, Mich.

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Greenfield Machine Co., Greenfield, Mass.
Greenfield Tap & Die Corp., Greenfield.
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Tabor Mfg. Co., Philadelphia, Pa.
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Petrie, Ltd., H. W., Toronto.
Pratt & Whitney Co., Dundas, Ont.
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Norton Co., Worcester, Mass.
Strelinger, Chas. A. Co., Windsor, Ont.
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Gardner & Son, Robt., Montreal.
Garvin Machine Co., New York.
Garlock-Walker Machy. Co., Toronto.
Greenfield Machine Co., Greenfield, Mass.
Haskins & Co., R. C., Chicago, Ill.
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Norton Co., Worcester, Mass.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
Wisconsin Electric Co., Racine, Wis.
Williams Mchy Co., A. R., Toronto, Ont.
Williams Tool Corp. of Can. Ltd., Brantford, Ont.

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Norton Co., Worcester, Mass.

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Ford-Smith Machine Co., Hamilton, Ont.
Foss Mchy. & S'ply Co. G. F., Montreal
Norton Co., Worcester, Mass.

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Dennis Wire & Iron Works, London, Ont
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Williams Mchy Co., A. R., Toronto, Ont.

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Garvin Machine Co., New York City.
Victor Saw Works, Hamilton, Ont.
Rice Lewis & Son, Toronto, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
Wilkinson & Kompass, Hamilton, Ont.

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Atkins & Co., E. C., Hamilton, Ont.
Can. Fairbanks-Morse Co., Montreal.
Diamond Saw & Stamping Wks., Buffalo.
Foss Mchy. & S'ply Co., G. F., Montreal
Ford-Smith Machine Co., Hamilton.
Perfect Machine Co., Galt, Ont.
Starrett Co., L. S., Athol, Mass.
Victor Saw Works, Hamilton, Ont.
Williams Machy. Co., A. R., Toronto.
Williams Mchy Co., A. R., Toronto, Ont

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Hoskins & Co., R. C., Chicago, Ill.

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Niles-Bement-Pond Co., New York, N.Y.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Toledo Machine & Tool Co., Toledo.
United Hammer Co., Boston, Mass.
Williams Mchy Co, Ltd., A. R., Montreal

HAMMERS, HELVE POWER
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Petrie, Ltd., H. W., Toronto.
Williams Mchy Co, Ltd., A. R., Montreal.

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Independent Pneumatic Tool Co., Chicago
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United Hammer Co., Boston, Mass.

HAMMERS, POWER
Nazel Eng. & Mach. Wks., Philadelphia

HAMMERS, STEAM
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Niles-Bement-Pond Co., New York.

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Canadian Link-Belt Co., Ltd., Toronto, Ont.

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Pratt & Whitney Co., Dundas, Ont.
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Wells Bros. of Canada Galt, Ont.

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Holden Co., Ltd., Montreal, Que
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Niagara Falls, Ont.

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Ford Chain Block & Mfg., Philadelphia.
Independent Pneumatic Tool Co., Chicago
Lyman Tube & Supply Co., Montreal, Que.
Morris Crane & Hoist Co., Herbert.
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Northern Crane Works, Walkerville, Ont
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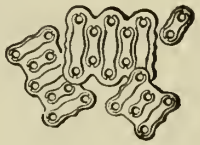

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If interested tear out this page and place with letters to be answered.

CANADIAN MACHINERY

BUYERS' DIRECTORY

Volume XXIV.

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Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
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Volta Mfg. Co., Welland, Ont.

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Starrett Co., L. S., Athol, Mass.

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Petrie, Ltd., H. W., Toronto.

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Petrie, Ltd., H. W., Toronto.

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Globe Engineering Co., Ltd., Hamilton.
Jones & Lamson, Springfield, Vt.

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Dominion Foundries & Steel Ltd., Hamilton, Ont.

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Williams Machy. Co., A. R., Toronto.

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Canada Machinery Corp., Galt, Ont.

LATHES, BORING
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Strelinger, Chas. A. Co., Windsor, Ont.

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Geo. F. Foss Machy. & Supply Co., Montreal.
Garlock-Walker Machinery Co., Toronto.
Petrie, Ltd., H. W., Toronto.
Pratt & Whitney Co., Dundas, Ont.
Seneca Falls Mfg Co., Seneca Falls, N.Y.
Strelinger Co., C. A., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

LATHES, BRASS
Ackworthie Ltd., J., Birmingham, Eng.
Acme Machine Tool Co., Cincinnati, Ohio.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

LATHES, ENGINE
Acme Machine Tool Co., Cincinnati, O.
John Bertram & Sons, Co., Dundas.
Canada Machy. Corp., Galt, Ont.
Canadian Fairbanks-Morse Co., Montreal.
G. F. Foss, Mchy. & S'ply Co., Montreal
Garlock-Walker Machinery Co, Toronto.
Garvin Machine Co., New York.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Kennedy & Sons, Wm., Owen Sound, Ont.
Lehman Mach. Co., St. Louis, Mo.
R. McDougall Co., Galt.
Niles-Bement-Pond Co., New York.
Perfect Machine Co., Galt, Ont.
Standard Equipment & Tool Wks, Montreal, P.Q.
Seneca Falls Mfg. Co., Seneca Falls, N.Y.
Sidney Tool Co., Sidney, Ohio.
Strelinger Co., C. A., Windsor, Ont.
Walcott Lathe Co., Jackson, Mich.
A. R. Williams Machy. Co., Toronto
Williams Mchy Co., A. R., Toronto, Ont.

LATHES, FOOT POWER
Seneca Falls Mfg. Co., Seneca Falls, N.Y

LATHES, HORIZONTAL
Intern'l. Mchy. Supplies Ltd., Montreal.

LATHES, JOURNAL TRUEING
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.

LATHES, PATTERNMAKERS'
J. G. Blount Co., Everett, Mass.
Can. Machinery Corp., Galt.
G. F. Foss Mchy. & S'ply Co., Montreal
Garlock-Walker Machy. Co., Toronto, Ont.

LATHES, POLISHING
Ackworthie Ltd., J., Birmingham, Eng.
Greenfield Tap & Die Corp., Greenfield
Wells Bros. of Canada, Galt, Ont.

LATHES, SCREW CUTTING
Bertram & Sons Co., John, Dundas, Ont.
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Foss Mchy. & Sply Co., G. F., Montreal
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Lehman Machine Co., St. Louis, Mo.
Niles-Bement-Pond Co, New York.
Seneca Falls Mfg. Co., Seneca Falls, N.Y.
Strelinger Co., C. A., Windsor, Ont.
Williams Machy. Co., A. R., Toronto.

LATHES, SPINNING
Bliss Co., E. W., Brooklyn, N.Y.

LATHES, TOOL ROOM
Canada Machinery Corporation, Galt, Ont.
Lehman Machine Co., St. Louis, Mo.
Seneca Falls Mfg. Co., Seneca Falls, N.Y.
Strelinger, Chas. A. Co., Windsor, Ont.

LATHES, QUICK CHANGE
Lehman Machine Co., St. Louis, Mo.

LATHE SAWS
Atkins & Co., E. C., Hamilton, Ont.

LATHES, TURRET
Acme Machine Tool Co., Cincinnati, Ohio
Herbert Ltd., Alfred, Toronto, Ont.

LEAD, PIG AND BAR
British Smelting & Refining Co., Ltd., Montreal, Que.
Hoyt Metal Co., Toronto, Ont.

LEAD BURNING OUTFITS
Turner Brass Works, Sycamore, Ill.

LEATHER STRAPPING
Graton & Knight Mfg. Co., Worcester, M.

LENSES FOR GOGGLES
Standard Optical Co., Geneva, N.Y.

LEVELS
Hughes, Owens Co., Ltd., Montreal, Que.

LIDS, SCREW TOP AND HINGE
Can. Whitley Co., Ltd., Windsor, Ont.

LINK BELTING
See Belting, Chain.

LINOLEUM MILL MACHINERY
Bertrams, Ltd., Edinburgh, Scotland.

LOCKERS, STEEL WARDROBE AND STEEL MATERIAL
Canada Wire & Iron Gds. Co., Hamilton
Dennis Wire & Iron Works, London, Ont

LUBRICANTS
Cataract Refining & Mfg. Co., Toronto.
Swan & Finch, Inc., New York.

LUBRICANTS, CUTTING AND GRINDING, DRAWING, STAMPING
Oakley Chemical Co., New York, N.Y.

LUBRICATING, OIL FILTERING AND CIRCULATING SYSTEMS
Bowser Co., Ltd., S. F., Toronto, Ont.

LUBRICATORS
Trabern Pump Co., Rockford, Ill.

LUMBERMEN'S TOOLS
Thos. Pink Co., Ltd., Pembroke Ont.

MACHINE COUNTER WEIGHTS
Katie Foundry, Galt, Ont.

MACHINE TOOLS
Barber Mach. Co., F. F., Toronto, Ont.

MACHINERY DEALERS
Archibald & Co., Chas. P., Montreal.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co. G. F., Montreal
Garlock-Walker Machy. Co Toronto, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Machy. Co., A. R., Toronto.

MACHINERY GUARDS (See Guards)

MACHINERY SUPPLIES
Crescent Machine Co., Ltd., Montreal.
Globe Engineering Wks., Hamilton, Ont.

MACHINERY, SPECIAL
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Crescent Machine Co., Ltd., Montreal, Que.
McClean Machine & Tool Co., Ltd., Hamilton, Ont.

MACHINISTS' TOOLS
Atkins & Co., E. C., Hamilton, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Starrett Co., L. S., Athol, Mass.

MAGNETIC BRAKES FOR ELECTRIC MOTORS
Volta Mfg. Co., Welland, Ont.

MANDRELS
Butterfield & Co., Inc., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Jardine & Co., A. B., Hespeler, Ont.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
McCrosky Tool Corp., Meadville, Pa., U. S. A.
Pratt & Whitney Co., Dundas, Ont.

MARKING MACHINERY
Brown, Boggs Co., Hamilton, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal
Perrin, Wm. R., Toronto.
Petrie, Ltd., H. W., Toronto.

MATS, RUBBER MATTING
Quaker City Rubber Co., Philadelphia, Pa
International Mchy. Sply., Ltd., Montreal

MEASURING MACHINES
Pratt & Whitney Co., Dundas, Ont.

MEASURES, REGISTERING
Bowser Co., Ltd., S. F., Toronto, Ont.

MEASURING TAPES AND RULES
Chesterman & Co., Jas., Sheffield, Eng.

MERCHANTS, IRON AND STEEL
Samuel Osborne (Can.), Ltd., Montreal.

METALLURGISTS
See Chemists.

METAL CLEANERS
Oakley Chemical Co., New York, N.Y.

METAL CUTTING MACHINES
Atkins & Co., E. C., Hamilton, Ont.
Lyman Tube & Supply Co., Montreal, Que.

METAL SAWS
See Saws.

METAL SAWS, POWER
E. C. Atkins & Co., Inc., Indianapolis.
Hoefer Mfg. Co., Freeport, Ill.
Lyman Tube & Supply Co., Montreal, Que.

METALS
British Smelting & Refining Co., Ltd., Montreal, Que.
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.
Canada Metal Co., Toronto, Ont.
Deloro Smelting & Refining Co., Ltd, Toronto, Ont.
Hoyt Metal Co., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.

METAL, STAMPINGS, SMALL
Can. Whitley Co., Ltd., Windsor, Ont.

METERS, OIL, GASOLINE, KEROSENE, ETC.
Bowser Co., Ltd., S. F., Toronto, Ont.
General Combustion Co., Ltd., Montreal, Que.

MICROMETERS
Taylor, J. A. M., 518 Stair Bldg., Toronto.
Petrie, Ltd., H. W., Toronto.

MILLS, BRACE AND TUBE
Elec. Steel & Metals, Welland, Ont.

MILL SPECIALTIES
Atkins & Co., E. C., Hamilton, Ont.

MILLS, SAND
Frost Mfg. Co., Chicago, Ill.

MILL MACHINERY
Alexander Fleck, Ltd., Ottawa.
Greenfield Tap & Die Corp., Greenfield
Wells Bros. of Canada, Galt, Ont.

MILLING ARBORS
Ackworthie Ltd., J., Birmingham, Eng.
Barber Mchy. Co., Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Kearney & Trecker Co., Milwaukee Wis.
Strelinger, Chas. A. Co., Windsor, Ont.

MILLING ATTACHMENTS
Ackworthie Ltd., J., Birmingham, Eng.
Bertram & Sons Co., John, Dundas, Ont.
Brown & Sharpe Mfg. Co., Providence.
Canada Machinery Corp., Galt, Ont.
Cincinnati Milling Machine Co., Cincinnati
Ford-Smith Mach. Co., Hamilton, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal
Hendey Mach. Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.

MILLING MACHINES, AUTOMATIC
Bilton Mach. Tool Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Betts Machine Co., Rochester, N.Y.
Petrie, Ltd., H. W., Toronto.
Standard Equipment & Tool Wks., Montreal, P.Q.

MILLING CUTTERS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Milling Machine Co., Cleveland.
Deloro Smelting & Refining Co., Ltd, Toronto, Ont.
Herbert, Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Marshall, Son & Bunney, Toronto.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

MILLING MACHINES, HAND
Bristol Machine Tool Co., Bristol, Conn.

MILLING MACHINES, THREAD
Gisholt Machine Co., Madison, Wis.
United States Mach. Tool Co., Cincinnati.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Standard Equipment & Tool Wks., Montreal, P.Q.
Strelinger, Chas. A. Co., Windsor, Ont.

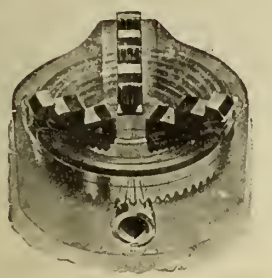
MILLING MACHINES, HORIZONTAL AND VERTICAL
Bristol Machine Tool Co., Bristol, Conn.
Brown & Sharpe Mfg. Co., Providence.
Bertram & Sons Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Cochrane-Bly Co., Rochester, N.Y., U.S.A.
Ford-Smith Mach. Co., Hamilton, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.
Herbert, Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Rockford Milling Mach. Co., Rockford, Ill.
Strelinger, Chas. A. Co., Windsor, Ont.
United States Mach. Tool Co., Cincinnati.
Williams Machy. Co., A. R., Toronto.

MILLING MACHINES, PLAIN, BENCH AND UNIVERSAL
Bilton Mach. Tool Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence.
Canada Machinery Corp., Galt, Ont.
Cleveland Milling Machine Co., Cleveland.
Cincinnati Milling Machine Co., Cincinnati
Ford-Smith Mach. Co., Hamilton, Ont.

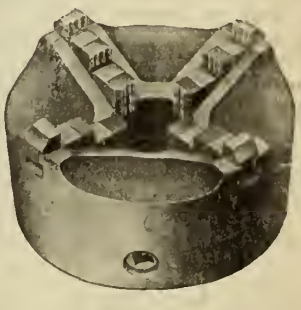
WILLIAMS & WILSON, LIMITED

Cable Address "Willwills" Montreal, P.Q. Established 1891

"Improved"
"Taylor" Patent Spiral Lathe Chucks



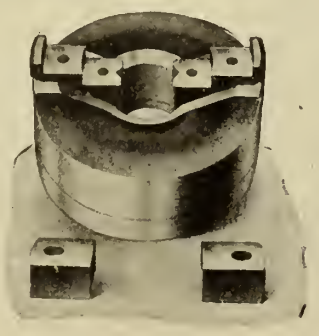
The Best Chucks For High Speed Steel



The ordinary Scroll Chuck is good enough for some purposes—but not for **High Speed Cutting Steels.** A chuck of tremendously greater gripping power is necessary! This gripping power is found in the

"Improved" "Taylor" Patent Self-Centering Chuck

It meets perfectly the demands of all High Speed Cutting Steels. Every part is made to **Limit Gage** and is **Interchangeable.** For Power of Grip, Accuracy and Service it is the best chuck on the market.



During the war, and for some time after, we were unable to secure these chucks, but now we can fill all orders promptly.

WILLIAMS & WILSON, LIMITED, MONTREAL, P.Q.

84 INSPECTOR STREET

If interested tear out this page and place with letters to be answered.

Fuss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Garvin Machine Co., New York.
Herbert, Ltd., Alfred, Toronto, Ont.
National Machy. Co., Tiffin, Ohio.
Cooley & Efkland, Inc., Cortland, N.Y.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Standard Equipment & Tool Wks., Montreal, P.Q.
Strelinger, Chas. A. Co., Windsor, Ont.

MILLING MACHINES, PROFILE

Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Fuss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

MILLING TOOLS

Aikenhead Hardware Co., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence.
Ford-Smith Mach. Co., Hamilton, Ont.
Geometric Tool Co., New Haven, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
Rice Lewis & Son, Toronto, Ont.
Baker Mfg. Co., Philadelphia, Pa.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

MINE CARS

Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Dominion Bridge Co., Montreal, Que.
Elec. Steel & Metals, Welland, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
Pratt & Whitney Co., Dundas, Ont.

MINING MACHINERY

Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Elec. Steel & Metals, Welland, Ont.
Holden Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto.
Williams Machy. Co., A. R., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

MIXERS, SAND

Foust Mfg. Co., Chicago, Ill.

MORTISING CHAINS

Renold of Canada Ltd., Montreal.

MORTISING MACHINES

Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.

MOTORS, ELECTRIC

Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Toronto.
Lincoln Electric Co. of Canada, Ltd., Toronto, Ont.
MacGovern & Co., Montreal, Que.
Northern Elec. Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Sturtevant Co., B. F., Galt, Ont.
Volta Mfg. Co., Welland, Ont.
Williams Mach'y Co., A. R., Toronto.

MOTOR SPRINGS

The Dunbar Brothers Co., Bristol, Conn.

MOTORCYCLE FRAME AND FORK

The Dunbar Brothers Co., Bristol, Conn.

MOTORS, PNEUMATIC

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto.
Holden Co., Ltd., Montreal, Que.

MOULDS, RUBBER

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

MULTIPLE INDEX CENTRES

Garvin Machine Co., New York.
Graton & Knight Mfg. Co., Worcester, M.

MULTI-DRILLING, MULTI-BORING, MULTI-TAPPING MACHINERY.

Nat. Automatic Tool Co., Richmond, Ind.

MUNICIPALITIES

City of St. John, Quebec.

NAIL SETS

Morrow Screw & Nut Co., J., Ingersoll, Ont

NAME PLATES, BRONZE, ETCHED AND STAMPED

Turner Brass Works, Sycamore, Ill.

NICHROME CASTINGS

Can. Driver-Harris Co., Ltd., Walkerville.

NICKEL

Pilot Steel & Tool Co., Montreal, Que.

NICKEL STEEL

See Steel.

NICKEL SILVER—SHEETS, ROLLS, PLATES and RODS

Brown's Copper and Brass Rolling Mills, New Toronto.

NIPPLE THREADING MACHINES

Landis Machine Co., Waynesboro, Pa.
Williams Tool Corp. of Can. Ltd., Brantford, Ont.

NITROGEN

Carter Welding Co., Toronto, Ont.

NUTS, STEEL, CASTELLATED AND COLD PRESSED

Galt Machine Screw Co., Ltd., Galt, Ont.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Williams & Co., J. H., Brooklyn, N.Y.

NUTS, SEMI-FINISH AND FINISHED

Gaut Machine Screw Co., Galt, Ont.
National-Acme Co., Cleveland, Ohio.
Wilkinson & Kompass, Hamilton.

NUT LOCKS

Edw. W. Robinson Co., Ltd., Montreal.

NUT BURRING AND NUT MACHINES (HOT)

National Machy. Co., Tiffin, Ohio.

NUT FACING AND BOLT SHAVING MACHINES

Garvin Machine Co., New York.
National Machinery Co., Tiffin, Ohio.
Petrie, Ltd., H. W., Toronto.
Victor Tool Co., Waynesboro, Pa.

NUT TAPPERS

Bertram & Sons Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
Jardine & Co., A. B., Hespeler.
Landis Machine Co., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Tool Corp. of Can. Ltd., Brantford, Ont.

OILERS

All-Way Oiler Mfg. Co., Toronto, Ont.

OIL SEPARATORS

Can. Fairbanks-Morse Co., Montreal.

OIL STONES

Aikenhead Hardware Co., Toronto, Ont.
Carborundum Co., Niagara Falls, N.Y.
Norton Co., Worcester, Mass.
Rice Lewis & Son, Toronto, Ont.

OIL STONE GRINDERS

Oliver Machy. Co., Grand Rapids, Mich.

OIL STORAGE SYSTEMS

Bowser Co., Ltd., S. F., Toronto, Ont.

OPENING DIE HEADS

Greenfield Tap & Die Corp, Greenfield.
Wells Bros. of Canada, Galt, Ont.

ORE HANDLING EQUIPMENT

Brown Hoisting Machinery Co., Cleveland, Ohio.
Canadian Link-Belt Co., Ltd., Toronto, Ont.

OSCILLATING VALVE GRINDERS (PNEUMATIC)

Cleveland Pneumatic Tool Co. of Canada, Toronto.

OVENS FOR BAKING, BLUING, DRYING, ENAMELING, JAPANNING AND LACQUERING

Brantford Oven & Rack Co., Brantford.

OVEN TRUCKS, STEEL

Brantford Oven & Rack Co., Brantford.
MacKinnon Steel Co., Sherbrooke, Que.

OVENS FOR DRYING, TEMPER AND OXYGEN, ELECTROLYTIC CELLS UNDER TRUCKS

Brantford Oven & Rack Co., Brantford

OXY-ACETYLENE WELDING AND CUTTING AND OUTFITS

Carter Welding Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
L'Air Liquide Society, Toronto, Ont.
Prest-o-Lite Co., Inc., Toronto, Ont.
Davis-Bournonville Co., Toronto, Ont.

OXYGEN

Carter Welding Co., Ltd., Toronto, Ont.
Dominion Oxygen Co., Ltd., Toronto, Ont.
Nat. Electro Products Ltd., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.

OXYGEN PLANTS (ELECTROLYTIC)

Davis-Bournonville Co., Toronto, Ont.

PACKINGS, ASBESTOS

Cleveland Wire Spring Co., Cleveland.

PACKING, ROD AND SHEET

Dunlop Tire & Rubber Goods Co., Ltd. Toronto.
Goodyear Tire & Rubber Co., Can., Ltd., Toronto
Gutta Percha & Rubber, Ltd., Toronto.
International Mach. Spls., Ltd., Montreal
Petrie, Ltd., H. W. Toronto.
Quaker City Rubber Co., Philadelphia, Pa

PANS, WET AND DRY

Foust Mfg. Co., Chicago, Ill.

PAPER MILL CONVEYORS AND DRIVES

Bertrams, Ltd., Edinburgh, Scotland.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont
Gutta Percha & Rubber, Ltd., Toronto.
MacKinnon Steel Co., Sherbrooke, Que

PARTITIONS, WIRE

See Guards

PAPER MILL MACHINERY

Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Garlock-Walker Machinery Co., Toronto
Hamilton Co., Ltd., Wm., Peterborough, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

PATTERN SHOP EQUIPMENT

Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto
Oliver Machy. Co., Grand Rapids, Mich
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.

PATTERN MAKERS' LATHES

See Lathes.

PATENT SOLICITORS

Fetherstonhaugh & Co., Ottawa.
Marion & Marion, Montreal.
Ridout & Maybee, Toronto.

PECK CARRIERS FOR POWER PLANTS

Can. Link-Belt Co., Toronto, Ont.

PENSTOCKS

William Hamilton Co., Peterboro, Ont.

PERFORATED METALS AND ORNAMENTAL IRON GOODS

Canada Wire & Iron Goods Co., Hamilton

PHOSPHOR TIN, COPPER AND BRONZE

British Smelting & Refining Co., Ltd., Montreal, Que.

PHOTOSTATS

Commercial Camera Co., Providence, R.I

PIG IRON

Hanna & Co., M. A., Cleveland, O.
Steel Co. of Canada, Ltd., Hamilton, Ont.

PINS, TAPER

Morrow Screw & Nut Co., J., Ingersoll, Ont

PINS, BELT-LACING

Clipper Belt Lacer Co., Grand Rapids.

PIPE, BLACK & GALVANIZED

Crane, Ltd., Montreal, Que.

PIPE FITTINGS, MALLEABLE AND CAST IRON

International Malleable Iron Co., Guelph.

PIPE CUTTING AND THREADING MACHINES

Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
McDougall Co., R., Galt.
Petrie, Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Wells Bros. Co. of Canada, Galt, Ont.
Williams Machy. Co., A. R., Toronto.
Williams Tool Corp. of Can. Ltd., Brantford, Ont.

PIPE, JOINT COMPOUNDS

Crane, Ltd., Montreal, Que.

PIPE RIVETED STEEL

Toronto Iron Works, Ltd., Toronto.
William Hamilton Co., Peterboro, Ont.

PIERCING

Oliver Machy. Co., Grand Rapids, Mich.

PIPE CUTTERS, ROLLING

Greenfield Tap & Die Corp., Greenfield
Wells Bros. Co. of Canada, Galt, Ont
Williams Tool Corp. of Can. Ltd., Brantford, Ont.

PIPE TOOLS AND DIES

Ackworthie Ltd., J., Birmingham, Eng.
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PIPE CUTTERS AND REAMERS

Greenfield Tap & Die Corp., Greenfield.
Strelinger, Chas. A. Co., Windsor, Ont.
Wells Bros. of Canada, Galt, Ont.

PIPE STOCKS AND THREADERS

Greenfield Tap & Die Corp., Greenfield.
Strelinger, Chas. A. Co., Windsor, Ont.
Wells Bros. of Canada, Galt, Ont.

PIPE TAPS AND VISES

Ackworthie Ltd., J., Birmingham, Eng.
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PIPE WRENCHES

Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PISTON AND PISTON RING MACHINES

National Acme Co., Windsor, Vt.

PLANER BOLTS

Atkins & Co., E. C., Hamilton, Ont.
Morrow Screw & Nut Co., J., Ingersoll, Ont

PLANER JACKS

Armstrong Bros. Tool Co., Chicago.

PLANERS, STANDARD AND ROTARY

Betts Machine Co., Rochester, N.Y.
Bertram & Sons Co., John, Dundas.
Oliver Machy. Co., Grand Rapids, Mich.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal
Fuss Mchy. & S'ply Co., G. F., Montreal
Gardner & Son, Robt., Montreal.
Garlock-Walker Machinery Co., Toronto
Garvin Machine Co., New York
Herbert Ltd., Alfred, Toronto, Ont.
Morton Mfg. Co., Muskegon Heights, Mich
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
Standard Equipment & Tool Wks., Montreal.

PLANING AND SHAPING MACHINERY

Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Fuss Mchy & S'ply Co., G. F., Montreal
Garlock-Walker Machinery Co., Toronto
Garvin Machine Co., New York.
Herbert, Ltd., Alfred, Toronto, Ont.
Niles-Bement-Pond Co., New York.
Perrin, Ltd., William, Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co. Ltd., A. R., Montreal

PLANER-SHAPER, COMBINED OPEN SIDE

Petrie, Ltd., H. W., Toronto.

PLANING MILL EXHAUSTERS

Can. Blower & Forge Co., Kitchener, Ont.
MacGovern & Co., Montreal, Que.
Niles-Bement-Pond Co., New York.
Sturtevant Co., B. F., Galt, Ont.

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PLIERS

Aikenhead Hardware Co., Toronto.
Rice Lewis & Son, Toronto, Ont.

PNEUMATIC CYLINDERS

Holden Co., Ltd., Montreal, Que.

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Strelinger Co., C. A., Windsor, Ont.

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Cleveland Pneumatic Tool Co., Can., Toronto.
Chicago Pneumatic Machy. Co., St. Louis.
Garlock-Walker Machy. Co., Toronto.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool Co., Chicago.
Int. Mach. & Supply Co., Ltd., Montreal.
Strelinger, Chas. A. Co., Windsor, Ont.

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MacKinnon Steel Co., Sherbrooke, Que.

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Brown & Sharpe Mfg. Co., Providence, R.I.
Ford-Smith Machine Co., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto.

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Petrie, Ltd., H. W., Toronto.
Wells Bros. of Canada, Galt, Ont.

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Bliss Co., E. W., Brooklyn, N.Y.
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Eastern Production Co., Detroit, Mich.
Metalwood Mfg. Co., Detroit, Mich.
Petrie, Ltd., H. W., Toronto.
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Stoll Co., D. H., Buffalo, N.Y.
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Toledo Machine & Tool Co., Toledo.
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Metalwood Mfg. Co., Detroit, Mich.
Toledo Machine & Tool Co., Toledo.

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Brown, Boggs Co, Ltd., Hamilton.
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Niles-Bement-Pond Co., New York.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co, Toledo.

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Dom. Steel Products Co., Ltd., Brantford.
Eastern Production Co., Detroit, Mich.
Lourie Manufacturing Co., Springfield, Ill.
Metalwood Mfg. Co., Detroit, Mich.
Niles-Bement-Pond Co., New York.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.
Toledo Machine & Tool Co., Toledo.
Stoll Co., Inc., D. H., Buffalo, N.Y.
Williams Machy. Co., A. R., Toronto.

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Eastern Production Co., Detroit, Mich.

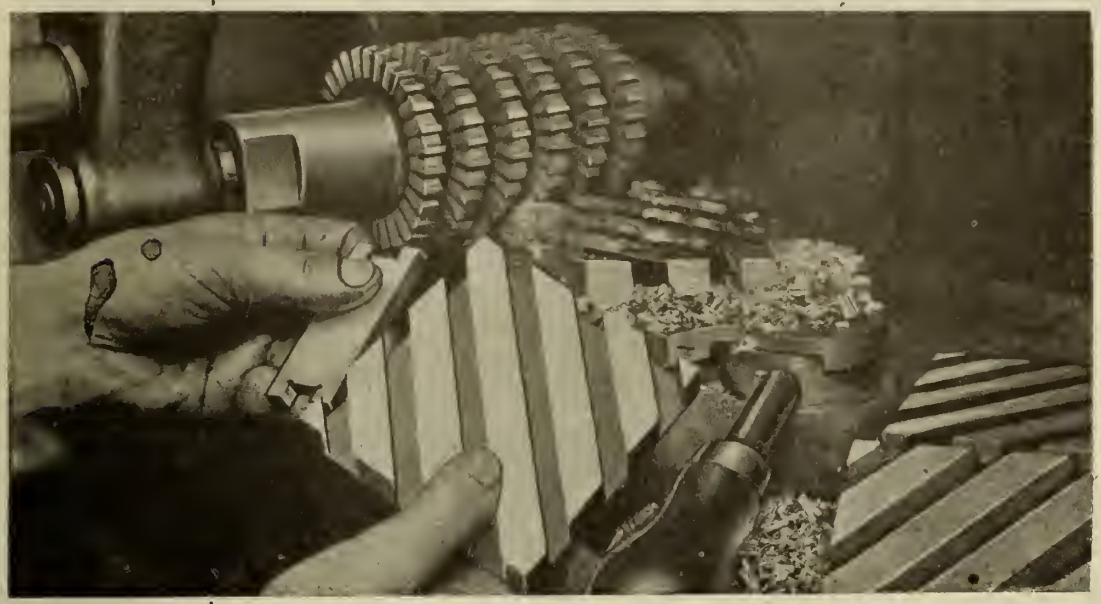
PRESSES, HYDRO-PNEUMATIC

Eastern Production Co., Detroit, Mich.

PRESSES, BALING

Perrin, Ltd., William R., Toronto.

MILWAUKEE MILLING MACHINES



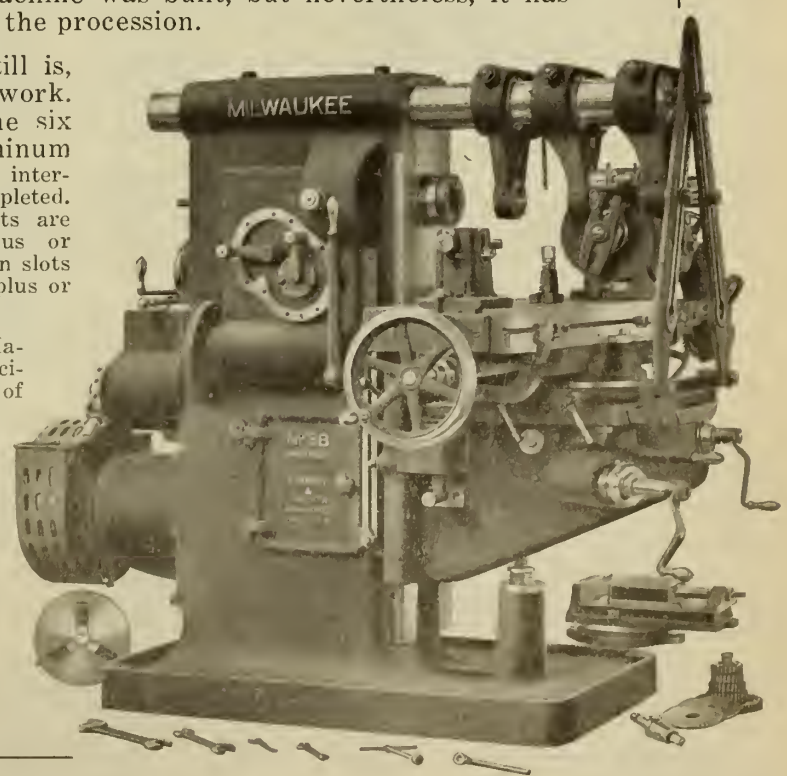
Durability and Accuracy

The above illustration shows a Milwaukee Milling Machine still doing extremely accurate work after eleven years of hard service. The world has gone a long way, industrially speaking, since the time this machine was built, but nevertheless, it has come right along with the procession.

It has been, and still is, used on precision work. One job is milling the six diagonal slots in aluminum squares which must be interchangeable when completed. Blocks are 4″ square; slots are 0.3870″ wide; 0.0005″ plus or minus limit; spaces between slots 0.5580″ wide with a limit, plus or minus, of 0.001″.

This Milwaukee Milling Machine's long record of efficiency proves the value of Milwaukee design when it comes to fine work and long service.

Milwaukee Milling Machines, latest models, fully described in catalog. Write for a copy, to-day.



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If interested tear out this page and place with letters to be answered

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Garlock-Walker Machinery Co., Toronto.
Perrin, Ltd., William R., Toronto.
Petrie, Ltd., H. W., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Machy. Co., A. R., Toronto.

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Petrie, Ltd., H. W., Toronto.

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Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
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Ford-Smith Machine Co., Hamilton, Ont.
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PULLEYS, FRICTION, CLUTCH
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Can. Link-Belt Co., Toronto, Ont.
Carlyle Johnson Mch. Co., Manchester, Ct.
Hamilton Co., Ltd., Wm., Peterborough, Ont.
Jones & Glassco, Montreal.
Positive Clutch & Pulley Works, Toronto.
Petrie, Ltd., H. W., Toronto.

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Hamilton Co., Ltd., Wm., Peterborough, Ont.
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Marshall, Son & Bunney, Toronto.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, O.
Williams Mchy Co., A. R., Toronto, Ont.

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Garlock-Walker Machinery Co., Toronto.
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Garlock-Walker Mach'y. Co., Toronto.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
Williams Mchy Co., A. R., Toronto, Ont.

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Shore Instrument & Mfg. Co., New York.
Taylor Instrument Co., Rochester, N.Y.

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Niles-Bement-Pond Co., New York.

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Holden Co., Ltd., Montreal, Que.
Niles-Bement-Pond Co., New York.
Petrie Ltd., H. W., Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

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Marshall, Son & Bunney, Toronto.

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Morse Twist Drill & Mach. Co., New Bedford, Mass.
McCrosky Tool Corp., Meadville, Pa., U. S. A.
Pratt & Whitney Co., Dundas, Ont.
J. A. M. Taylor, 318 Stair Bldg., Toronto
Wells Bros. of Can., Galt, Ont

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Gisholt Machine Co., Madison, Wis.
Lyman Tube & Supply Co., Montreal, Que
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Pilot Steel & Tool Co., Montreal, Que.
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Wilt Twist Drill Co., Walkerville, Ont.

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Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

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Ackworthie Ltd., J., Birmingham, Eng.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield.
Ingersoll Machy. Co., Ingersoll, Ont.
Marshall, Son & Bunney, Toronto.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
Wells Bros. of Canada, Galt, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

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Ackworthie Ltd., J., Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wells Bros. of Can., Galt, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

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Ackworthie Ltd., J., Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield.
Morrow Screw & Nut Co., John, Ingersoll.
Wells Bros. of Can., Galt, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

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Holden Co., Ltd. Montreal, Que.

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Can. Driver-Harris Co., Ltd., Walkerville.

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Jones & Glassco, Montreal.
Lyman Tube & Supply Co., Montreal, Que
Renold of Canada Ltd., Montreal.

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Brown, Boggs Co., Ltd., Hamilton.
Can. Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machinery Co., Toronto
Niles-Bement-Pond Co., New York.
Petrie Ltd., H. W., Toronto.
Toledo Machine & Tool Co., Toledo, O.

ROLLS CRUSHING
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

ROLLS AND TABLES
Dominion Foundries & Steel Ltd., Hamilton, Ont.
Elec. Steel & Metals, Welland, Ont.

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ROPE, GALX, MONEL METAL, BRONZE, TILLER AND SASH CORD
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Dom. Steel Products Co., Ltd., Brantford
Mesta Machine Co., Pittsburgh, Pa.

ROLL LATHES
Mesta Machine Co., Pittsburgh, Pa.

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ROLLS, CRUSHING
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Dom. Steel Products Co., Ltd., Brantford.
Can. Link-Belt Co., Toronto.

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Dom. Steel Products Co., Ltd., Brantford.

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SAW MILL MACHINERY
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Canada Machinery Corp., Galt.
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Atkins & Co., E. C., Hamilton, Ont.

SAWS — HIGH-SPEED FRICTION
Atkins & Co., E. C., Hamilton, Ont.

SAWS — PATTERN SHOP
Atkins & Co., E. C., Hamilton, Ont.

SAWS — SWING
Atkins & Co., E. C., Hamilton, Ont.

SCLEROSCOPES
Shore Instrument & Mfg. Co., New York.

SCREENING MACHINERY
Can. Link-Belt Co., Toronto.

SCREW EXTRACTORS
Cleveland Twist Drill Co., Cleveland.

SCREW MACHINES, HAND, AUTOMATIC
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Ltd., Toronto
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield.
Herbert, Ltd., Alfred, Toronto, Ont.
A. B. Jardine & Co., Hespeler.
National Acme Co, Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto.
Pratt & Whitney Co., Dundas, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
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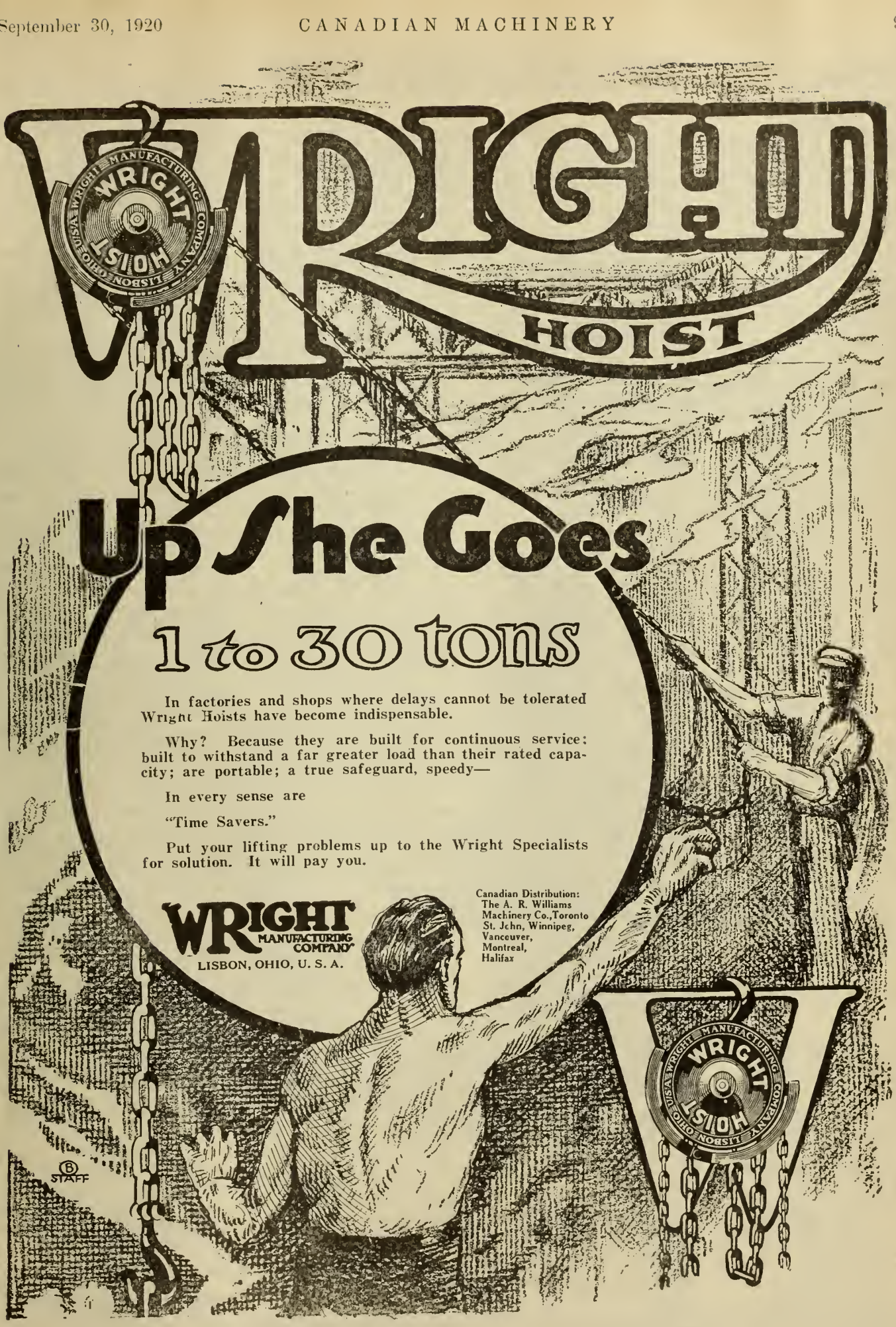

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SCREWS, MACHINE, SET, CAP AND SPECIAL
Galt Machine Screw Co., Galt.
John Morrow Screw & Nut Co., Ingersoll.
National Acme Co., Montreal.
Rice Lewis & Son, Toronto.
Steel Co. of Canada, Ltd., Hamilton.
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Herbert, Ltd., Alfred, Toronto, Ont.

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Butterfield & Co., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield.
A. B. Jardine & Co., Hespeler.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto.
J. A. M. Taylor, Stair Bldg., Toronto.
Wells Bros. of Can., Galt.
Wilkinson & Kompass, Hamilton.

SCREWS, SAFETY SET
Galt Machine Screw Co., Ltd., Galt, Ont.

SCREW SLOTTERS
Butterfield & Co., Inc., Rock Island, Que.
Garvin Machine Co., New York.
National Acme Co., Cleveland, O.
Pratt & Whitney Co., Dundas, Ont.

SELF-OPENING DIES
See Dies.

SET SCREWS, SAFETY
Aikenhead Hardware Co., Toronto.
Bristol Co., Waterbury, Conn.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wilkinson & Kompass, Hamilton.

SHANKS, STRAIGHT AND TAPER
Jacobs Mfg. Co., Hartford, Conn.

SHAPERS
John Bertram & Sons Co., Dundas.
Can. Fairbanks-Morse Co., Montreal.
Canadian Machinery Corp., Galt.
Cochrane-Bly Co., Rochester, N.Y., U.S.A.
Geo. F. Foss Mchy. & Sply. Co., Montreal.
Robt. Gardner & Son, Montreal.
Garlock-Walker Mach'y. Co., Toronto.
Herbert, Ltd., Alfred, Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Petrie, Ltd., H. W., Toronto.
Strelinger Co., C. A., Windsor, Ont.
Standard Equipment & Tool Wks., Montreal.
Walcott Lathe Co., Jackson, Mich.
Williams Mchy Co., A. R., Toronto, Ont.

SHAPERS, GEAR
Fellows Gear & Shaper Co., Springfield, V.

SHAFTING
Algoma Steel Corp., Sault Ste. Marie, O.
Can. Fairbanks-Morse Co., Montreal.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machy. Co., Ltd., Toronto
Jones & Glassco, Montreal.
Niles-Bement-Pond Co., New York.
Can. Drawn Steel Co., Hamilton.
Peckovers, Ltd., Toronto, Ont.
Petrie, Ltd., H. W., Toronto.
Pratt & Whitney Co., Dundas.
Rice, Lewis & Son, Toronto.
Strelinger, Chas. A. Co., Windsor, Ont.
A. R. Williams Machy. Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.
Williams Mchy Co., A. R., Toronto, Ont.

SHARPENING STONES
Norton Co, Worcester, Mass.
Rice, Lewis & Son, Toronto.

SHEARING MACHINES, ANGLE IRON, BAR AND GATE
John Bertram & Sons Co., Dundas.
Bertrams Ltd., Edinburgh, Scotland.
Canada Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machy. Co., Ltd., Toronto
A. B. Jardine & Co., Hespeler, Ont.
Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co., Toledo, O.

SHEARS, POWER
John Bertram & Sons Co., Dundas.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton.
Can Blower & Forge Co, Kitchener.
Canada Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machy. Co., Ltd., Toronto
A. B. Jardine & Co., Hespeler, Ont.
National Machy. Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto.
H. D. Stoll Co., Inc., Buffalo, N.Y.
Strelinger, Chas. A. Co., Windsor, Ont.
Toledo Machine & Tool Co., Toledo, O.
Williams, White & Co., Moline, Ill.
Williams Mchy Co., A. R., Toronto, Ont.

SHEARS, PNEUMATIC
Toledo Machine & Tool Co., Toledo, Ohio

SHEARS, PLATE CUTTING, SLITTING
Dom. Steel Products Co., Ltd., Brantford.

SHEARS, SPLITTING
Dom. Steel Products Co., Ltd., Brantford.

SHEARS, IRREGULAR AND CIRCLE CUTTING
D. H. Stoll Co., Inc., Buffalo, N.Y.

SHEARS, SQUARING
Brown, Boggs & Co., Hamilton, Ont.
D. H. Stoll Co., Inc., Buffalo, N.Y.

SHEET METAL WORKING MACHINERY
Herbert, Ltd., Alfred, Toronto, Ont.
D. H. Stoll Co., Inc., Buffalo, N.Y.

SHEET METAL WORKING TOOLS
Baird Machine Co., Bridgeport, Conn.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton.
Petrie, Ltd., H. W., Toronto.
D. H. Stoll Co., Inc., Buffalo, N.Y.
Strelinger, Chas. A. Co., Windsor, Ont.

SHEETS, CRUCIBLE, CAST
British Smelting & Refining Co., Ltd., Montreal, Que.

SHEETS, BLACK AUTO AND GALVANIZED
Peckovers, Ltd., Toronto, Ont.

SHEETS, NICKEL, RESIST. ALLOY
Can. Driver-Harris Co., Ltd., Walkerville.

SHELVING, STEEL
Dennis Wire & Iron Works, London.

SHIPYARD MACHINERY, SHOP FURNITURE
Dennis Wire & Iron Works, London.

SIDE TOOLS
Armstrong Bros. Tool Co., Chicago.
H. Williams & Co., Brooklyn, N.Y.

SILENT CHAINS
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal.
Renold of Canada Ltd., Montreal.

SLEDGES
Aikenhead Hardware Co., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.
Wilkinson & Kompass, Hamilton, Ont.

SLINGS, CHAINS
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

SLOTTERS
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
Herbert, Ltd., Alfred, Toronto, Ont.
National-Acme Co., Cleveland, Ohio.
Niles-Bement-Pond Co., New York.

SMOKESTACKS
William Hamilton Co., Peterboro, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

SNIPS, TINNERS AND SHEET METAL WORKERS
Kearney & Trecker Co., Milwaukee, Wis.
J. Morrow Screw & Nut Co., Ingersoll, Ont.

SOCKETS
Brown & Sharpe Mfg. Co., Providence
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.

SOIL PIPE FITTINGS, CAST IRON
Katie Foundry, Galt, Ont.

SOLDERING IRONS
Aikenhead Hardware Co., Toronto, Ont.
Brown, Boggs & Co., Hamilton, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.

SOLDER
British Smelting & Refining Co., Ltd. Montreal, Que.
Aikenhead Hardware Co., Toronto, Ont.
Canada Metal Co. Ltd., Toronto, Ont.
Hoyt Metal Co., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.
Tallman Brass & Metal Co., Hamilton.

SPELTER
British Smelting & Refining Co., Ltd. Montreal, Que.

SPEED REDUCING GEARS
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal.

SPRINGS, MACHINERY
Barnes, Wallace Co., Bristol, Conn.
Can. Steel Foundries, Ltd., Montreal.
Cleveland Wire Spring Co., Cleveland.
Dunbar Bros. Co., Bristol, Conn.
Garlock-Walker Machinery Co., Toronto.

SPECIAL MACHINERY
Baird Machine Co., Bridgeport, Conn.
Bertram, John, & Sons Co., Dundas.
Bliss, E. W. Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada.
Brown Engineering Corp., Toronto, Ont.
Dom. Steel Products Co., Ltd., Brantford
Ford-Smith Machine Co., Hamilton, Ont
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Globe Engineering Co. Ltd., Hamilton.
Hamilton Co., Ltd., Wm., Peterborough
A. B. Jardine & Co., Heepeler, Ont.
Katie Foundry, Galt, Ont.
Ker & Goodwin Machine Co., Ltd., Brantford Ont.
McCrosky Tool Corp., Meadville, Pa., U. S. A.
National-Acme Co., Cleveland, Ohio.
Niagara Machine Co., Pittsburgh, Pa.
Stoll Co., D. H., Buffalo, N.Y.
Victoria Foundry Co., Ottawa, Ont.
William R. Perrin, Ltd., Toronto.
Williams Tool Corp. of Can. Ltd., Brantford, Ont.

SPECIAL TOOLS, MACHINERY
Crescent Machine Co., Ltd., Montreal, Que.
McClean Machine & Tool Co., Ltd., Hamilton, Ont.

SPOT FACERS, INTERCHANGEABLE
Eclipse Counterbore Co., Ltd., Walkerville, Ont.

SPRING COILING AND WINDING MACHINERY
Baird Machine Co., Bridgeport, Conn.
Garvin Machine Co., New York.

SPRING MAKING MACHINERY (AUTOMATIC)
Baird Machine Co., Bridgeport, Conn.

SPRINGS, SPIRAL, TOOL
The Dunbar Bros. Co., Bristol, Conn.

SPRINGS STEEL
Barnes Co., Wallace, Bristol, Conn.

SPROCKETS, COMPENSATING
Morse Chain Co., Ithaca, New York.

SPROCKETS, SPRING
Morse Chain Co., Ithaca, New York.

SPROCKETS, CHAIN
Can Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal.
Lyman Tube & Supply Co., Montreal, Que
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works Philadelphia
Renold of Canada Ltd., Montreal.

SPRINGS FOR TOYS AND ELECTRIC DEVICES
The Dunbar Bros. Co., Bristol, Conn.

SPROCKET WHEELS, CAST
Can. Link Belt Co., Toronto, Ont.
Lyman Tube & Supply Co., Ltd. Montreal

SAFETY CYLINDERS
Oliver Mach. Co., Grand Rapids, Mich

SANDERS
Oliver Mach. Co., Grand Rapids, Mich

SAW BENCHES
Oliver Mach. Co., Grand Rapids, Mich.

SAW GUARDS
Oliver Mach. Co., Grand Rapids, Mich.

SAWING MACHINES
Herbert Ltd., Alfred, Toronto, Ont.

SAWS SWING
Oliver Mach Co., Grand Rapids, Mich.

SMALL TOOLS
Herbert Ltd., Alfred, Toronto, Ont.

STAYBOLT TOPS
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

STAIRS, IRON
Canada Wire & Iron Goods Co., Hamilton, Ont.

STAMPINGS SHEET BRASS COPPER, ALUMINUM AND STEEL
Dom. Forge & Stamping Co., Walkerville
Globe Engineering Co., Hamilton, Ont.

STAMPING MACHINERY
Bliss Co., E. W., Brooklyn N.Y.
Brown, Boggs, & Co., Hamilton, Can
Canada Machinery Corp., Galt, Ont.

SAFETY CYLINDERS
Oliver Mach. Co., Grand Rapids, Mich

STEAM APPLIANCES
Darling Bros., Ltd., Montreal, Quebec.

STEAM SEPARATORS AND TRAPS
Can. Fairbanks-Morse Co., Montreal.

STEAM TURBINES
General Combustion Co., Ltd., Montreal Que.
Sturtevant Co., B. F., Galt, Ont.

STEEL BALLS
See Balls Steel.

STEEL, CRUCIBLE TOOL
Atkins & Co., Ltd., Wm. Sheffield, Eng.
Illingworth Steel Co., John. New York
Marshall, Son & Bunney, Toronto

STEEL, CARBON, FERRO-TUNGSTEN
Armstrong, Whitworth of Can., Montreal.
Atkins & Co., Ltd., Wm. Sheffield Eng.
Firth & Sons, Thos. Montreal Que.
Latrobe Electric Steel Co., Latrobe, Pa.
Lincoln Electric Co. of Canada, Ltd Toronto, Ont.
Marshall, Son & Bunney Toronto.
Peckovers, Ltd., Toronto, Ont.
Samuel Osborne (Can.), Ltd., Montreal
Vanadium-Alloys Steel Co., Pittsburgh

STEEL, CHROME MOLYBDENUM
United Alloy Steel Corp., Canton, Ohio.

STEEL CHROME VANADIUM
Norton, Ralph B., Agent, Montreal.
Atkins & Co., Ltd., Wm. Sheffield, Eng.
Marshall Son & Bunney, Toronto
United Alloy Steel Corp., Canton, Ohio.

STEEL CHROME NICKEL
Firth & Sons, Ltd., Thos., Montreal.
Lyman Tube & Supply Co., Ltd., Montreal
Norton, Ralph B., Agent, Montreal.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall Son & Bunney, Toronto
United Alloy Steel Corp., Canton, Ohio.

STEEL CASTINGS
Can. Elec. Steel Casting Co., Aurora, Ont
Davidson Mfg. Co., Ltd., Montreal, Que
Dominion Foundries & Steel Ltd., Hamilton, Ont.
Dom. Iron & Steel Sydney, N.S.
Kennedy & Sons, Wm., Owen Sound
Electric Steel & Metals Co., Welland.
Nova Scotia Steel & Coal Co., Windsor
Swedish Crucible Steel Co., Windsor

STEEL, COLD DRAWN
United Alloy Steel Corp., Canton, Ohio.

STEEL, COLD ROLLED
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Can. Drawn Steel Co., Hamilton, Ont.
Rice Lewis & Son, Toronto, Ont.
Swedish Steel & Importing Co. Ltd., Montreal.
Union Drawn Steel Co., Hamilton, Ont.

STEEL, ELECTRIC FURNACE
United Alloy Steel Corp., Canton, Ohio.

STEEL FJAB
Lincoln Electric Co., of Canada, Ltd., Toronto, Ont.

STEEL, NICKEL
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall, Son & Bunney, Toronto.
United Alloy Steel Corp., Canton, Ohio.

STEEL, HIGH SPEED
Armstrong-Whitworth of Can., Montreal
Wm. Atkins & Co., Sheffield, Eng.
Can. Fairbanks-Morse Co., Montreal
Deloro Smelting & Refining Co., Ltd. Toronto, Ont.
H. A. Drury Co., Ltd., Montreal.
Firth & Sons, Thos., Montreal, Que.
Illingworth Steel Co., J., New York.
Latrobe Electric Steel Co., Latrobe, Pa.
Marshall, Son & Bunney, Toronto, Ont.
Osborne, Samuel, Montreal, P.Q.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Toronto, Ont.
Swedish Steel & Importing Co., Ltd., Montreal.
Vanadium-Alloys Steel Co., Pittsburgh.

STEEL, OPEN HEARTH
Illingworth Steel Co., John, New York.
United Alloy Steel Corp., Canton, Ohio.

STEEL PLATES
Dominion Foundries & Steel Ltd., Hamilton, Ont.

STEEL PRODUCTS AND MACHINERY
Dom. Steel Products Co., Ltd., Brantford

STEEL, ROCK DRILL
Armstrong, Whitworth of Canada, Montreal, Que.
Lincoln Electric Co. of Canada, Ltd., Toronto, Ont.

STEEL, SPECIAL ANALYSIS
United Alloy Steel Corp., Canton, Ohio.

STEEL, SPRING AND REINFORCING
Peckovers, Ltd., Toronto, Ont.
United Alloy Steel Corp., Canton, Ohio.

STEEL, STRUCTURAL
Algoma Steel Corp., Sault Ste. Marie
MacKinnon Steel Co., Sherbrooke, Que.
Peckovers, Ltd., Toronto, Ont.

STEEL, TOOL
Armstrong, Whitworth of Can., Montreal
Atkins & Co., Wm., Sheffield, Eng.
Can. Fairbanks-Morse Co., Montreal
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Drury Co., H. A., Montreal, Que.
Deloro Smelting & Refining Co., Ltd, Toronto, Ont.
Firth & Sons, Thos., Montreal, Que
Lincoln Electric Co., of Canada, Ltd., Toronto, Ont.
Lyman Tube & Supply Co., Ltd., Montreal
Marshall, Son & Bunney, Toronto, Ont.
Latrobe Electric Steel Co., Latrobe, Pa.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son Toronto, Ont.
Vanadium-Alloys Steel Co., Pittsburgh.

STEEL TUBING
Tube Co. of Canada, Ltd., Toronto, Ont.

STEEL, VANADIUM
Wm. Atkins & Co., Ltd., Sheffield, Eng.
Armstrong Whitworth of Can., Montreal
Dominion Foundries & Steel Ltd., Hamilton, Ont.
Drury, H. A., Co., Montreal, Que.
Marshall, Son & Bunney, Toronto.
Vanadium-Alloys Steel Co., Pittsburgh.
Wells Bros. of Can., Galt, Ont.

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Deloro Smelting & Refining Co., Ltd, Toronto, Ont.

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Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

STOCKS AND DIES
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros., of Can., Galt, Ont.

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A. B. Jardine & Co., Ltd., Hespeler, Ont.
Rice Lewis & Son, Toronto, Ont.
Wells Bros., Co., of Canada, Galt, Ont.

STONES, COMMUTATORS
Lyman Tube & Supply Co., Ltd., Montreal

STRAIGHTENING MACHINERY
Baird Machinery Co., Bridgeport, Conn.
Bertrams, Ltd., Edinburgh, Scotland.

STRAND
Dom. Steel Products Co., Ltd., Brantford.
Page Steel & Wire Co., Adrian, Mich.

SURFACE PLATES
Brown & Sharpe Mfg. Co., Providence, R.I.

STRUCTURAL STEEL WORKS
William Hamilton Co., Peterboro, Ont.

SWITCHBOARDS
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THE motor on Landis Boring Machines is mounted on the top of the column and is **direct connected to the main drive shaft,** thus eliminating fully 50 per cent. of all motor trouble.

Belting, gearing and shifting, and the resulting loss of power, due to friction, are eliminated.

Constant speed motors of either direct or alternating current may be used.

Economical and Efficient Power Transmission

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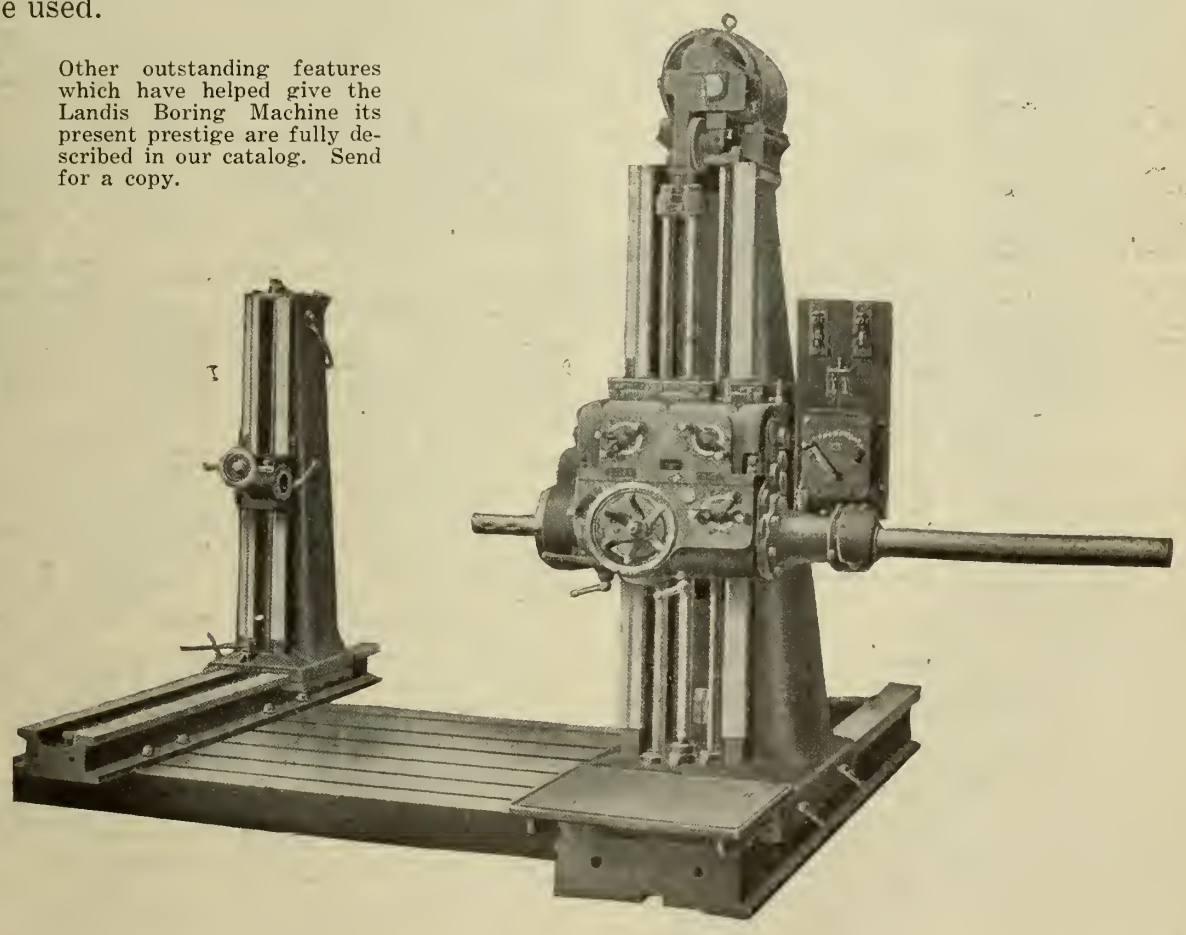

Landis Tool Company, Waynesboro, Pa.

Canadian Agents: A. R. Williams Machinery Co., Toronto, Winnipeg, Vancouver
Williams & Wilson, Montreal

If interested tear out this page and place with letters to be answered.

TABLES, DRAWING
Economy Drawing Table Co., Adrian, Mich.

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TANKS, AIR, EXPANSION
Can. John Wood Mfg. Co., Ltd., Toronto

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Dom. Forge & Stamping Co., Walkerville.
MacKinnon Steel Co., Sherbrooke, Que.
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TANKS, PNEUMATIC AND CLOSET
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TANKS, STEEL, WATER PRESSURE
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MacGovern & Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Toronto Iron Works, Ltd, Toronto.

TANK WAGONS
MacKinnon Steel Co., Sherbrooke, Que.
Toronto Iron Works, Ltd., Toronto.

TANKS, WELDED
Can. John Wood Mfg. Co., Ltd., Toronto
Lincoln Electric Co. of Canada, Ltd., Toronto, Ont.

TANKS
Can. Ingersoll-Rand Co., Ltd., Sherbrooke
Elec. Steel & Metals, Welland, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
Williams Hamilton Co., Peterboro, Ont.

TAPER PINS
Galt Machine Screw Co., Ltd., Galt, Ont.

TAPES, MEASURING
James Chesterman & Co., Ltd., Sheffield, Eng.
Rice Lewis & Son, Toronto, Ont.

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Canada Machinery Corp., Galt, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garvin Machine Co., New York.
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A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Murchy Machine & Tool Co., Detroit.
Niles-Bement-Pond Co., New York.
National-Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto.
L. S. Starrett Co., Athol, Mass.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Tool Corp. of Can. Ltd., Brantford, Ont.

TAPS, ADJUSTABLE
Butterfield & Co., Rock Island, Que.
Geometric Tool Co., New Haven.
Ingersoll Mach. Co., Ingersoll, Ont.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Pilot Steel & Tool Co., Montreal, Que.
Victor Tool Co., Waynesboro, Pa.

TAPS, GUN, HAND, BOILER
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

TAPS, MACHINE RELIEVED
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

TAPS, MACHINE SCREW
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

TAPS, PIPE
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield.
Ingersoll Mach. Co., Ingersoll, Ont.
Marshall, Son & Bunney, Toronto.
Wells Bros. of Can., Galt, Ont.

TAPS, STAYBOLT, TAPPER
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

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Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Foss Machy. & Spty. Co., G. F., Montreal.
Geometric Tool Co., New Haven.
Greenfield Tap & Die Corp., Greenfield.
Ingersoll Mach. Co., Ingersoll, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Morse Twist Drill & Mchy. Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Rice Lewis & Son, Toronto, Ont.
Starrett Co., L. S., Athol, Mass.
Strelinger, Chas. A. Co., Windsor, Ont.
Taylor, J. A. M., 318 Stair Bldg., Toronto.
Wells Bros. of Canada, Galt, Ont.

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Walton Co., The, Hartford, Conn.

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Taylor Instrument Co., Rochester, N.Y.

THERMOMETERS, RECORDING AND INDEX
Bristol Co., Waterbury, Conn., U.S.A.
Taylor Instrument Co., Rochester, N.Y.

TESTING INSTRUMENTS, METALLURGICAL
Shore Instrument & Mfg. Co., New York.

TENOVERS
Oliver Machy. Co., Grand Rapids, Mich.

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Toronto Testing Laboratory, Toronto.

THREAD-CUTTING MACHINES
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Mach. Co., Ltd., Toronto
Geometric Tool Co., New Haven.
Jardine & Co., Ltd., A. B., Hespeler.
Landis Machine Co., Waynesboro, Pa.
National-Acme Co., Cleveland, Ohio.
National Machy. Co., Tiffin, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Petrie, Ltd., H. W., Toronto.
Wells Bros. Co. of Canada, Galt., Ont.

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Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield.
Landis Machine Co., Waynesboro, Pa.
Pratt & Whitney Co., Dundas, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
Wells Bros. of Canada, Galt, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

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Greenfield Tap & Die Corp., Greenfield.
Petrie, Ltd., H. W., Toronto.
Wells Bros. Co. of Canada, Galt., Ont.

THUMB SCREWS AND NUTS
See Screws.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

TIN—PIG AND BAR
British Smelting & Refining Co., Ltd., Montreal, Que.
Hoyt Metal Co., Toronto, Ont.

TINSMITHS' TOOLS
Brown, Boggs & Co., Hamilton, Can.
Petrie, Ltd., H. W., Toronto.

TIRE BENDERS
Jardine & Co., Ltd., A. B., Hespeler.

TIRE SETTING MACHINES, HYDRAULIC
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Perrin, Ltd., William R., Toronto.

TOOL CASES
Rice Lewis & Son, Toronto, Ont.

TOOL HOLDERS
Albenhead Hardware Co., Toronto, Ont.
Armstrong Bros. Tool Co., Chicago.
Cleveland Twist Drill Co., Cleveland.
Deloro Smelting & Refining Co., Ltd. Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

TOOL MAKERS
Samuel Osborne (Can.), Ltd., Montreal.

TOOL POSTS, LATHE
Armstrong Bros. Tool Co., Chicago.
Williams & Co., J. H., Brooklyn, N.Y.

TOOL ROOM EQUIPMENT
Herbert Ltd., Alfred, Toronto, Ont.

TOOL ROOM PARTITIONS
Canada Wire & Iron Goods Co., Hamilton.

TOOLS, BLACKSMITHS'
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Rice Lewis & Son Toronto, Ont.

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Petrie, Ltd., H. W., Toronto.

TOOLS, ELECTRIC
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool Co., Chicago.
Strelinger, Chas. A. Co., Windsor, Ont.
Williams Machy. Co., A. R., Toronto.
U. S. Electrical Tool Co., Cincinnati, O.

TOOLS, FORMING
Davidson Tool Mfg. Co., New York, N.Y.
Deloro Smelting & Refining Co., Ltd. Toronto, Ont.

TOOLS, LUMBERING
Thos. Pink & Co., Pembroke, Ont.

TOOLS, LATHE, PLANER, SLOTTER
Armstrong Bros. Tool Co., Chicago.
Gisholt Machine Co., Madison, Wis.
Williams & Co., J. H., Brooklyn, N.Y.

TOOLS, SCREW MACHINE
Foster Machine Tool Co., Elkhart, Ind.

TOOLS, SHOP
Strelinger Co., C. A., Windsor, Ont.

TOOLS, SPECIAL
Crescent Machine Co., Ltd., Montreal, Que.
McClean Machine & Tool Co., Ltd., Hamilton, Ont.
McCrosky Tool Corp., Meadville, Pa., U. S. A.

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TORCHES, GASOLINE, KEROSENE AND ALCOHOL
Turner Brass Works, Sycamore, Ill.

TORCHES, STEEL
Armstrong, Whitworth of Can., Montreal.
Prest-O-Lite Co., Inc., Toronto, Ont.

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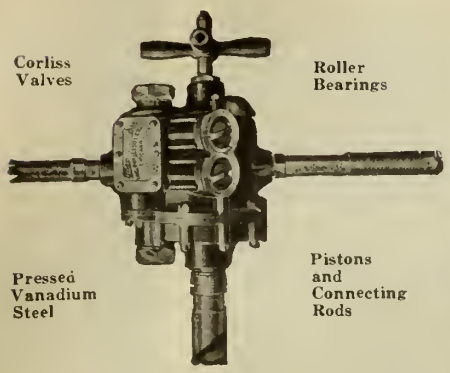

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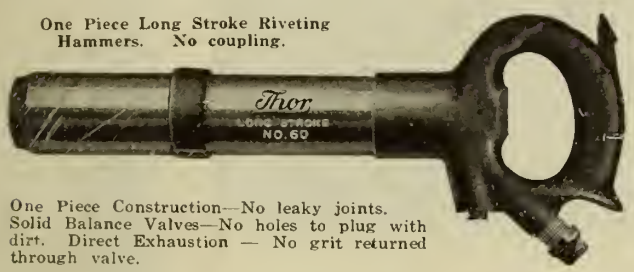

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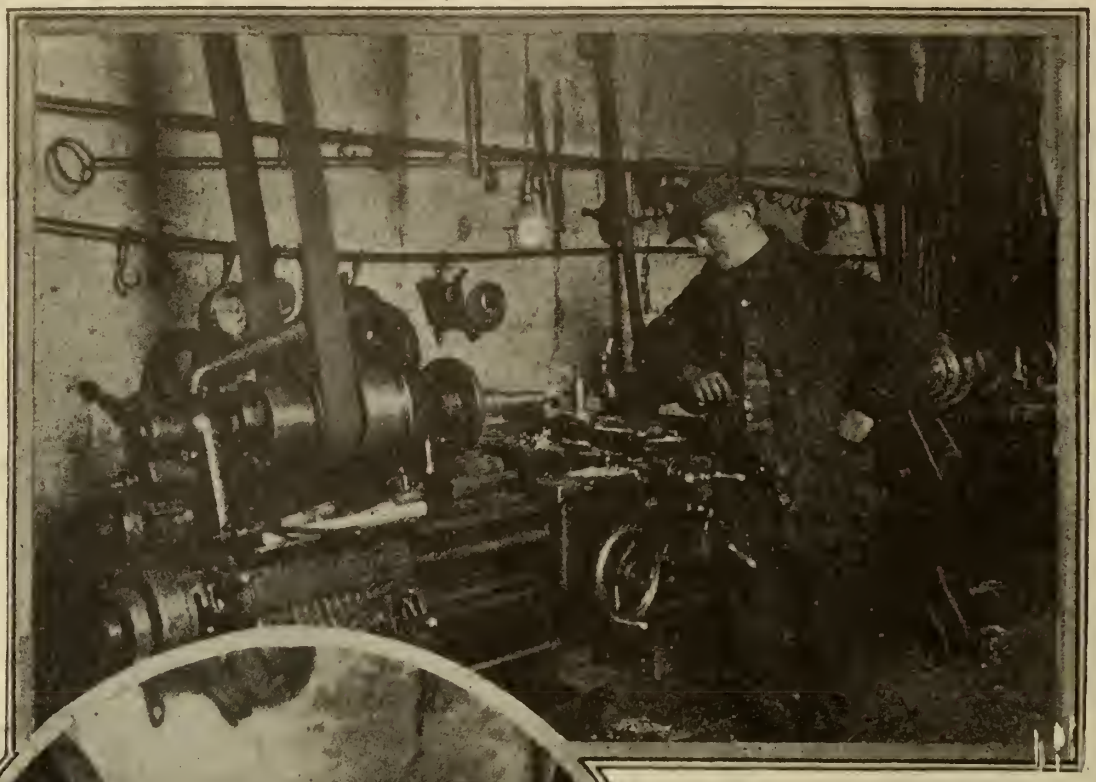

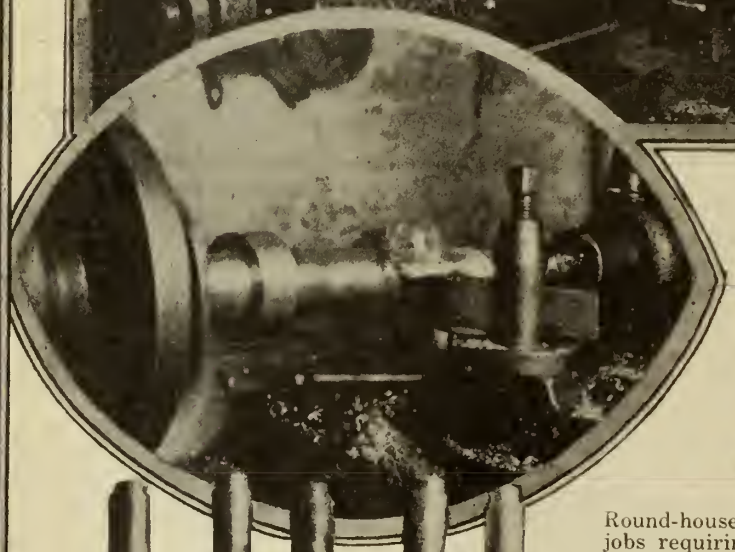

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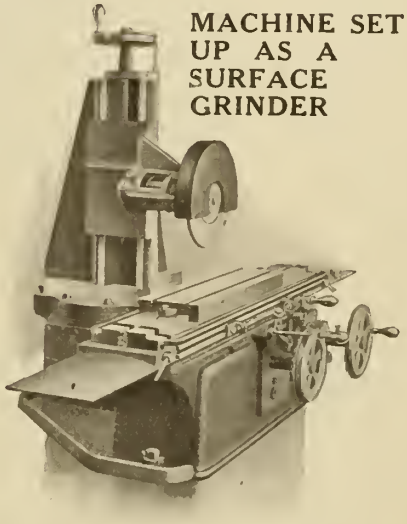
(Patented May 28, 1918)

MACHINE SET UP AS AN INTERNAL GRINDER



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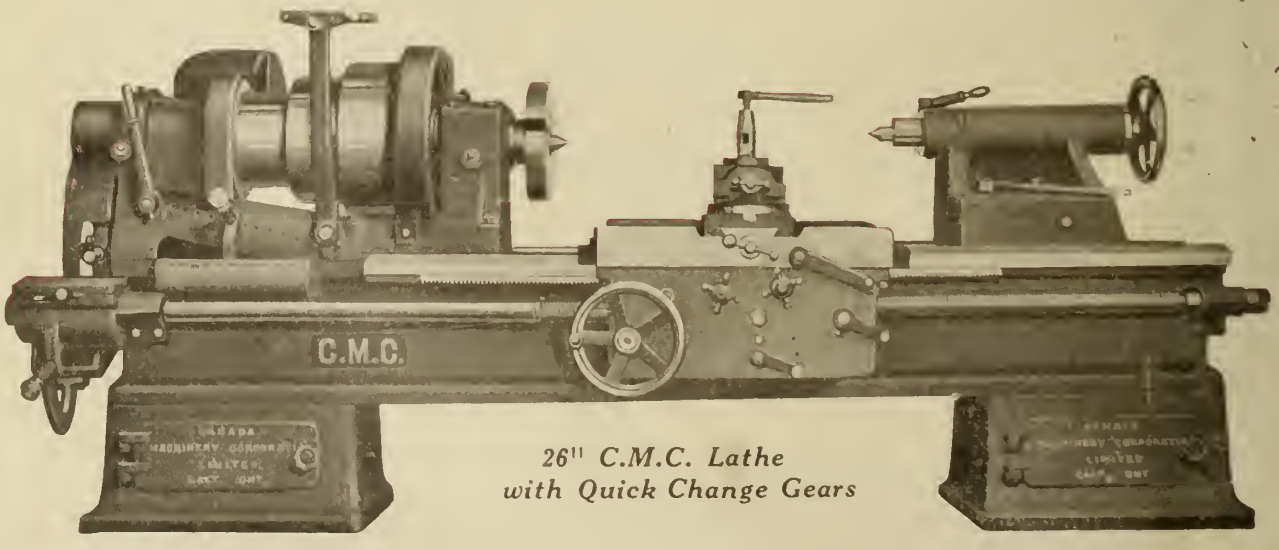

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